Clean Technologies
Economic Impact and Innovation

5th Annual IP Data and Research Conference

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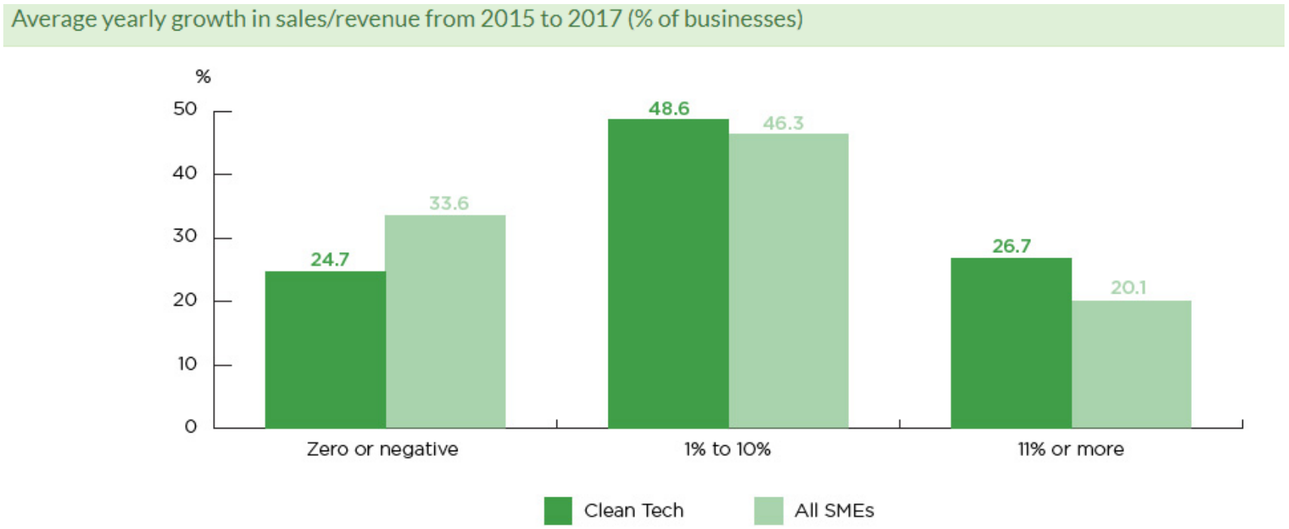
Nicholas Johnston, Junior Policy Analyst, ISED

March 24, 2022

OUTLINE

- Status of the CleanTech Sector in Canada
- CleanTech SMEs in Canada
- Canadian CleanTech Firm characteristics data
- Canadian CleanTech IP awareness and ownership data
- Canadian CleanTech IP benefits data
- National Research Council Canada’s Material for Clean Fuels Challenge Program

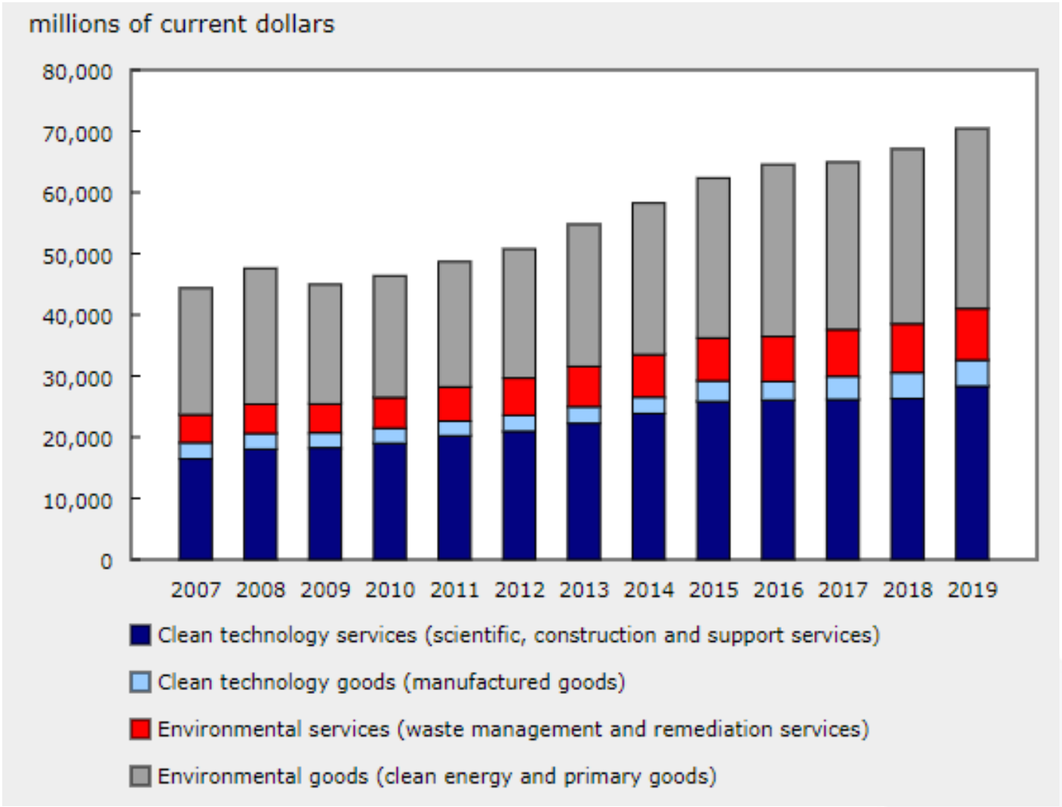
Cleantech Sector is Growing



GDP growth in the environmental and clean tech sector was driven by the clean technology services category.

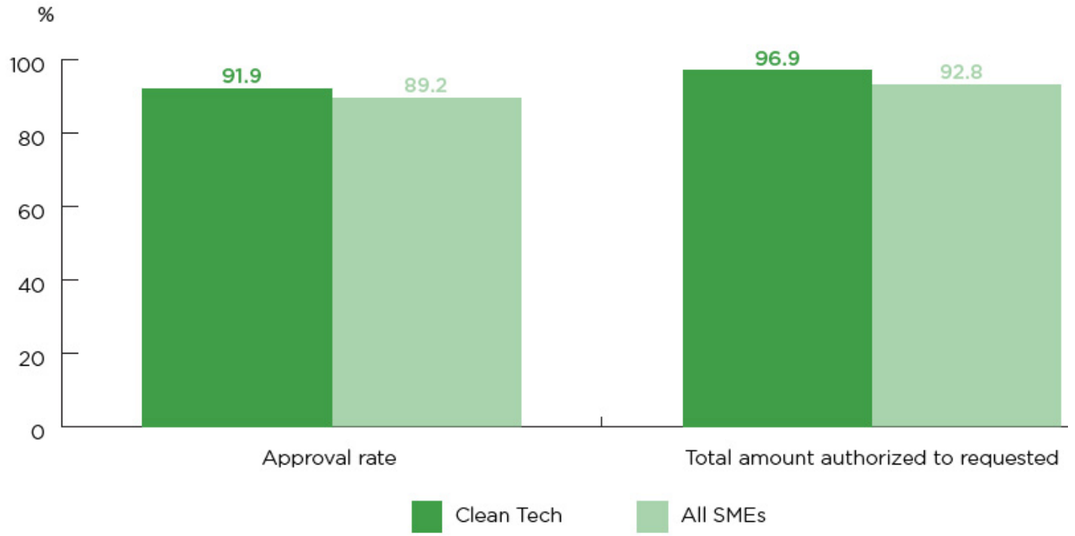
In particular, the growth reflected gains in the scientific and research and development services industry (+9.9%) as well as the construction services industries (+5.7%).

The generation of clean electricity also contributed to the national increase, with its GDP growth of 3.3% over the period.

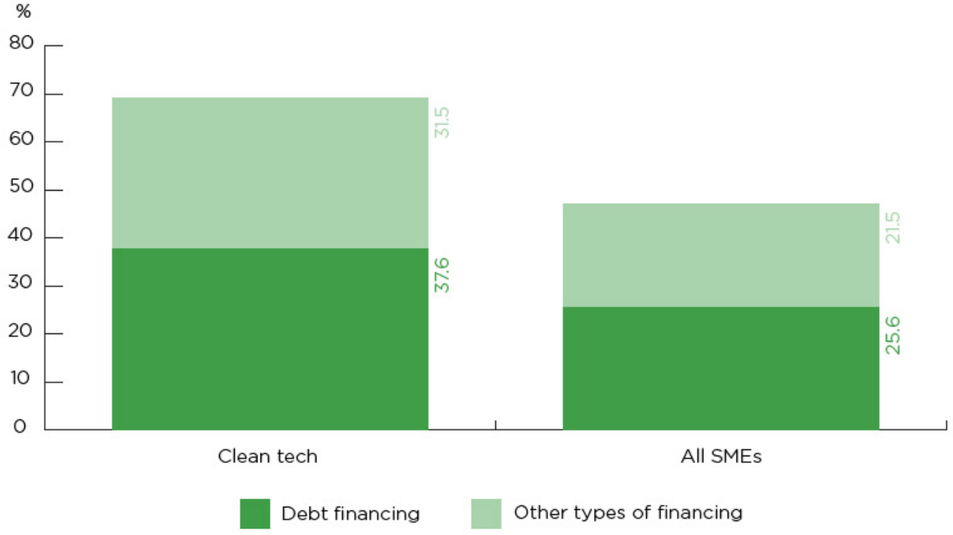


Cleantech Sector is Well-Funded

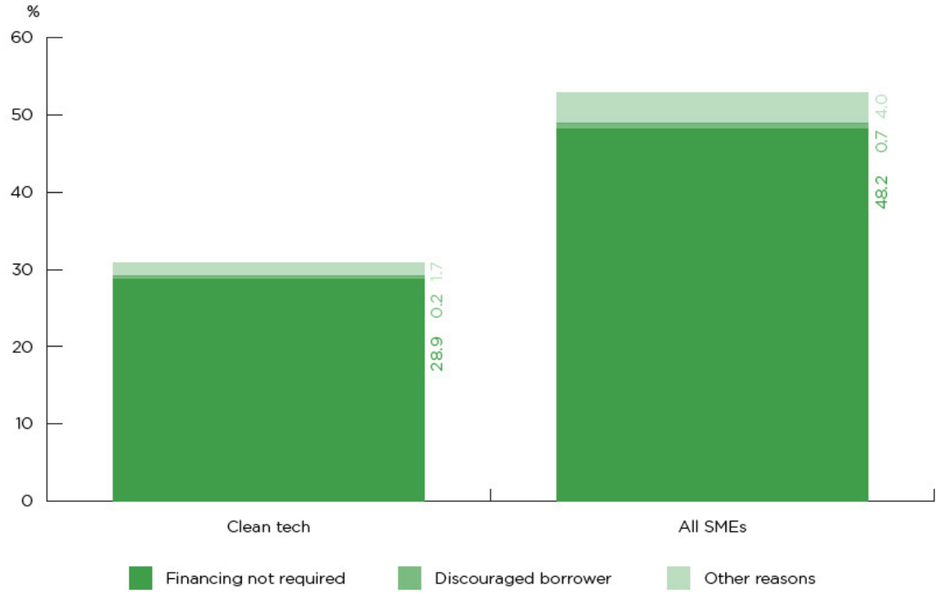
Approval rate (% of businesses), and share of amount of financing authorized to requested (%)



