



Canada's New Economic Engine

Modelling Canada's EV battery supply chain potential—and how best to seize it

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Canada's New Economic Engine

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SFU

MORRIS J. WOSK
CENTRE FOR DIALOGUE



EXECUTIVE SUMMARY:

A battery-powered future

Batteries are evolving. No longer just something that needs changing in your TV remote, batteries are fast becoming the engines of the global economy.

In a decade's time, a battery will likely power your car or the electricity grid that lights your home. Perhaps the biggest opportunity lies in electric vehicles. The battery is the most valuable part of an EV, and by 2030, the International Energy Agency predicts we could see a hundred times more EVs on the road than there were in 2020.

If Canada plays its cards right, it has the potential to build a domestic EV battery supply chain that could support up to **250,000 jobs by 2030 and add \$48 billion to the Canadian economy annually.**

That's according to new modelling from Clean Energy Canada and the Trillium Network for Advanced Manufacturing, which explores how Canada can build out its battery supply chain and the economic potential of this industry.¹⁴ Across the four scenarios developed, the results are clear: the more Canada goes big on batteries, the more jobs and economic benefits await.

Those quarter-million jobs would be found across the country: from the geologist exploring for copper deposits in B.C., to the engineer developing battery testing equipment in Nova Scotia, to the worker assembling electric vehicles in Ontario.

And with the introduction of the U.S.'s new EV tax credit—requiring that a proportion of EV battery parts are sourced from North America and battery minerals are sourced from U.S. allies—Canada has a huge and guaranteed market right next door. The race to build the supply chain is on, and already carmakers like Volkswagen and Mercedes-Benz are responding, signing recent deals to secure Canadian EV battery raw materials.^{28,29}

Fortunately, the wheels are already in motion. Stellantis and LG Energy Solution are investing \$5 billion to build a battery factory in Windsor that will employ 3,200 workers.^{17,18} A handful of recent announcements by multinational companies like BASF and Umicore to bring battery material production to Quebec and Ontario will support thousands of additional jobs.^{32, 33, 39}

What's more, a robust battery supply chain would also bolster Canada's already world-leading clean technology companies, such as Ontario-based Li-Cycle, which recently signed a deal with General Motors to recycle battery components.⁴³

But despite some solid investments, the success of Canada's EV battery supply chain—and the hundreds of thousands of future jobs it could support—is still largely dependent on swift government action.

In fact, in a scenario where no additional government action is taken, Canada's battery supply chain would create just 60,000 jobs and contribute only \$12 billion in GDP—fulfilling only about a quarter of both its jobs and GDP potential.¹⁴

Resting on our laurels isn't a good option. To realize this battery-building vision, Canada needs to be smart about where it focuses its efforts. The EV battery supply chain involves nine stages, from mining raw battery minerals, to assembling EVs, to recycling battery materials. And while Canada could do it all, a more effective strategy would double down on a few key stages where the opportunity is greatest.

KEY OPPORTUNITIES FOR CANADA



EV ASSEMBLY

This stage is where Canada can leverage its existing automaking expertise and facilities. After all, we already have the assembly plants, workforce, and R&D capacity ready to go.



BATTERY CELL MANUFACTURING

Cell manufacturing is essentially the heart and soul of the battery supply chain and is where the most value is added. China currently commands 80% of the world's cell manufacturing capacity, and thus Canada must quickly up its game if it wants to be a major player.



INTEGRATED BATTERY MATERIAL MANUFACTURING

The final critical opportunity for Canada is in building an integrated battery material manufacturing industry that plays to Canada's trifecta of strengths: critical minerals, clean electricity, and battery recycling leadership. That means Canadian minerals are mined, processed, and recycled in proximity to one another, making the supply chain more efficient.

How do we make all this happen?

At a high level, Canada needs a national battery strategy and a plan to ready the industry's critical workforce. We also require faster project approvals (slowness being an oft-cited competitive weakness of Canada), policies that encourage domestic demand for batteries, efforts to market Canada's clean brand abroad, and investments aimed at growing homegrown Canadian companies in the space.

North America is undergoing an energy transformation unlike any we've seen before, and batteries will power this change.

