Canada–Europe: Unlocking the Transatlantic Hydrogen Value Chain

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The hydrogen partnership between Canada and Europe builds on decades of energy collaboration and transatlantic ties. Geography also lends a hand, offering efficient maritime trade routes for hydrogen and its derivatives.

Rooted in shared values and a common commitment to climate goals, the Canada-EU partnership is further strengthened by harmonized standards, aligned regulatory frameworks, coordinated investment mechanisms, and integrated logistics. Together, these elements form a strong foundation for a sustainable transatlantic hydrogen collaboration.

I. Charting the Future: Canada-Europe in Hydrogen Innovation

Hydrogen and fuel cells represent a particularly promising pillar in Canada-Europe collaboration, forming a key chapter in global green innovation. Companies such as Ballard, Daimler, and Air Liquide have been pioneering H2 and FCEV technologies for decades, placing Canada and Europe at the forefront of cleantech leadership.

In 1983, Ballard Research Inc., supported by a small federal research fund, pioneered the development of PEM fuel cells, bringing this largely neglected technology to the world and ushering in the subsequent fuel cell “renaissance.”

In 1992, following initial success in PEM research, Ballard entered a partnership with Daimler AG to jointly develop a compact, high-power-density fuel cell stack. The result was Daimler’s first-generation FCEV, *NECAR 1*, which demonstrated that the basic requirements for using fuel cell technology as electric vehicle propulsion had already been met.

In 1994, Ballard engaged Powertech Labs to assess the safety and feasibility of using CNG cylinders for hydrogen storage—an initiative that led to the release of *CSA B51*, the world’s first published H2 fuel tank standard. In 2010, a fleet of 20 Ballard-powered FCBs was deployed for the Vancouver Winter Olympics, refueling at a 70MPa H2 station built and operated by Air Liquide. The hydrogen was produced in Bécancour, Québec, using hydroelectric power, then liquefied and trucked nearly 4,900 kilometers across the country to the station. In 2011, the fleet surpassed one million kilometers of cumulative operation.

The legacy continues. In 2024, Ionomr Innovations Inc. achieved a breakthrough with iridium-free, perfluorinated-substance-free CCMs based on its Aemion® AEM, solidifying Canada’s position in next-generation electrolysis. In April 2025, Canada became the first G7 country to approve the construction of a small modular reactor —a step toward stable, low-cost electricity. Meanwhile, Europe is rapidly advancing SOEC technology: the French Alternative Energies and Atomic Energy Commission (CEA) has made significant progress in improving SOEC cell and stack performance, enabling reversible operation and integration into larger systems. In 2023, Sunfire also installed the world’s largest SOEC electrolyzer in Rotterdam, with a capacity of 2.6 MW and an output of over 60 kilograms of green hydrogen per hour.

II. Canada's Eastern Edge: A Gateway to Europe's Hydrogen Future

Spanning from the Pacific to the Atlantic, Canada's vast geography positions Québec in the east and Nova Scotia, Newfoundland and Labrador in the Atlantic region—natural gateways for hydrogen collaboration with Europe. With direct access to transatlantic shipping routes and established maritime infrastructure, Québec and the Atlantic provinces are well positioned to facilitate hydrogen trade, technology exchange, and cross-border innovation.

Québec provides a strong foundation for green hydrogen production, thanks to its abundant, low-cost hydroelectricity and well established industrial base. Although it lacks deepwater ports for direct transatlantic shipping, Québec can efficiently transport hydrogen derivates to ports in Atlantic Canada. Its mature infrastructure, skilled workforce, and supportive regulatory environment further strengthen its role in the global hydrogen value chain.

Atlantic Canada, particularly Nova Scotia and Newfoundland and Labrador, offers a more direct route to Europe. With its strong wind resources and deepwater ports facing the EU, the region is positioned to export green H2 and its derivatives at scale. Backed by programs such as the Canada–Germany Hydrogen Alliance, Atlantic Canada is leveraging its geography and diplomatic ties to advance hydrogen partnerships.

Factor	Québec	Nova Scotia	Newfoundland & Labrador
Electricity	World-class hydro-power (~96% clean)	Offshore wind potential (>40 GW theoretical)	High offshore wind potential; some hydro
Port access	Ports farther inland (Québec City, Montréal)	Atlantic deepwater ports (e.g., Point Tupper)	Atlantic deepwater ports (e.g., Argentia)
Maritime to Rotterdam	~6,200 km (via St. Lawrence River)	~4,800 km	~4,200 km
Export focus	In development	Strong export focus to Europe via ammonia	Strong export focus to Europe via ammonia
Prospects for local hydrogen deployment	High—industrial hubs (steel, chemicals, etc.), mobility electrification	Moderate—some local demand, less industry	Emerging—small industrial base, growing energy sector
Government support	Hydrogen strategy aligned with clean energy goals	Active export promotion, streamlined permitting	Export-oriented, clear hydrogen strategy
European partnerships	MoU and collaboration	Green ammonia: EverWind Fuels & Uniper	Germany–Canada Hydrogen Alliance flagship projects
Key projects	Projet Mauricie (70,000 t/yr green H2), local industrial applications	EverWind Fuels green hydrogen export facility	Several offshore wind-to-hydrogen projects under development

III. From Hydro to Hydrogen: Québec's Quiet Role in the Value Chain

Electricity costs, often representing 50–80% of total green hydrogen production expenses, are the primary driver of project economics. Québec's hydropower is nearly emissions-free and among the cheapest globally, with industrial rates about CAD 5.3¢/kWh, or even lower under special large-power contracts. In addition, Québec has abundant freshwater from rivers and lakes—an advantage over Australia and the MENA region. The table below compares Québec, Iceland, and Saudi Arabia as potential hydrogen suppliers to Europe.