Requested financing (% of businesses)



Reasons for not requesting financing (% of businesses)



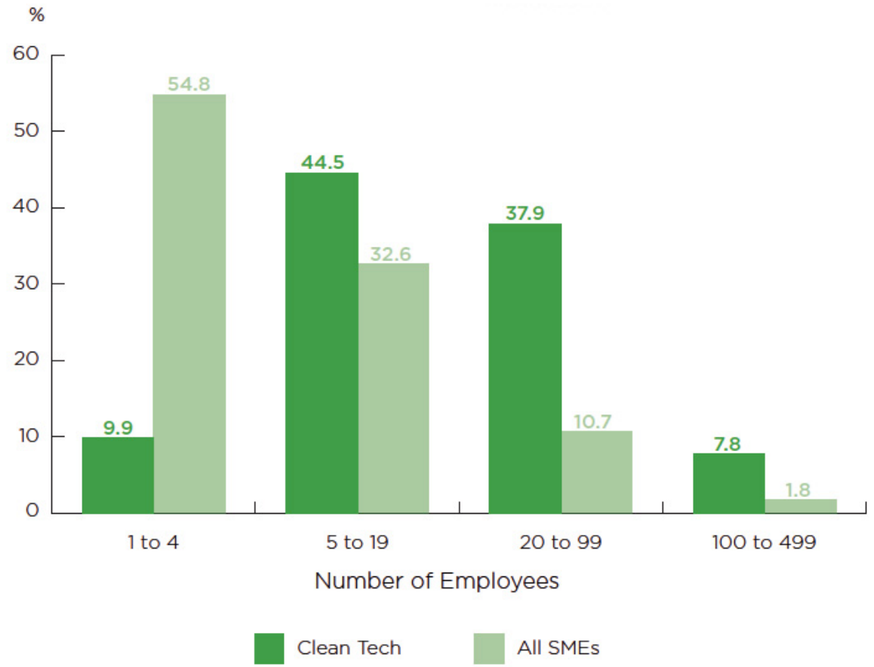
While nearly all financing requests made by all SMEs were approved in 2017 but clean tech SMEs accessed financing even more readily

Of note, 92 percent of debt financing requests made by clean tech SMEs were approved, with 97 percent of the funding required being approved

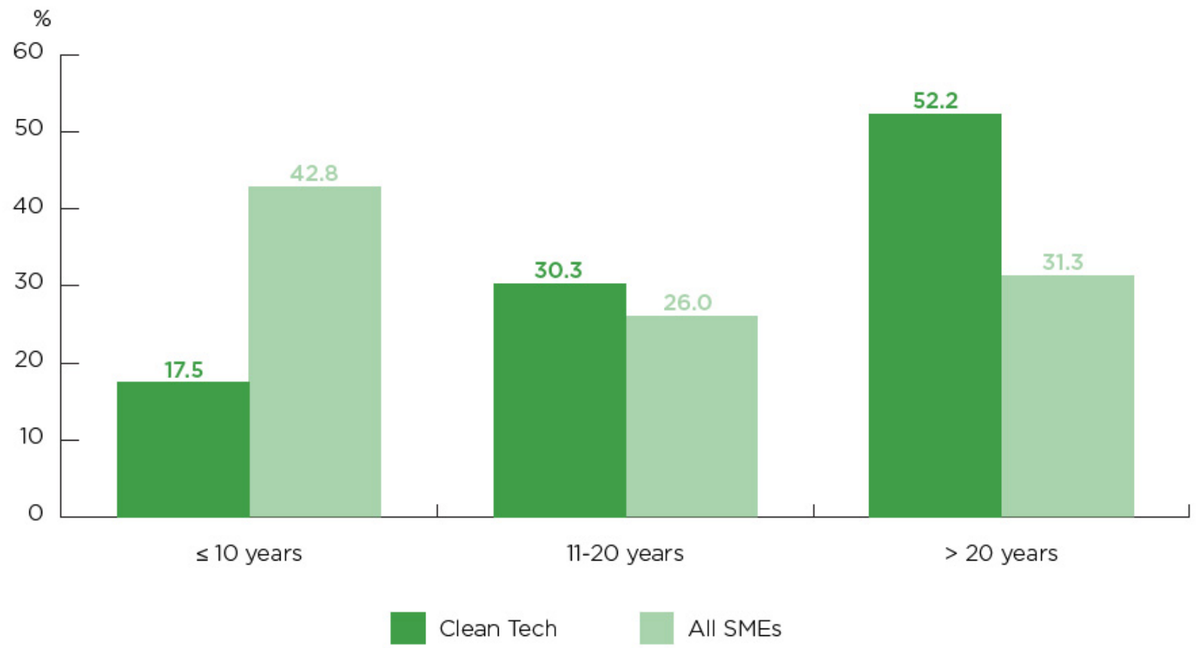
Furthermore, less than 1 percent of both clean tech SMEs and all SMEs did not request financing because they did not think their request would be approved (i.e., discouraged borrowers)

CLEANTECH SECTOR IS STABLE

Firm size (number of employees) (% of businesses)



Firm age (% of businesses)



In 2017, clean tech SMEs were large and well-established businesses, tending to have more employees and tending to have been in operation longer than all SMEs.

Very few micro-sized clean tech firms, only 10 percent, having between 1 and 4 employees, in contrast to over half of all other SMEs being in this firm size group.

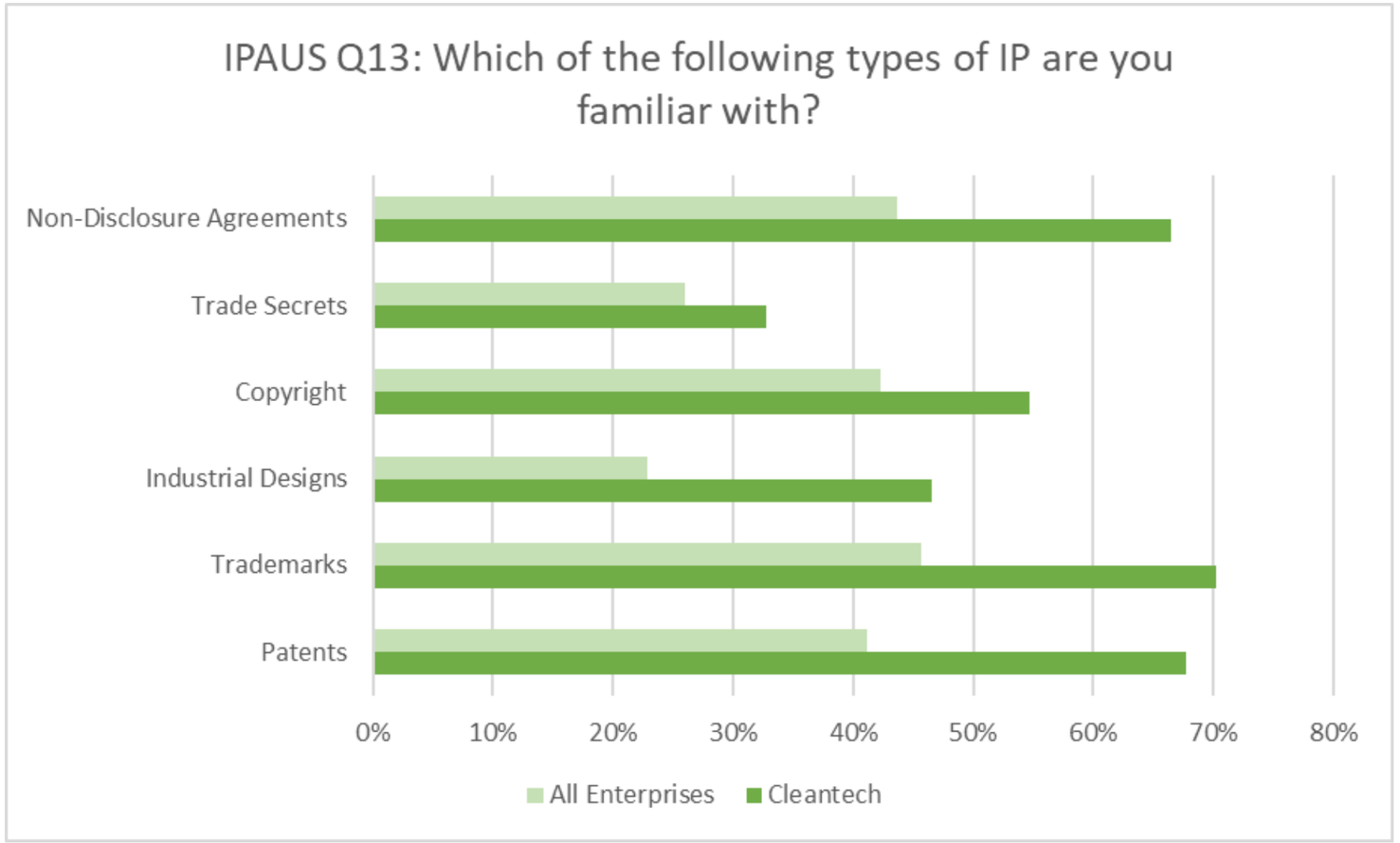
Clean tech SMEs were also more likely to be older.

Half (52 percent) of clean tech SMEs had been in operation more than 20 years, compared with 31 percent of all SMEs.

Similarly, clean tech SMEs were less likely to be younger, with 18 percent in operation for 10 years or less, compared with 43 percent of all SMEs.