A strong Canadian battery supply chain will be the new engine of Canada's economy. It will be an engine built to last.



B.C.-based Nano One recently formed a joint venture with battery-maker BASF to reuse and recycle battery products in Quebec.^{1,2}

Photo credit: Nano One



Size of the prize

A Canadian EV battery supply chain isn't just a nice-sounding idea. It's a very real, very large economic opportunity with potential winners across Canada and across industries. It's also an opportunity to strengthen Canada's competitiveness and secure our strategic position in an emerging, net-zero global economy.

By 2030, **Canada's EV battery supply chain could support nearly 250,000 direct and indirect jobs.**¹⁴

The full economic impact would be bigger still. When induced jobs are considered (for example, employees at a restaurant popular with supply chain workers), a total of nearly 323,000 jobs could be created across Canada. This amounts to \$59 billion added to the Canadian economy in 2030 alone.

While Canada has landed some major battery investments as of late, securing the full potential of this industry will only happen if governments act quickly, expand their ambition, and channel their resources into the most strategic areas of the supply chain.

If, on the other hand, we rely solely on existing investments and hope the other pieces of the supply chain fall into place, Canada's EV battery supply chain may support as few as 60,000 direct and indirect jobs and contribute just \$12 billion to Canada's GDP.

In other words, only 23% of Canada's battery supply chain potential would be realized, with not even a quarter of the jobs.

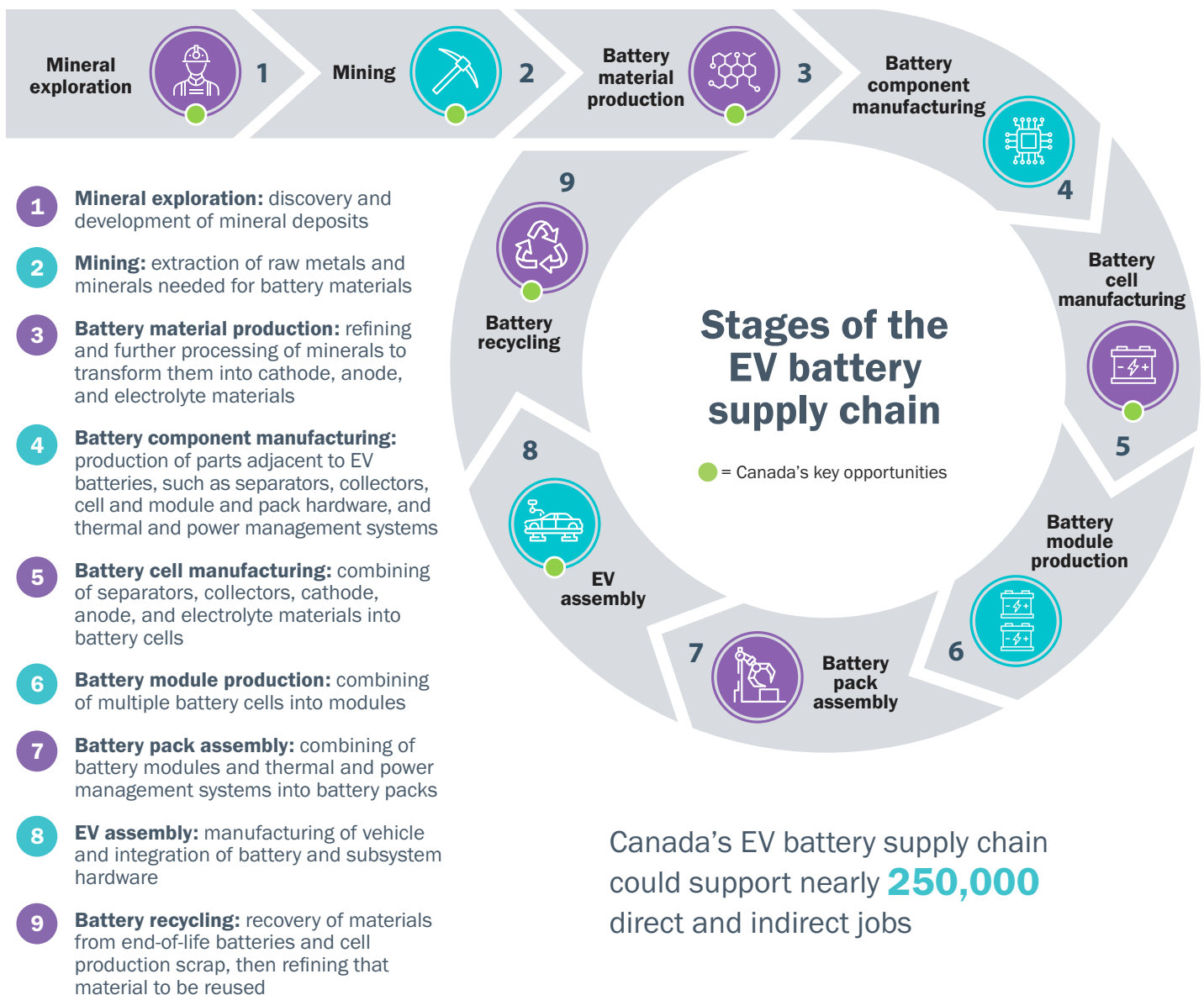
The choices Canada makes over the next seven years will determine which outcome we achieve.

