

PERSPECTIVE

Quebec's Electric Battery Industry: The Challenge Will Be to Keep the Momentum Going

By Joëlle Noreau, Senior Economist

Electric vehicles (EVs) are a growing industry both at home and abroad. That's why Quebec wants in on the EV battery market. It may seem like an odd choice, but Quebec already has a lot going for it, including metal mining and battery recycling. There are a few obstacles standing in the way, however. There's the ongoing labour shortage and US protectionism. Then there's the competition, which has deep financial pockets and a big head start. But that just means Quebec needs to be bold and creative. It may not have the biggest lithium reserves, but recent announcements prove it's well on its way to becoming a hub for electric battery manufacturing and recycling plants. There's a lot of enthusiasm right now. The challenge will be to maintain it.

Background

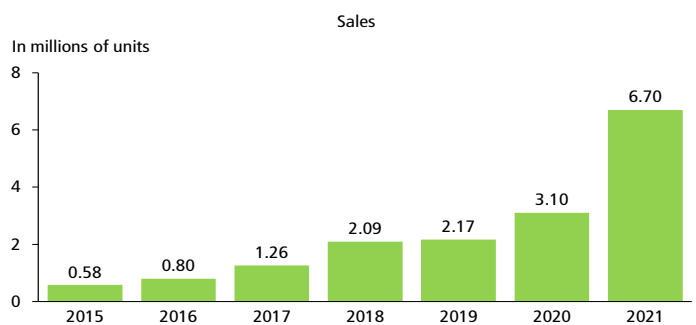
Worldwide, the number of electric vehicles on the road is rising rapidly. Graph 1 shows the annual global sales growth of light-duty plug-in vehicles from 2015 to 2021. Booming sales seem to reflect the urgent need to eliminate or at least reduce greenhouse gas emissions.

Several different types of EVs have been developed over the years. Box 1 on page 2 contains a brief description of the technology used in each. The information is from the Canadian Automobile Association (CAA) website.

Electric vehicles run on batteries. That's why some analysts call them the heart of the vehicle. Global strategy and consulting firm [McKinsey](#) says they're the "critical ingredient" in the transition to a greener economy. In practical terms, they store the energy that runs the electric motor.

Lithium-ion batteries are the industry standard today. They provide optimal safety, performance and battery life. They're made of modules containing cells that are connected in series or parallel. A group of connected modules is called a battery pack. The way these cells are manufactured is therefore strategic. Box 2 on page 2 briefly explains how lithium-ion batteries work and the terms used to describe them. We'll use some of these terms later in this article.

GRAPH 1
Estimated plug-in electric light vehicle sales worldwide from 2015 to 2021



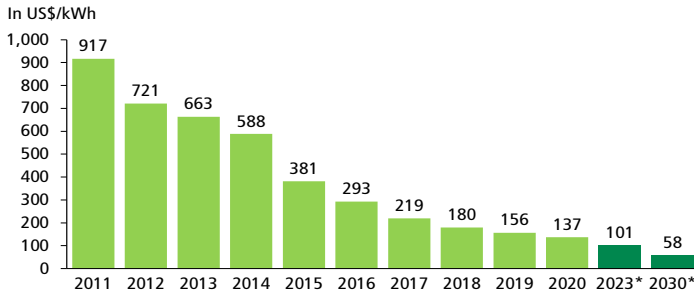
Sources: Statista and Desjardins, Economic Studies

The cost of producing a lithium-ion battery has fallen dramatically. Graph 2 on page 2 shows the price drop since 2011 and the projected decline over the next 8 years. But according to [IndustryWeek](#), costs have been falling for thirty years, alongside the cost of producing solar panels. And this reduction is attributed more to R&D than to economies of scale.

Now or Never

So why start producing EV batteries now? There are many reasons. According to McKinsey, large-scale manufacturing of battery cells creates value and good-paying jobs. It also diversifies and modernizes the local economy. McKinsey expects the

GRAPH 2
The cost of lithium-ion batteries is down sharply and should continue to drop



Sources: Statista and Desjardins, Economic Studies

battery cell market to grow more than 20% on average each year until 2030. In fact, it estimates that the global market could hit US\$360 billion to US\$410 billion with some 90 battery cell gigafactories worldwide by the end of the decade.

The timing is also right because both the US and Europe are emerging markets, meaning they still have room for new battery manufacturers. That’s not the case everywhere. Europe already has plants in Hungary, Poland, the UK, Germany and Sweden.