Cleantech Sector is Active in IP

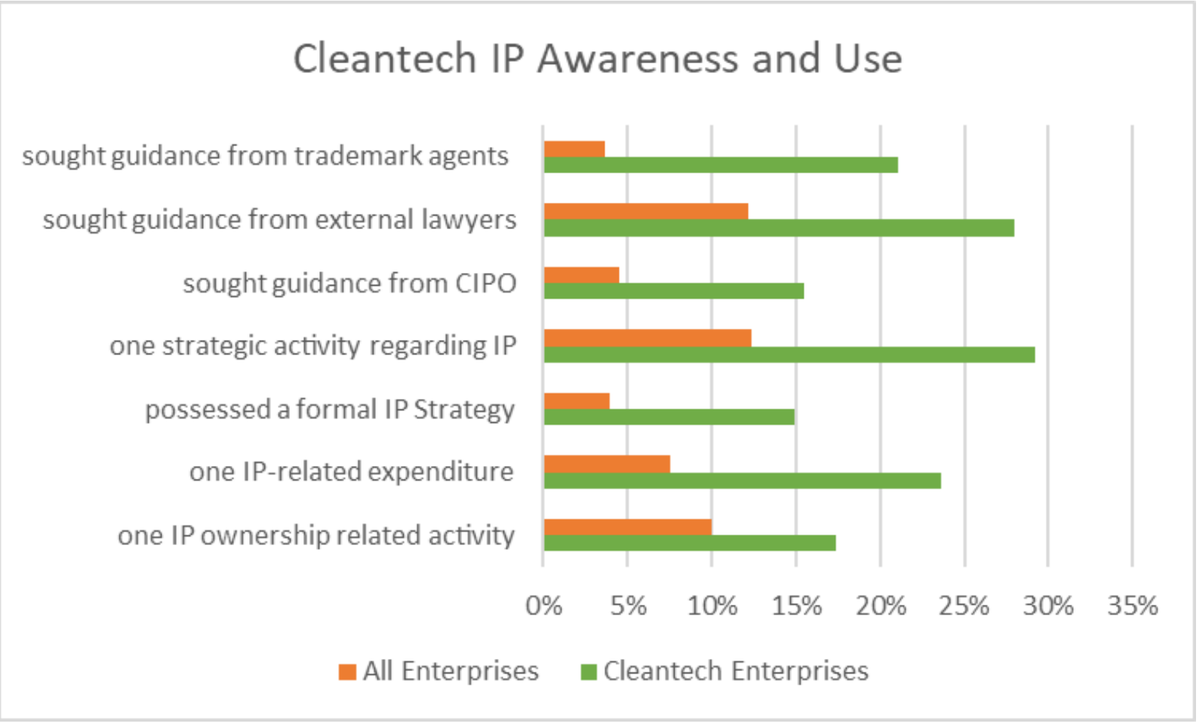
Enterprises involved within the Cleantech sector were more familiar with at least one type of IP (80.1%) compared to the average enterprise (57.8%) and were also more familiar with all types of IP compared with the average enterprise.



Cleantech Sector is Active in IP

IPAUS Enterprises involved in the CleanTech sector were more likely to:	Cleantech Enterprises	All Enterprises
Have been involved in at least one IP ownership related activity	17.4%	10%
Have incurred at least one IP-related expenditure	23.6%	7.5%
Have possessed a formal IP Strategy to protect its IP	14.9%	3.9%
Have participated in at least one strategic activity regarding IP	29.2%	12.4%
Have sought guidance or advice from CIPO	15.5%	4.5%
Have sought guidance or advice from external lawyers	28%	12.2%
Have sought guidance or advice from patent or trademark agents	21.1%	3.7%

Clean tech firms were more likely to take part in strategic activities relating to IP



National Research Council Canada (NRC): Clean Energy Agenda

ENERGY STORAGE

Advance new energy storage technology for stationary and transportation applications

Advance the integration of new technologies into electrical grids and vehicles

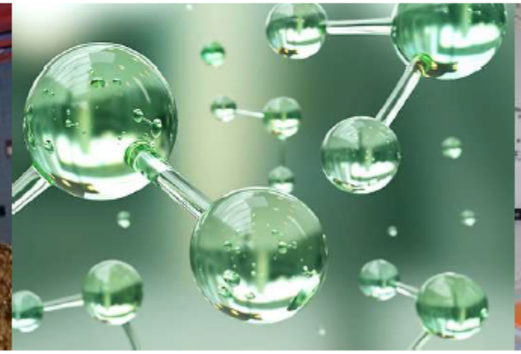
BIOENERGY and LOW CARBON FUELS

Improve biomass conversion and biofuel upgrading

Increase fuel flexibility of conventional power generation technology

Certify and integrate sustainable fuels

MATERIALS FOR CLEAN FUELS



Develop new materials to convert CO_2 into renewable fuels and chemical feedstocks

Reduce the cost to make, move, store, and use hydrogen

Develop AI-accelerated platforms for catalyst discovery

CLEANER TRANSPORTATION

Reduce fuel consumption and greenhouse gas emissions in air, surface and marine vehicles

Advance electric transportation

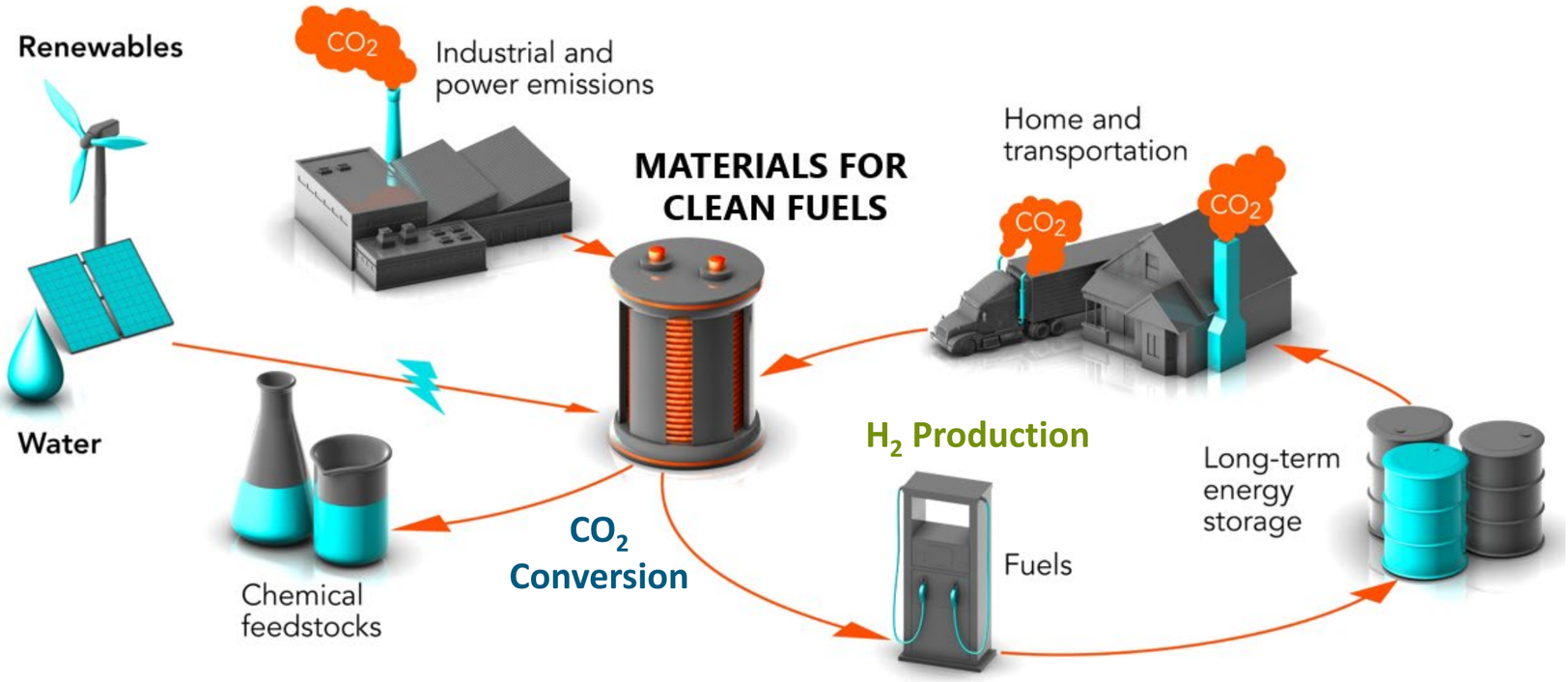
SMART BUILDINGS

Increase energy efficiency, deployment and economic performance

Reduce greenhouse gas of energy retrofit technologies for commercial and institutional buildings

NRC: Material for Clean Fuels Challenge Program

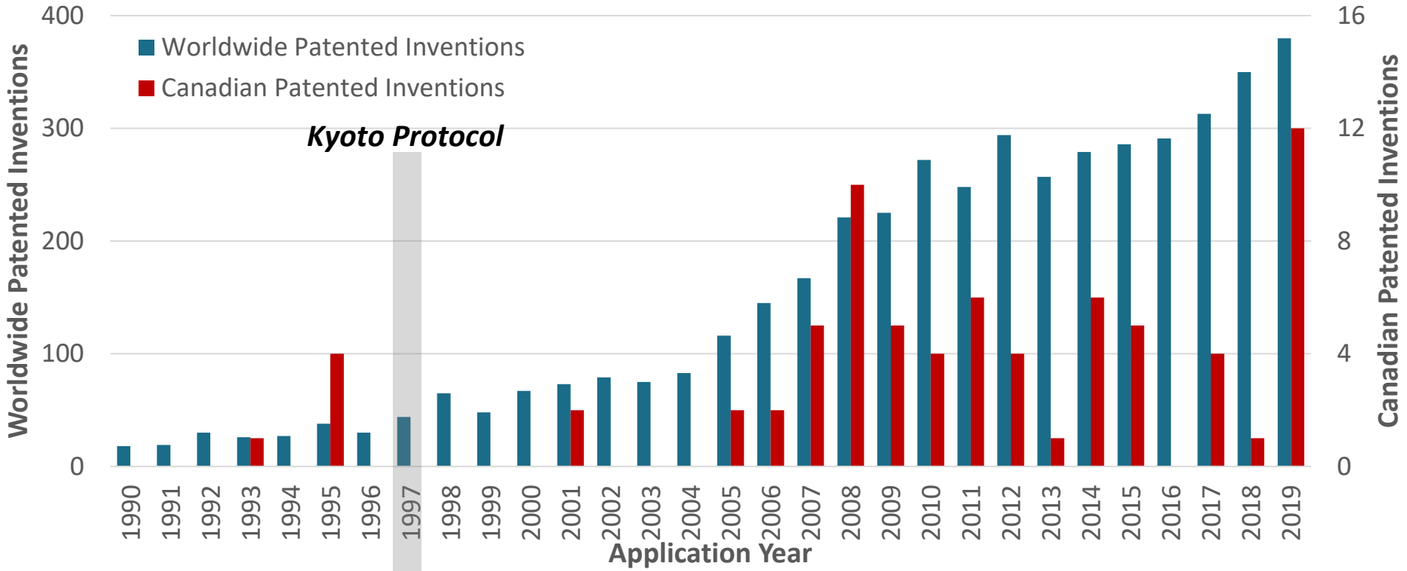
- **Challenge:** Develop *novel materials* needed for clean energy systems to meet *Canada emissions reductions commitments* at *low cost*.
- **NRC's role:** Coordinate a national effort to *collaborate with leaders in academia and industry* to accelerate this development to *decarbonize Canada's oil and gas, and petrochemical sectors*.
- **Canadian Intellectual Property Office's (CIPO) role:** Provide an *evidence-base using patented inventions* for the program's following two research areas:



- **CO_2 Conversion:** develop new catalyst materials that can efficiently convert captured CO_2 either from the air or from industrial flue into renewable fuels and chemical feedstocks.
- **H_2 Production:** support new technologies that can produce H_2 for industrial use while emitting less CO_2.