Realizing Canada's fully charged battery potential will depend on government-led climate and economic action. It will require us to reach Canada's electric vehicle sales targets and ensure nearly all assembly plants are focused on EVs. It will also mean accelerating critical mineral projects, filling key gaps in the battery materials stage, and attracting at least one more battery gigafactory (in addition to the Stellantis-LG facility announced in March). While that might sound like a tall order, it's not an unrealistic one. By taking a smart and strategic approach, Canada can transform its battery potential into a battery powerhouse.

Methodology

Canada has the ingredients needed to build a successful battery industry, but many of the industry experts Clean Energy Canada consulted felt we needed to better define what Canada's battery opportunity actually is in order to identify where Canada can best compete. Clean Energy Canada thus partnered with the Trillium Network for Advanced Manufacturing to quantify the economic opportunity for a Canadian EV battery supply chain and identify top priorities for the next decade to guide industrial development. Our analysis focuses on North American EV and battery

demand up to 2030. This includes fully electric and plug-in hybrid passenger cars, SUVs, minivans, and pickup trucks, as well as medium- and heavy-duty vehicles such as buses and commercial trucks. It does not consider the economic impact of conventional hybrids or of electrified marine, off-road, industrial, or aerospace-related vehicles. Nor does it consider hydrogen fuel cells, consumer products (e.g. power tools), energy storage systems, or research and development activities.



Canada's EV battery supply chain could support nearly **250,000** direct and indirect jobs