The US and Europe aren’t as well served as the Chinese, South Korean and Japanese markets, which are much more advanced and already have many battery production lines. Plants tend to spring up wherever there are vehicle manufacturers. That’s why for years Chinese leaders have been publicizing their goal of making China an EV manufacturing hub.

But opening a battery production plant comes with its share of challenges, ranging from securing financing and recruiting skilled labour to training employees and forging ties and partnerships with vehicle manufacturers. And that’s on top of establishing a solid supply chain that will provide a sufficient quantity and quality of materials.

What Does Canada Have to Offer?

So where does Canada fit into all of this? Producing electric batteries is in line with Canada’s green goals. And though the competition has a big head start, Canada has made it clear it has its sights set on more than just lithium mining. In fact, many want Canada to make the most of its lithium resources by processing them domestically.

Australia provides a cautionary tale in this regard. For years it supplied China with lithium to process. Now Australia wants to be involved after the lithium is out of the ground. But that’s where the analogy with Australia ends, because unlike Australia, Canada has an auto industry. Canada’s proximity to the US market could also help support a homegrown battery industry.

But nothing’s a given. Leading US automakers are announcing plans for their own battery plants. And the preference for “Made in America” products now extends to zero-emission vehicles. There’s even a tax credit of up to US\$12,500 on

BOX 1
Electric Vehicle Categories

- ▶ Battery electric vehicles
 - Onboard batteries power one or more electric motors. Batteries are plugged into the electricity grid to recharge.
- ▶ Plug-in hybrid electric vehicles
 - These vehicles combine an internal-combustion engine with an electric motor, but batteries are charged by plugging into the grid.
- ▶ Hybrid electric vehicles
 - These vehicles are powered by an internal-combustion engine and an electric motor. Batteries are charged internally during braking.
- ▶ Fuel-cell electric vehicles
 - Fuel cells generate electricity by combining oxygen and hydrogen. Few re-fuelling stations are currently available.

Source: Canadian Automobile Association, adapted by Desjardins, Economic Studies

BOX 2
Lithium-Ion Batteries: Some Basic Concepts

Electric vehicle battery packs contain multiple modules made up of interconnected cells.

Each cell is a small battery that turns the energy released during a chemical reaction into electric power.

The cells and modules in a traction battery are controlled by software called the Battery Management System (BMS).

A cell has three basic parts:

- ▶ Two electrodes: A cathode (positive charge) and an anode (negative charge).
- ▶ One electrolyte that separates the two electrodes and allows lithium ions to pass through.

Source: La Belle Batterie, adapted by Desjardins Economic Studies

the purchase of domestic zero-emission vehicles, making foreign-made EVs much less attractive. President Biden wants electric vehicles to account for 50% of all new cars sold by 2030, but that’s a far cry from the current figure. The number of charging stations is rising too slowly to meet the projected need. Convincing Americans to change their habits will be a hard sell if they’re worried about getting stranded on the side of the road.

Why Quebec?

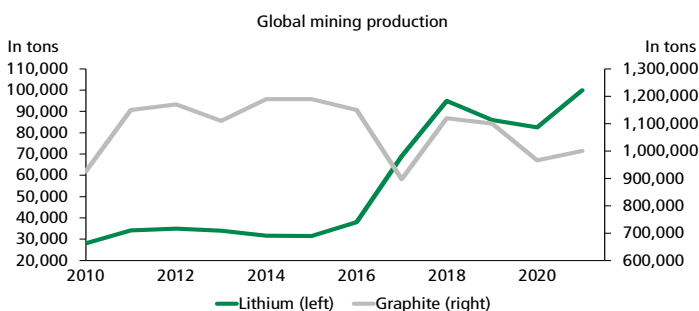
The Quebec government has put together a plan to develop the province’s battery industry. It’s a three-part plan:

- ▶ Mine and process Quebec minerals to make battery components like anodes and cathodes
- ▶ Produce commercial electric vehicles
- ▶ Recycle more batteries using state-of-the-art Quebec technology

As of October of last year, \$8 billion to \$10 billion in public and private investments had already been announced.

What does Quebec’s economy have going for it? A number of things, including metal mining and battery recycling. And Quebec has reserves of lithium, often dubbed the “key component of the energy transition.” Graph 3 shows the growing global demand for lithium. In 2018, global consumption was an estimated 50,700 metric tons. That figure is expected to climb to 150,000 metric tons by 2025.

GRAPH 3
Surge in lithium production



Sources: U.S. Geological Survey and Desjardins, Economic Studies

As you can see in the Table, Quebec and the rest of Canada aren’t major players in the lithium mining industry. But they could be. According to the U.S. Geological Survey, last year Canada had an estimated 2.5% of the world’s lithium reserves, which translates to about 530,000 metric tons. Chile, Australia, Argentina and China are the leading global producers today.