Patent Filing Trends (1990 – 2019)

CO_2 Conversion

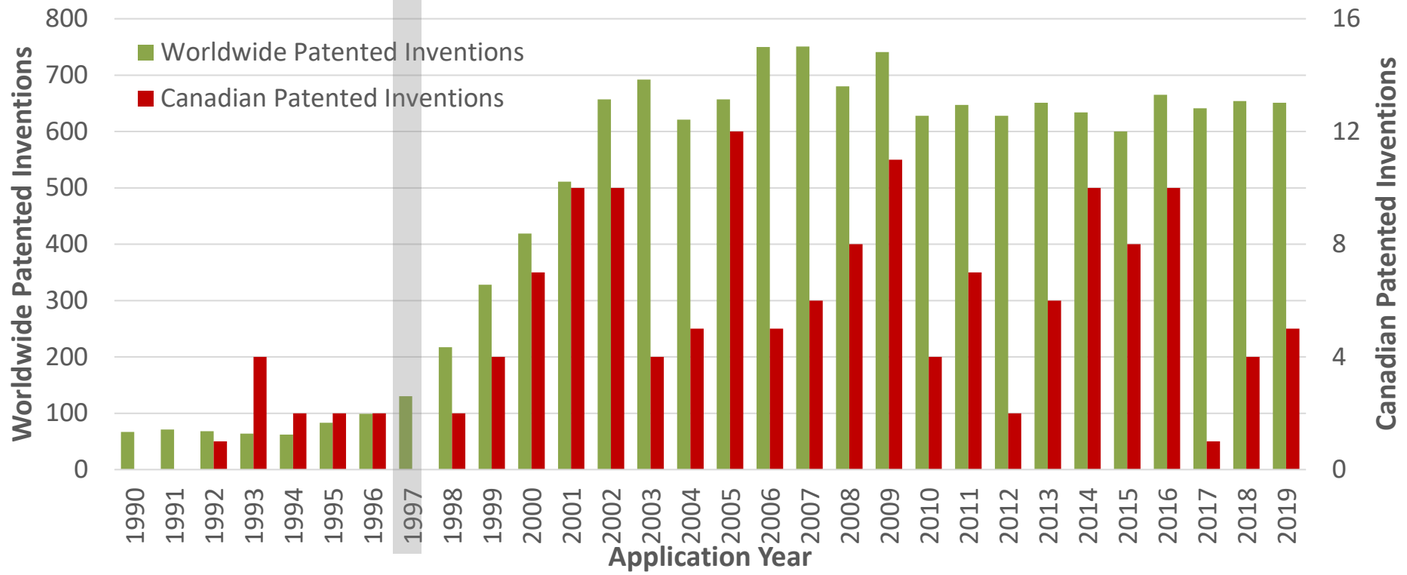


Total Worldwide Patented Inventions: ***4,566***

Total Canadian Patented Inventions: ***74***

(~1.6%)

H_2 Production



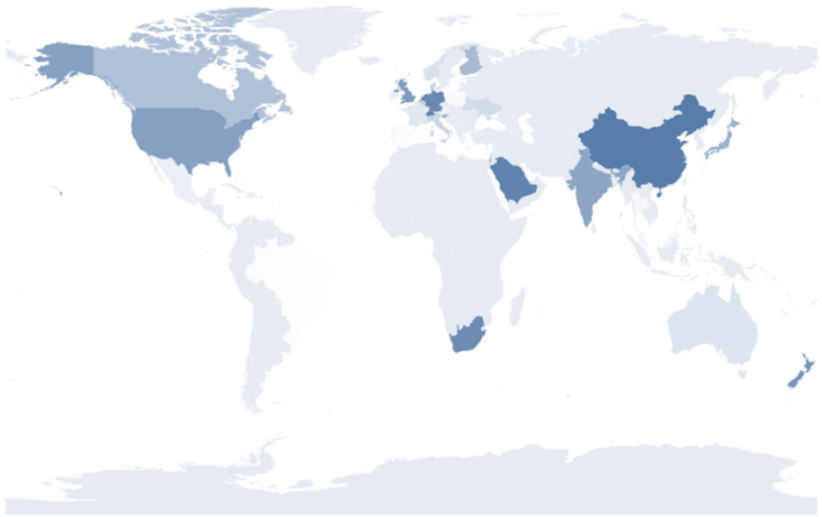
Total Worldwide Patented Inventions: ***14,067***

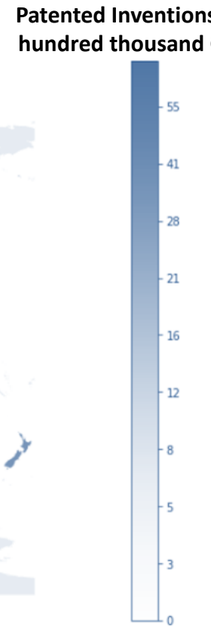
Total Canadian Patented Inventions: ***153***

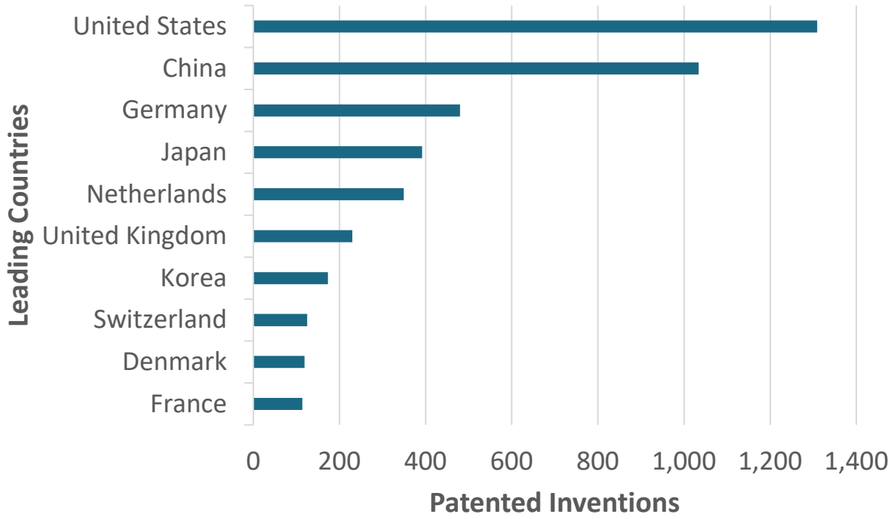
(~1.1%)