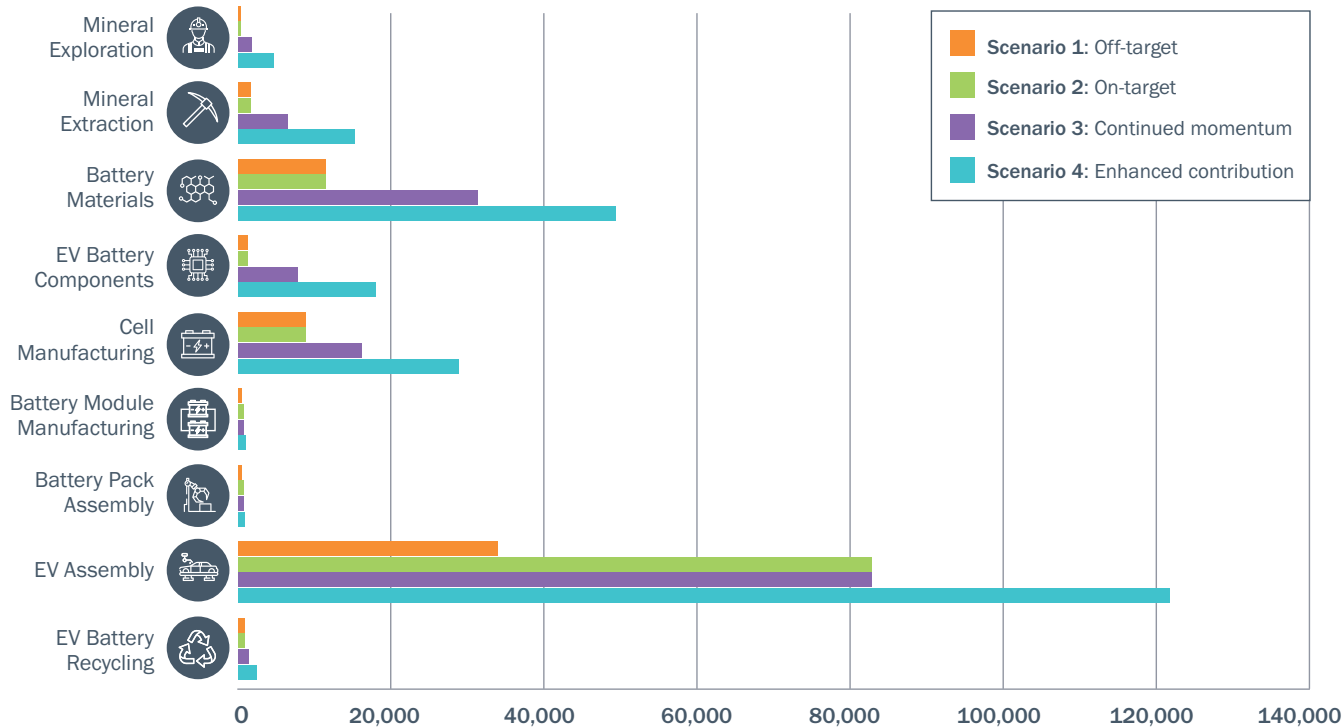
Scenarios

We developed **four scenarios**, each more ambitious than the next, to evaluate the potential of Canada's EV battery supply chain. **All figures are for the year 2030.**