According to the [Système d’information géominère du Québec](#), environments compatible with the presence of lithium minerals have been identified in the James Bay, Abitibi, Témiscamingue

TABLE
Global lithium reserves as of 2021

	RESERVES ¹	PERCENTAGE
	Tons	%
Argentina	2,200,000	10.00
Australia	5,700,000	25.91
Brazil	90,000	0.43
Canada	530,000 ²	2.52 ²
Chile	9,200,000	41.82
China	1,500,000	6.82
United States	750,000	3.41
Zimbabwe	220,000	1.00
Rest of world	2,200,000 ²	10.00 ²
TOTAL	22,000,000	100.00

¹ Rounded. Reserves are mineable ore deposits; ² 2020 data.
Sources: U.S. Geological Survey and Desjardins, Economic Studies

and Outaouais regions. One lithium mine was in operation prior to 2020 near Barraute north of Val D’Or. It was most active between 1955 and 1965. Since then, it has been operated only sporadically. There’s also the proposed Whabouchi mine in the James Bay region north of Chibougamau.

In addition to lithium, Quebec has graphite, nickel and cobalt. And unlike in many places in the world, these mineral resources can be mined under predictable conditions in a stable social and political environment. Quebec is also known for its clean energy. It’s been a leader in the North American green economy for years, bolstering its green credentials. And it has a stated, targeted strategy and a strong commitment to develop its electric battery industry. The province’s plan is backed by the federal government, provincial counterparts and local industry players. Quebec also boasts experienced researchers. And while it doesn’t yet have an electric battery manufacturing plant, Quebec has developed a commercial electric vehicle production segment. It also has a deepwater port at the Bécancour industrial park. The [government of Quebec](#) advanced the park \$38 million in early February to build infrastructure to accommodate any future plants. It’s too early to call it a “green energy valley,” but the region is rumoured to be the future site of a green energy innovation hub, which would extend to Trois-Rivières and Shawinigan as well.

What’s more, Quebec is home to Lion Electric and other makers of trucks, buses, minibuses and other commercial electric vehicles. The province is also a leader in lithium-ion battery recycling.

But developing this market won’t be easy. The global race is on, and the competition has a big head start. They also have more financial resources than Quebec does.

Yet manufacturers are giving Quebec a chance. Just this March, two companies announced plans to open plants in the Bécancour region. German chemical conglomerate BASF purchased a site in the Bécancour port and industrial park for a cathode

manufacturing and battery recycling plant. General Motors is also planning to build a cathode plant in the Bécancour area, with production slated to begin in 2025. And nearby, Quebec-based Nemaska Lithium has broken ground on an ore processing plant for the Whabouchi mine that should be complete late this year.

Quebec has extended invitations to two manufacturers of lithium-ion battery cells as well. UK startup Britishvolt is looking to build a 60 GWh plant in Bécancour, while Canadian startup StromVolt announced plans last fall for its own battery plant.

Going beyond Useful Life

Wondering if lithium-ion batteries will have a bigger environmental impact over their lifespan than gasoline engines? You aren't alone. Fortunately, solutions have already been developed and research is ongoing to ensure that the materials that go into today's batteries will be used in the next generation of vehicles. The challenge lies in doing that on a commercial scale. Some companies are already looking into this, and there's promising testing being done right now.

These solutions will minimize the social and environmental impacts of new mining operations, slash waste, reduce pollutant emissions and curb the use of energy, metals and other new materials. In January, Quebec-based Lithion Recycling announced that it's building a battery plant slated to open in 2023. It will have a capacity of 7,500 metric tons per year, the equivalent of 20,000 hybrid or electric vehicle batteries. It also has plans to build a hydrometallurgy plant for strategic metal mining and purification that could be up and running by 2024.

More on the Horizon

There's been a steady stream of news about new electric battery plants and partnerships since late 2021. These announcements are the result of a concerted effort and strategy that are starting to pay off. It's a promising venture in terms of both possible job creation and added value. But as is the case across the economy, labour shortages and employee training are huge challenges.

The time is right to join this global movement. The European and North American markets are expanding rapidly, and Quebec has a lot going for it. But nothing's a given. Labour is hard to come by, and the US remains in a protectionist stance. The competition has deep financial pockets and a big head start. But that just means Quebec needs to be bold and creative. It may not have the biggest lithium reserves, but recent announcements prove it's well on its way to becoming a hub for electric battery manufacturing and recycling plants. There's a lot of enthusiasm right now. The challenge will be to maintain it.