Geographical Clusters of Patent Activity

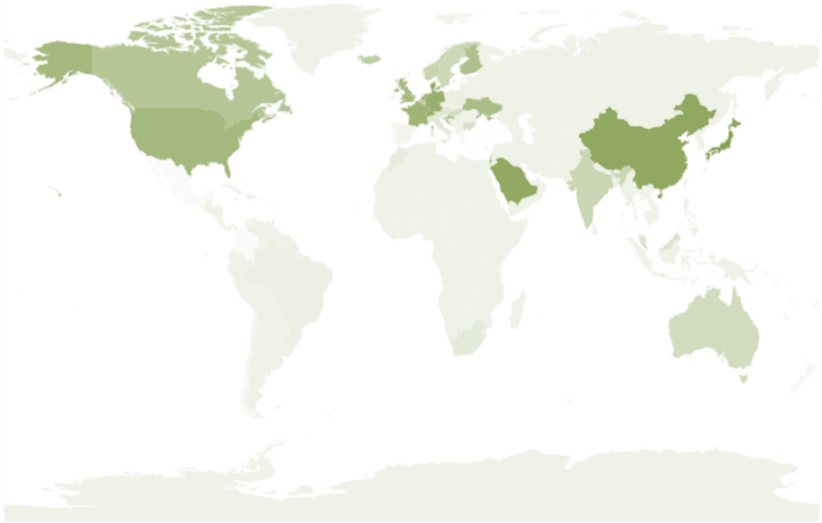
CO_2 Conversion

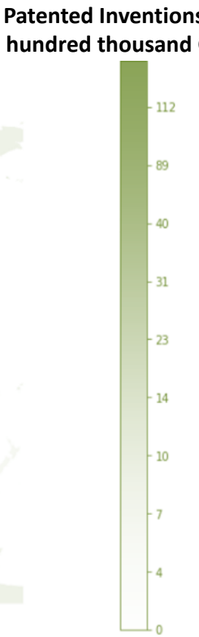


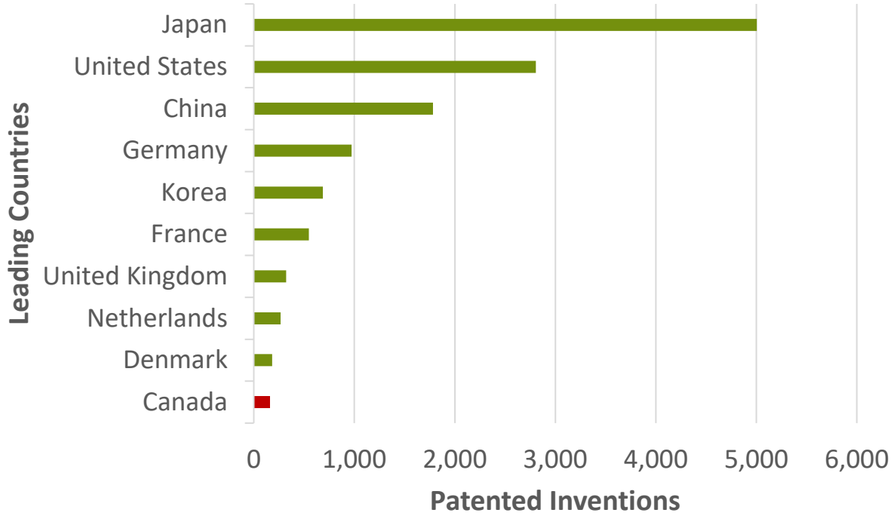




H_2 Production

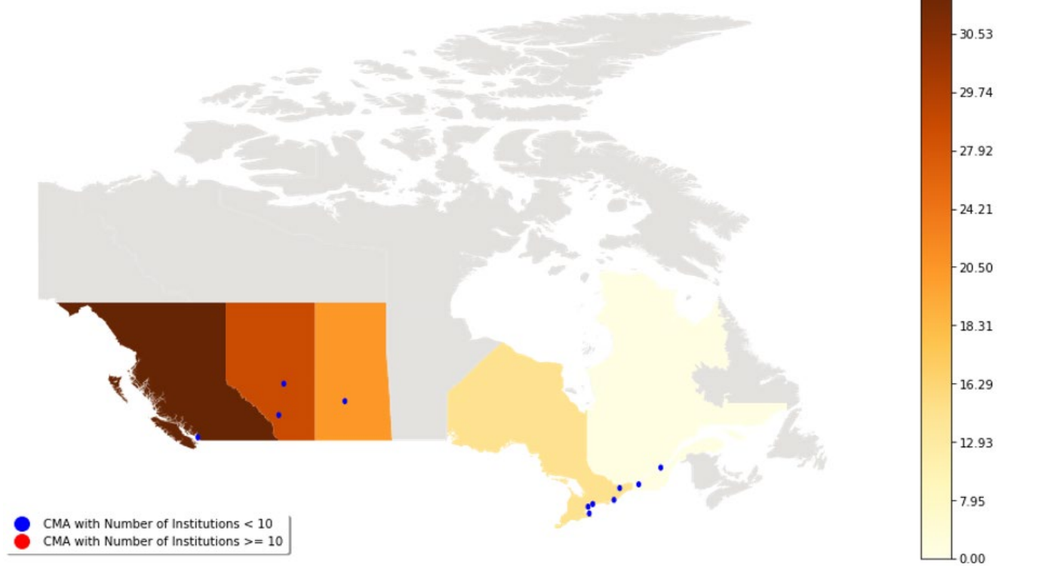






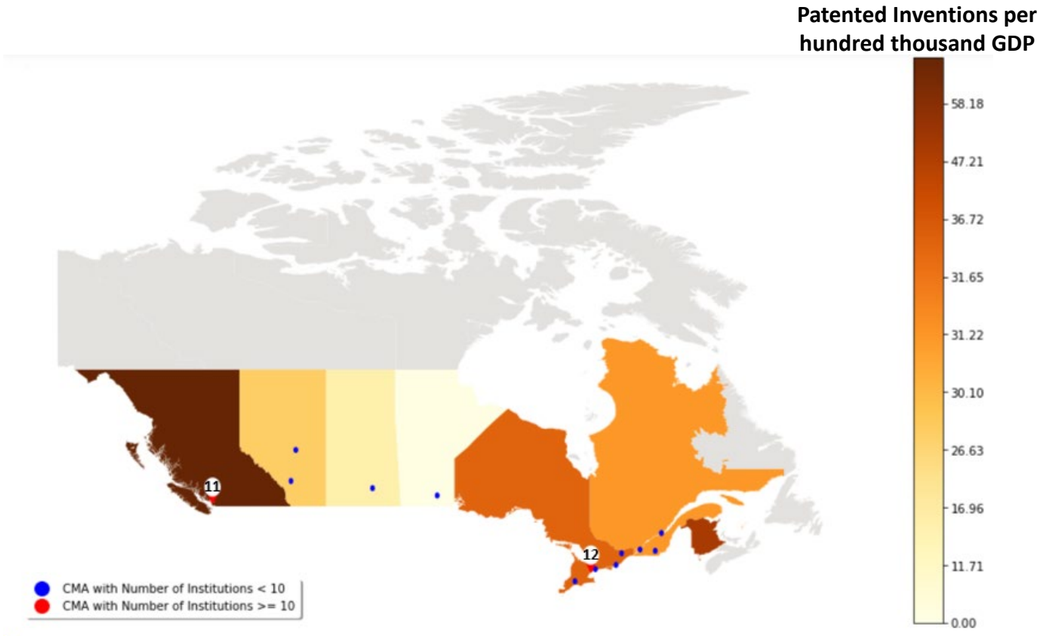
Geographical Clusters of Patent Activity - contd

CO_2 Conversion



- *British Columbia* has the highest patenting intensity followed by *Alberta* and *Saskatchewan* respectively.
- Institutions spread out almost equally among *Calgary, Edmonton, Ottawa, Toronto* and *Vancouver.*

H_2 Production



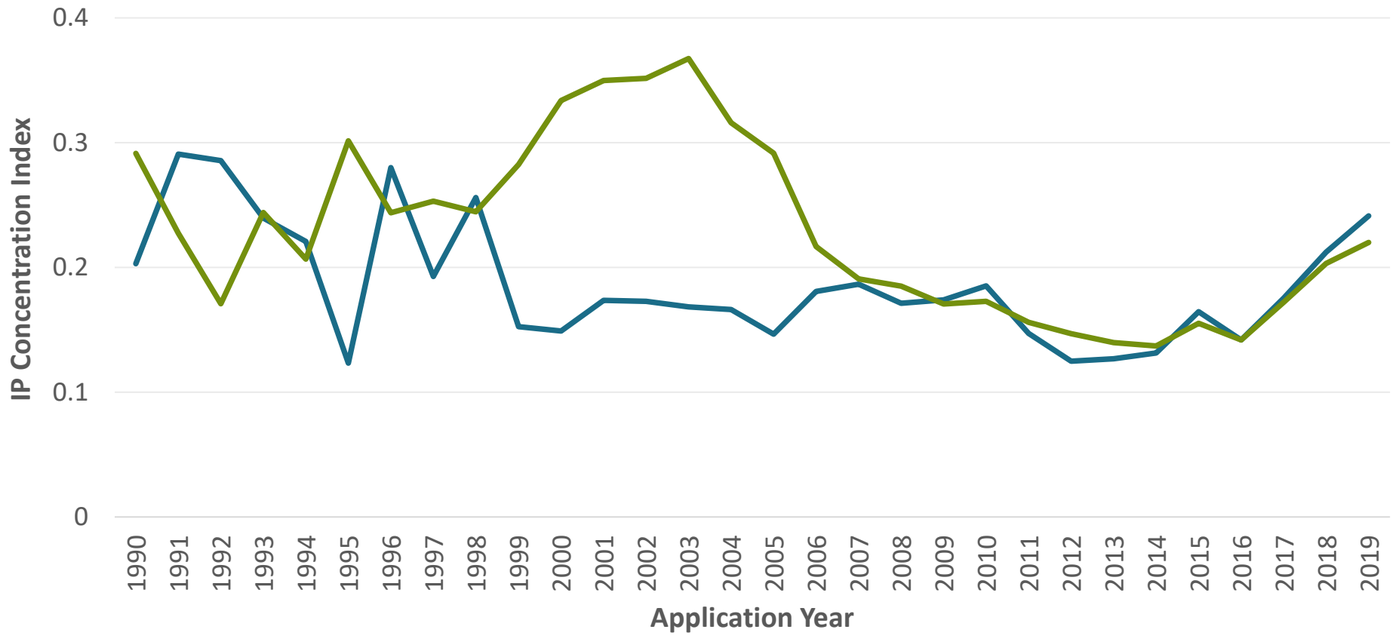
- *British Columbia* has the highest patenting intensity followed by *New Brunswick, Ontario* and *Quebec* respectively.
- *Toronto* (12 institutions) and *Vancouver* (11 institutions) emerge as *"innovation hotspots"* within Canada.

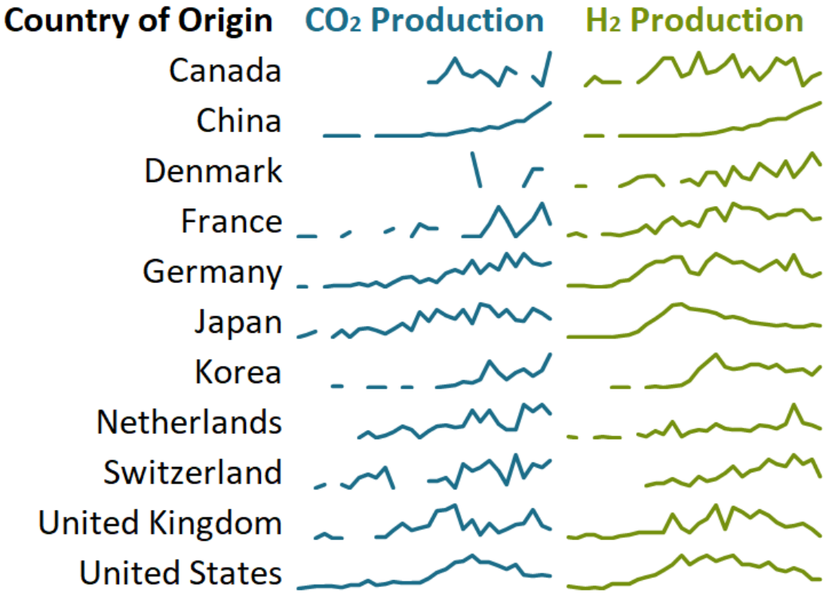
IP Concentration among Countries

- IP Concentration Index (IPCI) is used to determine the competitiveness of an industry based on the distribution of patented inventions among countries.
- Index values:
  - closer to 0 → low concentration (competitive environment)
  - between 0.15 and 0.25 → moderate concentration
  - greater than 0.25 → high concentration