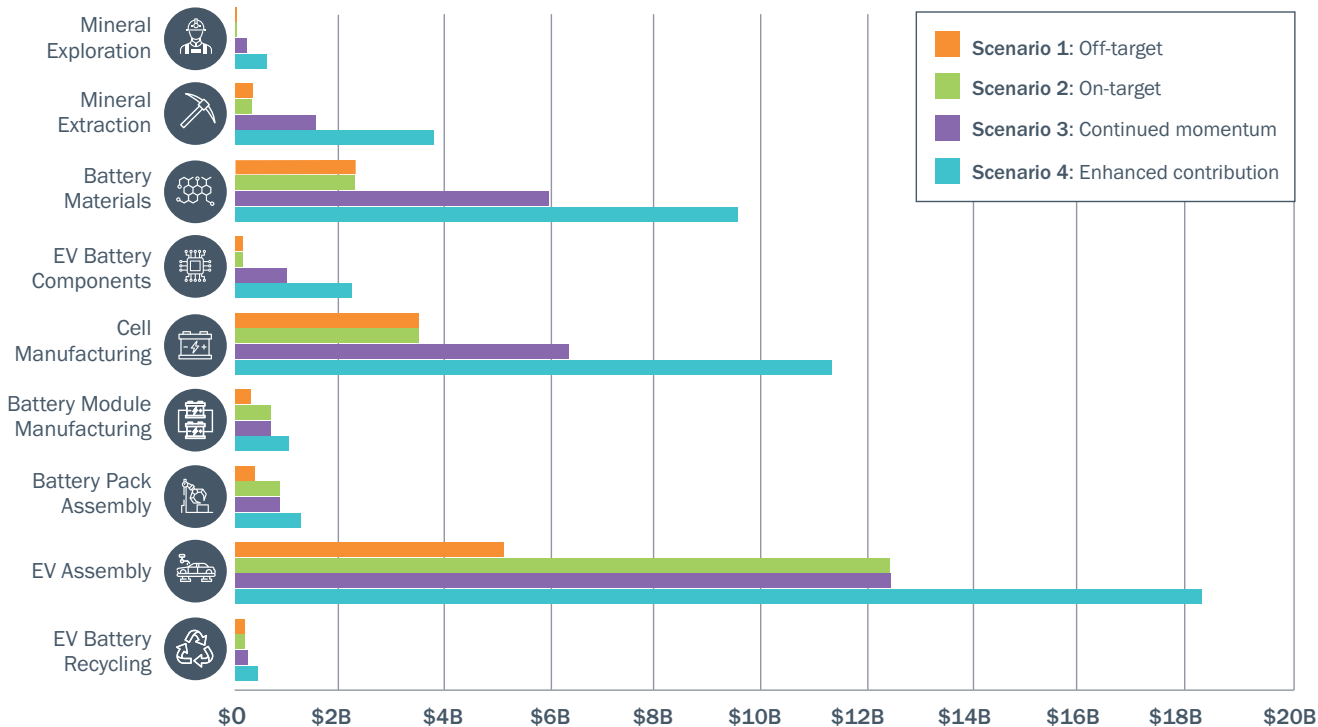
	1 SCENARIO 1 Off-target	2 SCENARIO 2 On-target	3 SCENARIO 3 Continued momentum	4 SCENARIO 4 Enhanced contribution
KEY ASSUMPTIONS	<ul style="list-style-type: none"> Includes battery-related investments already announced in Canada. Canada and the U.S. miss their zero-emission light-duty vehicle sales targets, with Canada reaching 25% and the U.S. reaching 16%. Zero-emission medium- and heavy-duty vehicle sales reach 10% in Canada and 9% in the U.S. 	<ul style="list-style-type: none"> Includes battery-related investments already announced in Canada. Canada meets its zero-emission light-duty vehicle sales target of 60%, with the U.S. reaching 33%. Zero-emission medium- and heavy-duty sales reach 35% in Canada and 16% in the U.S. 	<ul style="list-style-type: none"> Adds new mines; new investments in battery materials, cathode production, and recycling; and the attraction of one more major battery cell facility (total of 90 GWh of annual capacity). Canada meets its zero-emission light-duty vehicle sales target of 60%, with the U.S. reaching 33%. Zero-emission medium- and heavy-duty sales reach 35% in Canada and 16% in the U.S. 	<ul style="list-style-type: none"> Nearly all assembly capacity in Canada is used to build EVs. Adds more new mines; new investments in battery materials, cathode production, and recycling; and the attraction of one more major and two smaller battery cell facilities (total of 160 GWh of annual capacity). Canada exceeds its zero-emission light-duty vehicle sales target, reaching 90% sales in 2030, with the U.S. reaching its target of 50%. Zero-emission medium- and heavy-duty sales reach 35% in Canada and 23% in the U.S.
Jobs in the EV battery supply chain (direct and indirect)	60,487	110,485	198,669	246,958
Total jobs supported by the supply chain (direct, indirect, and induced)	79,112	144,970	198,669	322,927
GDP added to Canada's economy (annual, direct, and indirect)	\$12.2 billion	\$19.4 billion	\$29.1 billion	\$48.2 billion
Government revenue (annual)	\$2.7 billion	\$5 billion	\$6.7 billion	\$11 billion
Economic output across the supply chain (annual)	\$26.9 billion	\$51.4 billion	\$65 billion	\$103.8 billion
EV assembly (annual)	434,884 vehicles	1,045,837 vehicles	1,045,837 vehicles	1,565,390 vehicles
Cell production (annual)	45 GWh	45 GWh	90 GWh	160 GWh
Canadian mines feeding the battery supply chain	4 (graphite, lithium)	4 (graphite, lithium)	11 (cobalt, graphite, lithium, nickel, phosphate)	21 (cobalt, graphite, lithium, manganese, nickel, phosphate)

This number represents the recently announced Stellantis-LG gigafactory in Windsor

Jobs Overview



GDP Overview





A global transition

Put simply, the battery market is booming. As automakers race to go electric and countries around the world shift away from fossil fuels, demand for the batteries that will power our vehicles and stabilize global electricity grids is set to rise exponentially.