Factor	Québec (Canada)	Iceland	Saudi Arabia
Electricity sources	Stable hydropower; growing solar & wind	Stable geothermal & hydropower	Solar & wind energy
Scale potential	37 GW hydro capacity built; ~10 GW available for development	Moderate scale (~2 GW geothermal + hydro)	Massive solar potential (> 100GW); emerging wind power
Water supply for electrolysis	Abundant freshwater from rivers & lakes	Abundant freshwater from glaciers & rivers	Scarce freshwater; mostly desalination required
Export infrastructure	Highly developed ports (MTL, QC City)	Limited port infrastructure	Major oil export ports (Yanbu)
Rotterdam (sea)	~6,200 km	~3,000 km	~7,500 km

Guided by its 2030 Green Hydrogen and Bioenergy Strategy, Québec is charting pathways to establish itself as a long-term green hydrogen exporter to Europe. It actively participates in Canada's clean hydrogen investment programs and initiatives and collaborates with Germany through the Canada-Germany Hydrogen Alliance. As the most European province in Canada, Québec has forged strong research ties with Europe: Université du Québec à Trois-Rivières (UQTR) is the only Canadian university that has joined Hydrogen Europe Research, promoting transatlantic R&D in electrolysis and fuel cells.

Québec is also at the forefront of high-value e-fuels and sustainable aviation fuel (SAF) developmnet—sectors with strong export potential to Europe. Polytechnique Montréal is leading research in power-to-liquid (PtL) technologies, while the SAF+ Consortium, including Airbus, Pratt & Whitney, and Hydro-Québec, is advancing a pilot e-fuel plant near Montréal. Targeting commercial output by 2030, the project aims to reduce lifecycle CO_2 emissions by up to 90%, directly supporting Europe's sustainable aviation goals.

Montréal—the world's third-largest aerospace hub after Seattle and Toulouse, and home to the International Civil Aviation Organization (ICAO)—anchors these efforts. Through cluster organizations Aéro Montréal and CRIAQ, industry players such as Airbus and Pratt & Whitney are developing the CADAQ-100 project, which plans to test 100% SAF on A220 aircraft by 2028, reinforcing Québec's strategic role in the transatlantic sustainable aviation ecosystem.

IV. Alberta's Rise: Building the Backbone of Clean Hydrogen

Alberta, accounting for 70% of Canada's hydrogen production and use, is emerging as a serious player in the global energy transition. With vast natural gas resources, robust infrastructure, and a skilled workforce, the province is pivoting toward clean hydrogen and e-fuels. Building steadily under the radar, Alberta is gaining strategic relevance for Europe, especially Germany and the Netherlands, as they seek reliable, low-carbon solutions to decarbonize heavy industry and transport.

Released in 2021, Alberta's Hydrogen Roadmap sets a clear ambition: to become one of the world's top three exporters of clean hydrogen, targeting annual production of 3–4 million tonnes by 2050. The roadmap outlines the provincial government's policy framework to support market takeoff, aiming to attract over C$30 billion in capital investment and position Alberta as a global supplier of choice for clean hydrogen by 2030.

Industry is aligning with that vision. Key players such as Linde, Shell, Air Products, and Suncor are investing heavily in clean hydrogen projects across the province. Linde's C$2 billion blue hydrogen facility in Fort Saskatchewan, under construction since April 2025, has secured long-term offtake agreements and is scheduled to begin operations in 2028. In Edmonton, Air Products is building a C$1.6 billion net-zero hydrogen plant that will capture over 90% of CO_2 from natural gas feedstock. The plant, powered entirely by the hydrogen it produces, will also use biomethane generated at a nearby renewable diesel facility as a substitute feedstock. Meanwhile, Shell's Polaris CCS project, set to open in 2028, will mark another milestone after its C$1.35 billion Quest facility, which has been operating in Alberta since 2015.

On the e-fuels front, Alberta has funded a range of CCUS and hydrogen R&D projects through its innovation programs and support for universities and start-ups. These efforts are underpinned by leading research institutions, including University of Alberta, University of Calgary, and InnoTech Alberta, which conduct world-class R&D in clean fuels, carbon management, and energy systems.

OUTLOOK Canada and EU countries such as Germany and the Netherlands share a deep industrial and fossil-fuel legacy. Much like Germany's Rhine-Ruhr region and the Rotterdam port-industrial complex, Canada's energy finance and EPC centers in Calgary—coupled with its energy industrial base in Edmonton—offer comparable capabilities, now being channelled toward a lower-carbon future.

Based in Calgary, Canadian Pacific Kansas City (CPKC) connects Canada from coast to coast by rail. Partnering with ATCO, it is now developing one of the world's most ambitious hydrogen locomotive programs, integrating solar farms, electrolysis, and refuelling stations—positioning Calgary as a key hydrogen logistics hub.

Europe's demand is clear: Germany aims to import 45–90 TWh of hydrogen by 2030, while the Netherlands positions itself as a hydrogen gateway. Canada is responding—not only with commitment and expertise, but also with capital and infrastructure. As EU policymakers and corporations seek diversified supply chains, Canada is quietly edging into Europe's hydrogen landscape. Europe's H2 success is Canada's success.