CO_2 Conversion

H_2 Production

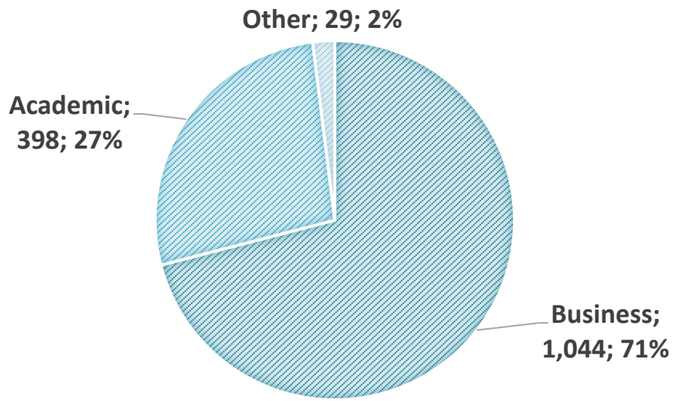




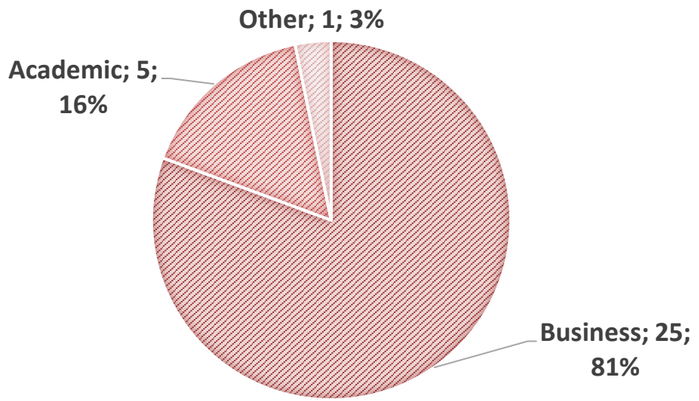
Institution Profiling

CO_2 Conversion

Total Institutions Worldwide: *1,471*



Canadian Institutions: *31*

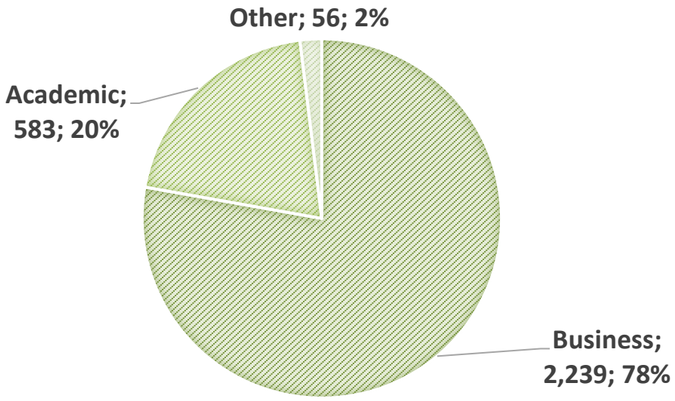


Leading Institutions: Shell, NL; BASF SE, DE; ExxonMobil, US

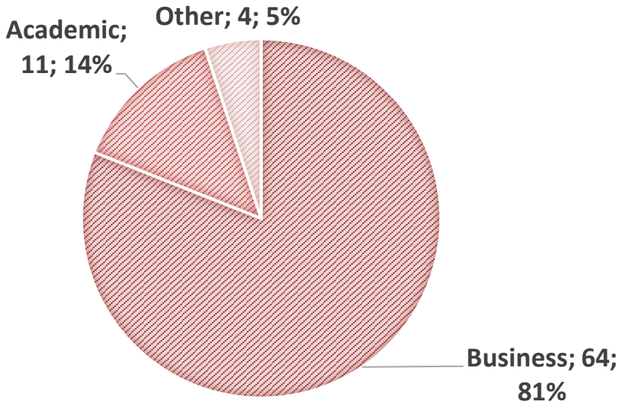
Leading Institutions: Queen's University, ON; Nova Chemicals, AB; Iogen Corporation, ON

H_2 Production

Total Institutions Worldwide: *2,878*



Canadian Institutions: *79*



Leading Institutions: Panasonic, JP; Nippon Oil, JP; Toyota,JP

Leading Institutions: Shell Canada, AB; Ballard Generation Systems, BC; Stuart Energy Systems, ON

Thank you

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Canada

Australian Government
IP Australia

PATENT ANALYTICS ON HYDROGEN AND LOW EMISSIONS TECHNOLOGIES

CIPO and CIGI 5th Annual IP Data & Research Conference

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24 March 2022

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P Patents
TM Trade Marks
D Designs
PBR Plant Breeder's Rights

Australian Government
IP Australia

Australian Government
Office of the Special Adviser
to the Australian Government
on Low Emissions Technology

Australian Government
Department of Industry, Science,
Energy and Resources

Australian Government
Australian Trade and Investment Commission

ACT Government

CSIRO

Australian Government
CTPCO
CRITICAL TECHNOLOGIES
POLICY COORDINATION OFFICE

P TM D PBR

Global patent families, 2015-21
(PATSTAT 2021 Spring Edition)

Low emissions

Solar photovoltaic cells	44,420
Solar photovoltaic inverters	41,845
Carbon capture and storage	29,589
Grid energy storage	26,969
batteries only	*10,464*
Low emission steel, aluminium, iron ore	3,790
iron ore only	*2,200*
Soil carbon measurement	320

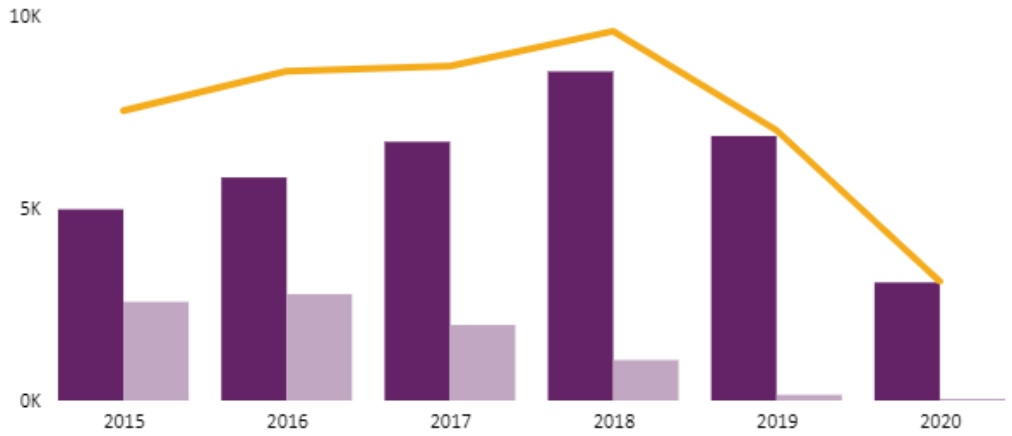
Hydrogen

Hydrogen production	18,611
possible emissions reduction	*2,150*
Hydrogen utilisation	13,177
possible emissions reduction	*1,759*
Hydrogen storage and distribution	3,165
possible emissions reduction	*332*

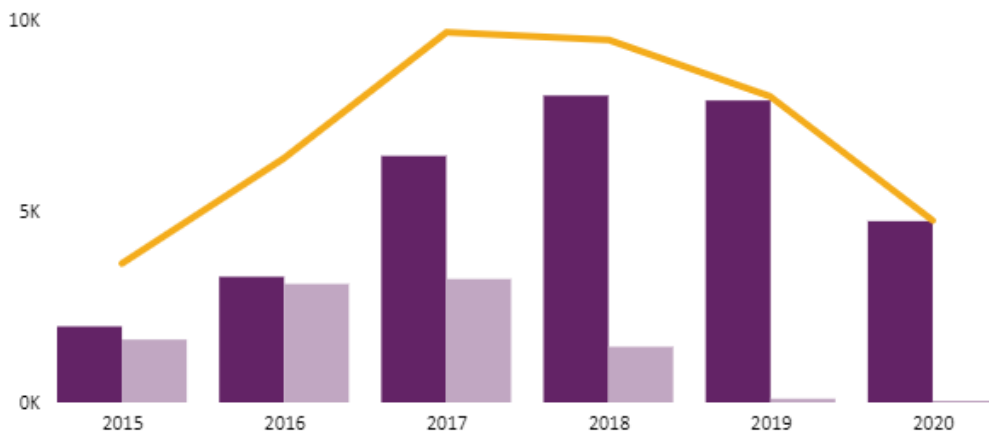
Solar photovoltaics

Total patent families
Being sought or in force
Lapsed, expired or withdrawn

Cells



Inverters



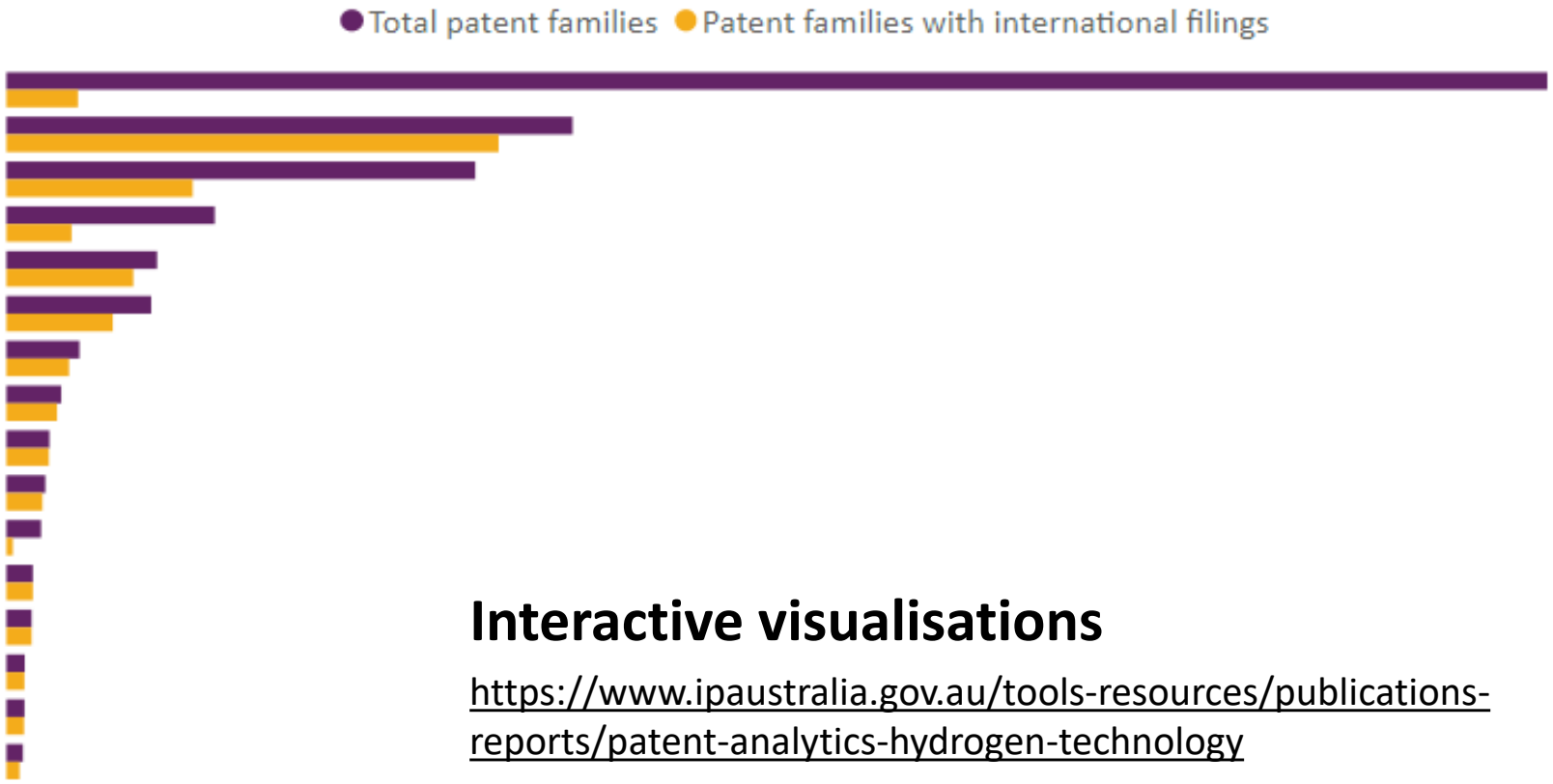
P TM D PBR

Solar photovoltaics

Cells			Inverters	
From	To		From	To
30,711	33,393		36,379	37,298
6,993	5,462		5,245	2,308
310	279		229	299
153	373		80	261