Consider that in 2012, about 120,000 EVs were sold worldwide. Today, that many are sold in the space of a single week. Electric car sales represented close to 9% of the global car market in 2021; the International Energy Agency estimates that number could increase to as much as 35% in 2030.³

In many markets, the bar is set far higher than that. The U.S. government announced in November 2021 an ambitious 50% electrification target for new car sales by the year 2030.⁴ Canada has gone even further, committing to at least 60% by 2030 en route to 100% by 2035.⁵ Canada was also one of 15 countries to sign the global Drive to Zero memorandum of understanding last year, pledging to work toward 30% zero-emission commercial vehicle sales by 2030 and 100% by 2040.⁶

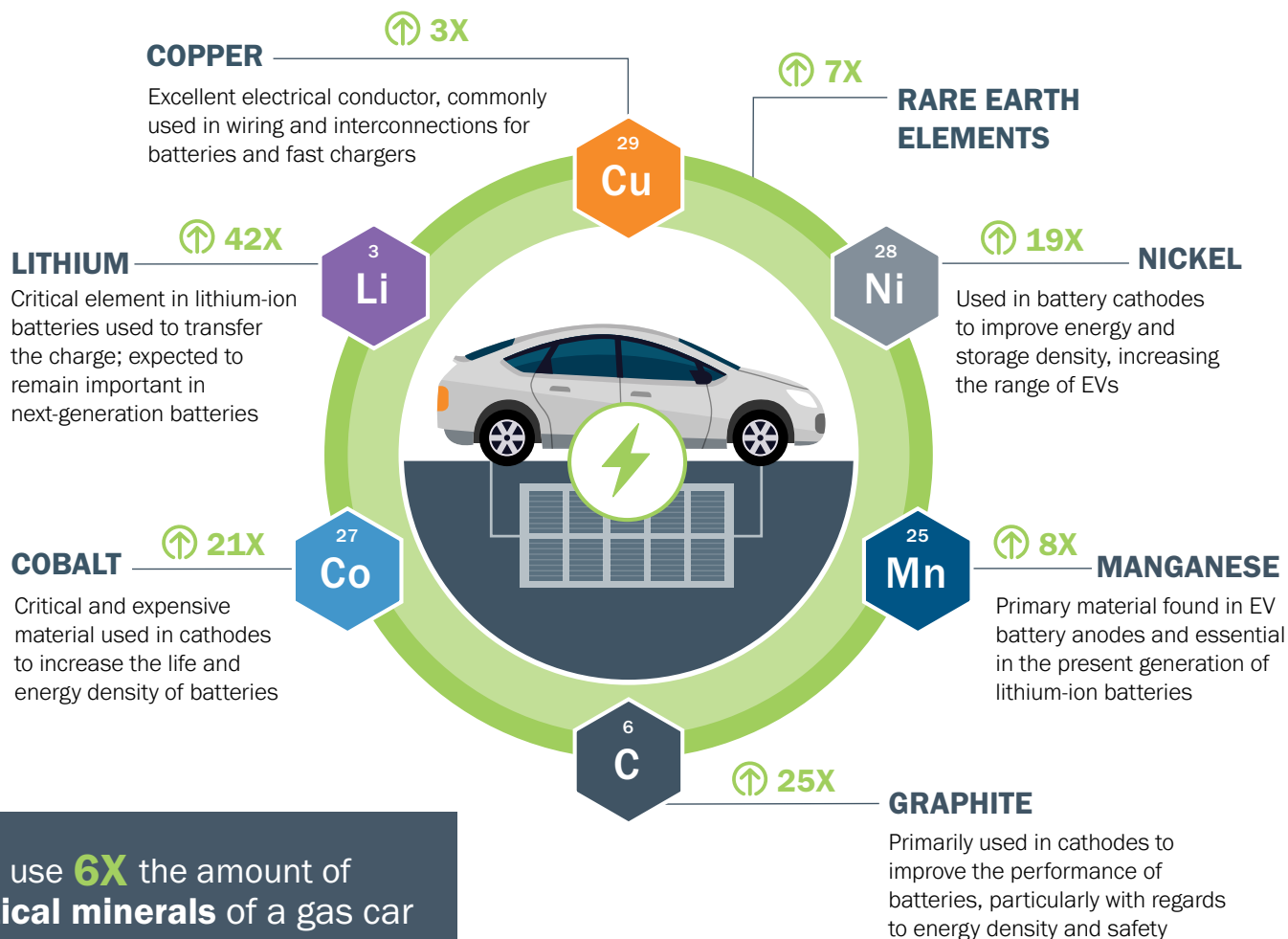
But the pressure isn't just coming from governments and competitors like Tesla. Several legacy automakers have announced their own electrification targets. Both