International filings – all hydrogen

	Total patent families	Patent families with international filings
China	17264	809
United States	6348	5520
Japan	5258	2094
Republic of Korea	2341	738
Taiwan	1695	1429
Germany	1629	1199
France	826	709
United Kingdom	622	575
Netherlands	490	483
Canada	444	411
Russian Federation	396	80
India	304	304
Saudi Arabia	290	290
Italy	213	209
Switzerland	210	205
Australia	193	155



Interactive visualisations

https://www.ipaustralia.gov.au/tools-resources/publications-reports/patent-analytics-hydrogen-technology

THANK YOU

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https://www.ipaustralia.gov.au/about-us/research-and-data/patent-analytics-hub

P Patents TM Trade Marks D Designs PBR Plant Breeder's Rights

CIPO 5th Annual Data and IP Conference | 24 March 2022

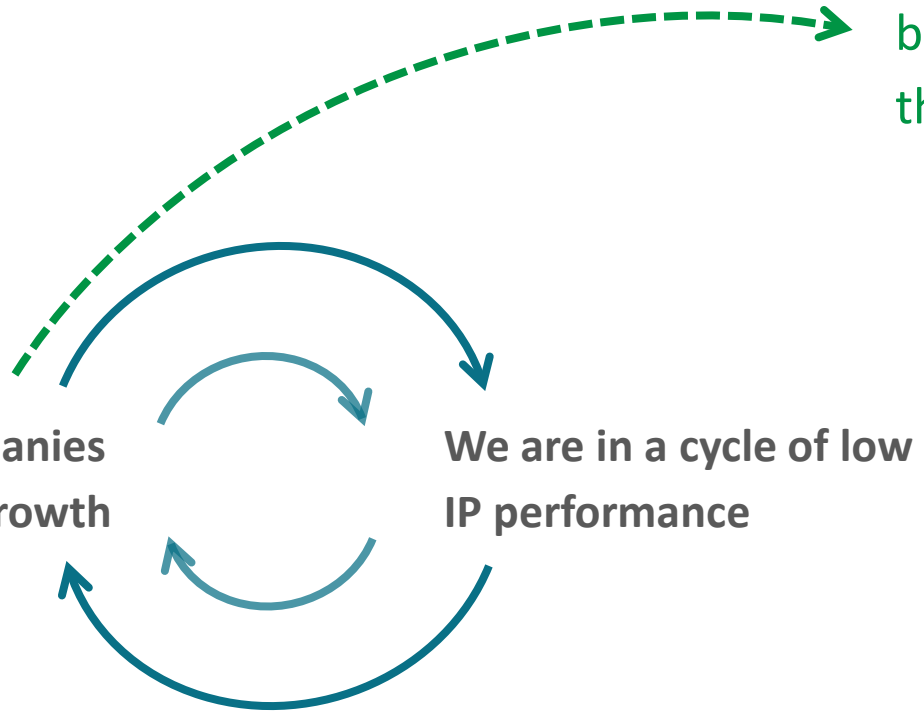
IP in Climate Tech Companies: SDTC's approach

Amber Batool, Vice-President and Chief of Staff

SDTC.CA

IP Matters

SDTC is turning the tide with the creation of business leaders and SDTC companies that think strategically around IP.



- A known lack of SME IP sophistication
- Growing deficit of Canadian IP ownership
- Lagging in international patent filings

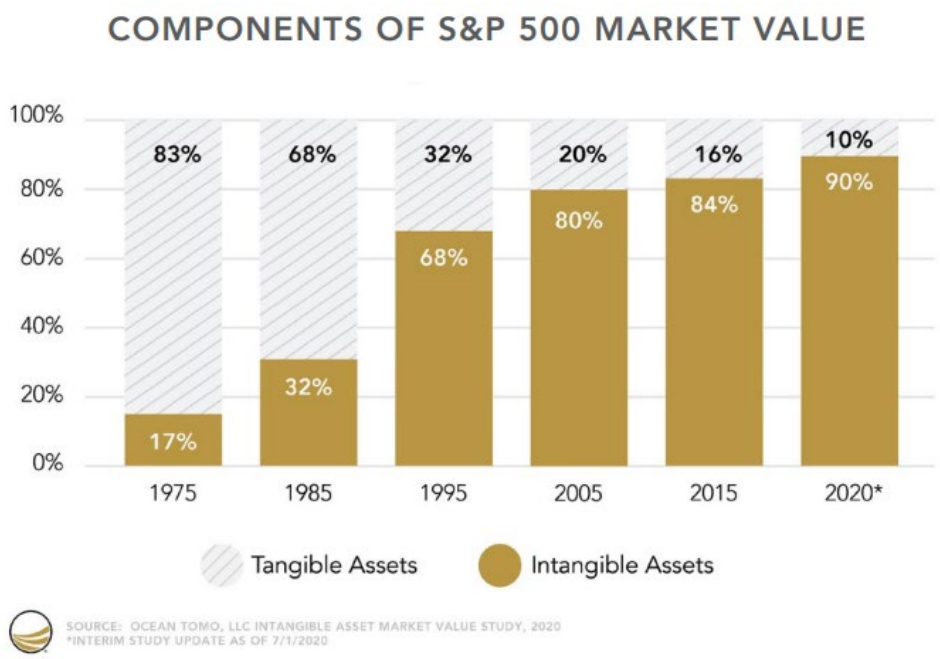
DID YOU KNOW:
IP rich companies are 1.6x more likely to be high growth

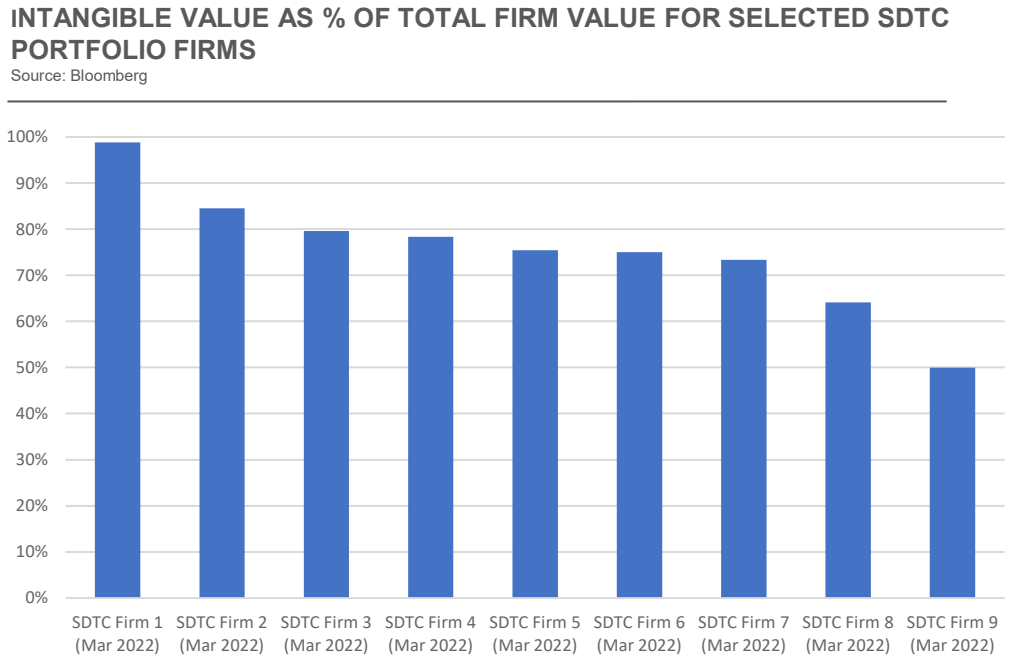
- ✓ **3x** more likely to expand domestically
- ✓ **4.3x** more likely to expand internationally
- ✓ International filings are a predictor of high growth

SDTC.CA

It is not just high growth startups …. IP matters in scale-ups

Intellectual property is the most valuable asset for companies that have scaled, yet we do little to assist scale-ups with supports unique to their high IP sophistication and IP retention needs.