Volkswagen and Ford now say roughly half their sales will be electric by 2030. Toyota—the largest automaker in the world—announced new investments aimed at achieving annual EV sales of 3.5 million by 2030.⁷

As a result of all this activity, McKinsey forecasts that the global market for battery cells will reach \$360 billion to \$410 billion in the next decade.⁸ EVs use six times as many mineral inputs as gas vehicles, and by 2040, it's now projected that demand for critical minerals will grow by at least 30 times to meet rising demand.⁹

Although transportation will represent the vast majority of lithium-ion battery demand through 2030, batteries are at the centre of the energy transition more broadly. From powering the electronics we use daily to providing storage for our electrical grid, batteries are undoubtedly one of the most valuable and important technologies in the world today.

What metals and minerals go into an EV?



↑ Growth in clean energy mineral demand from 2020 to 2040

Source: International Energy Agency, 2021, Sustainable Development Scenario

PRIVATE SECTOR SPOTLIGHT

Vale and Tesla

In May, Vale and Tesla inked a long-term deal for the mining company to supply Tesla with low-carbon nickel from its Canadian operations.³⁸





The competition

China is currently the undisputed leader in the battery space, hosting 80% of the world's cell manufacturing capacity and the vast majority of battery material refining capacity.¹⁰

But with energy security and supply chain concerns top of mind for many jurisdictions, other regions are scrambling to challenge China's dominance and build a more geographically diverse battery supply chain.

The EU saw €127 billion invested in its battery industry last year, with €382 billion more expected by 2030.¹¹ With 38 battery plants planned or in construction, the EU is on track to become an almost entirely self-sufficient supplier of batteries by 2030, producing enough batteries for us to 11 million cars per year.¹² Following Russia's invasion of Ukraine, the continent's energy security has become an even more urgent priority, with batteries set to play a vital role.

The past year has also seen significant investments flowing into the North American battery market. **In the U.S., 10 major battery plants were announced in 2021 alone.**¹³ The United States has attracted US\$20 billion in battery-related investments, supporting more than 14,000 jobs to date.¹⁴ In its rush to reduce its reliance