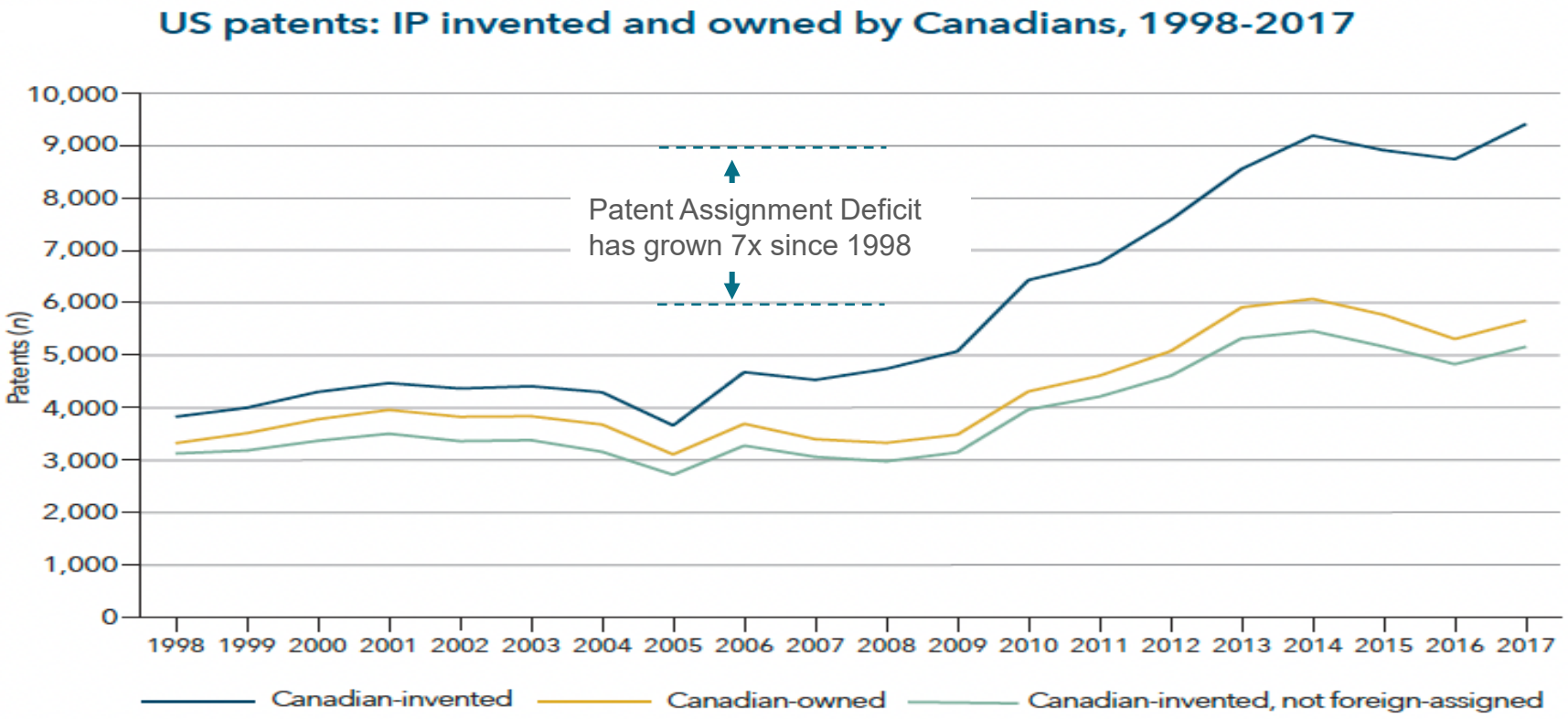


SDTC is addressing this gap through a long-term IP and Data strategy, positioned to support scale-up businesses to create lasting economic value and opportunities for all Canadians.

SDTC.CA

Canadian based IP ownership is a growing deficit

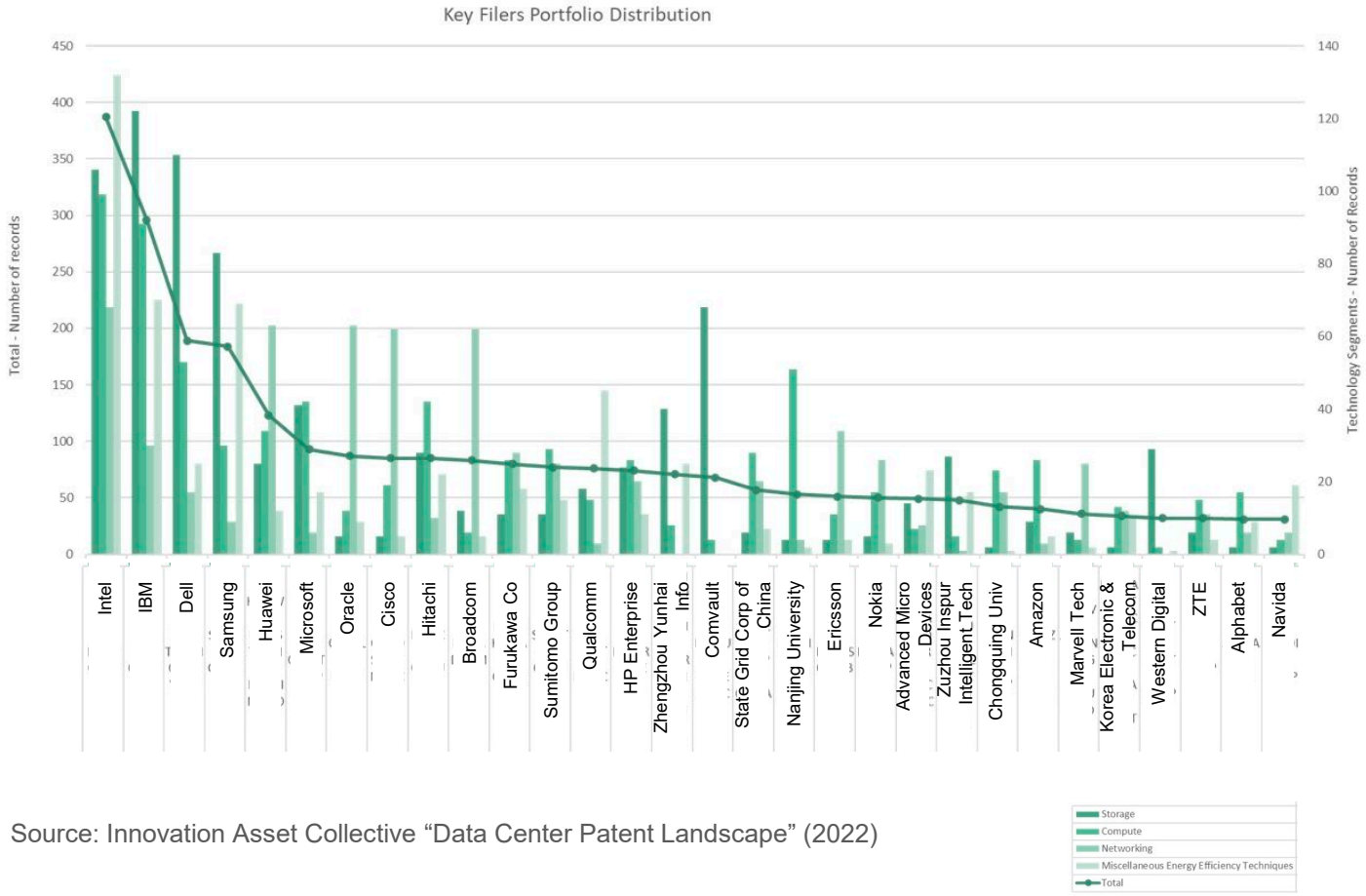
What IP and data is developed in Canada, does not stay to create real economic value here.



SDTC.CA

The Reality of Climate Transformation Technology in Data Centers

1) Regardless of technology positioning, companies need to compete and collaborate with key IP owners …



Source: Innovation Asset Collective “Data Center Patent Landscape” (2022)

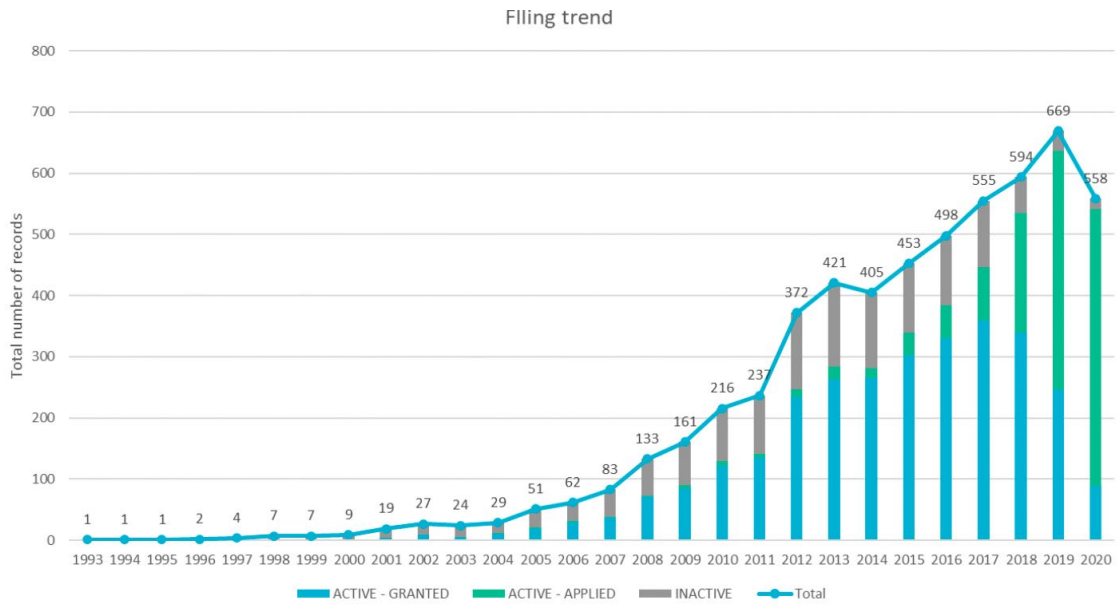
SDTC.CA

The Reality of Climate Transformation Technology in Data Centers

2) … and these top IP owners are continually investing in energy efficient data center technologies

10-year patent trends show high growth:

- Networking: 16% CAGR
- Computing: 22% CAGR
- Data storage: 26% CAGR
- Efficiency Techniques: 15% CAGR



Source: Innovation Asset Collective “Data Center Patent Landscape” (2022)

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The Reality of Climate Transformation Technology in Data Centers

3) Yet despite numerous Canadian companies playing in this sector, few have mature IP positions to compete.

Source: Innovation Asset Collective "Data Center Patent Landscape" (2022).

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Many SDTC companies are developing their IP sophistication

Terramera

ATTABOTICS

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Anaergia
Breaking Barriers to Sustainability

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minesense

- Data as an IP asset
- Formal IP strategy or data strategy
- Member of Innovation Asset Collective
- Dedicated internal IP resource, expert, or in-house counsel
- Growing patent position and international patent portfolio
- Participate as “IP Mentor” for SDTC peer-to-peer learning sessions
- IP layering strategy that uses patents, trademarks, and trade-secrets

SDTC is focusing on outcomes and not just inputs. We will measure increased IP capacity and sophistication in our companies and analyze how they and why they progressed.

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…but we need to do better

> Canada is the world's open-source factory for ideas. We create it, but let others commercialize it.
>
> **- Ontario Expert Panel, February 2020**

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SDTC's Approach: How we approach making impact

Research and actions that advance **thought leadership** in intellectual property strategies, issues and solutions.

Stay focused on the companies – support the development of **tailored IP strategies and learning pathways** that benefit companies and future climate tech entrepreneurs, based on their current IP needs and stage of commercialization journey.

Foster **IP capacity creation** for SME's and our ecosystem partners, through mentorship, talent building, education, resources and partnerships.

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What's next: A call to action

Collaborate: Leverage and integrate each other's IP initiatives

IAC CAI Innovation Asset Collective / Collectif d'actifs en innovation

iGP Innovation Governance Program

Presented by Council of Canadian Innovators / Conseil canadien des innovateurs

bdc

EDC

OPIC Office de la propriété intellectuelle du Canada

CIPO Canadian Intellectual Property Office

Evolve: As SME IP maturity rises, add advanced policy and program approaches to keep ahead of our companies evolving IP needs

- ✓ Increase access to IP talent and expertise
- ✓ Prepare for predatory behaviors
- ✓ Increase IP positions
- ✓ Lower IP flight

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SUSTAINABLE DEVELOPMENT TECHNOLOGY CANADA

TECHNOLOGIES DU DEVELOPPEMENT DURABLE CANADA

Thank You

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