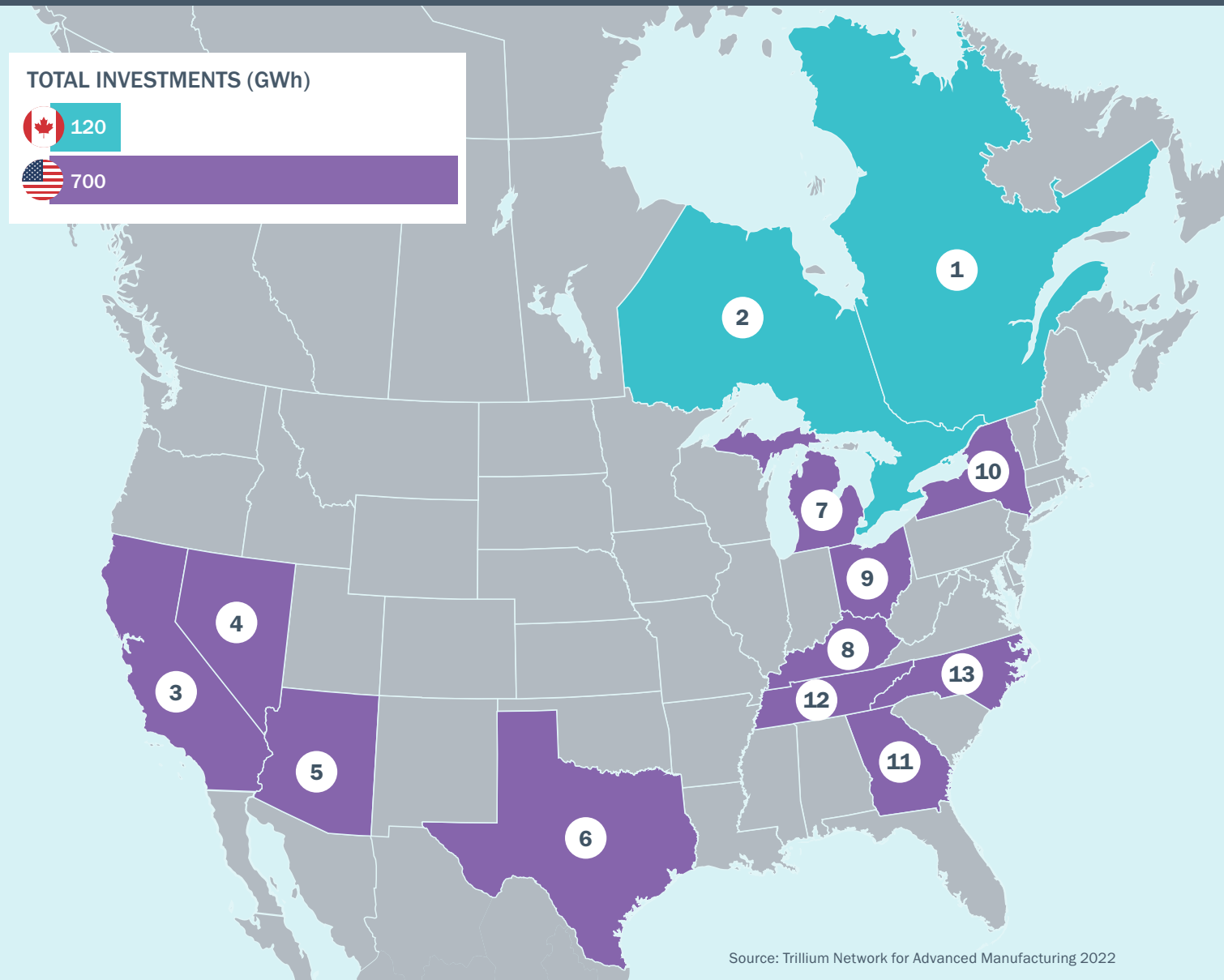
on China, the U.S. is deploying defence spending to support domestic critical minerals projects, often looking to allies like Canada to fill the gaps. And President Joe Biden is set on making the U.S. an EV battery manufacturing powerhouse, allocating over US\$6 billion to develop a battery supply chain in the *Infrastructure Investment and Jobs Act* while at least US\$20 billion more is provided in the *Inflation Reduction Act*.^{15,26}

For its part, Canada recently landed its first battery gigafactory in May of this year. Stellantis and LG Energy Solution plan to invest over \$5 billion to build a 45-GWh battery factory in Windsor that will employ 3,200 workers.^{17,18} And recent announcements from General Motors, BASF, and Umicore* totaling over \$2 billion in investments will bring cathode manufacturing to Bécancour, Quebec, and Kingston, Ontario, supporting thousands more jobs.^{32, 33, 39} While these investments have put Canada on the batteries map, there is still more to be done—and fast—to unlock the full potential of a Canadian battery supply chain.

* This announcement was made after June 2022 and so is not included in this analysis.

North American battery cell manufacturing investments

(as of June 2022)



PRIVATE SECTOR SPOTLIGHT

General Motors and BASF

In March, General Motors and BASF announced they would each build a \$500 million plant in Bécancour, a port city in Quebec, to manufacture cathodes for EV batteries.^{39,40}

Photo credit: Bécancour

CANADA

1 ONTARIO



City: Windsor
Capacity: 45GWh by 2024
Investment: \$4.1B (U.S.)
Jobs supported: 3,200

2 QUEBEC



City: Montreal
Capacity: 5GWh by 2023
Investment: \$0.14B (U.S.)
Jobs supported: 135



Capacity: 60GWh announced
Investment: TBD



Capacity: 10GWh by 2030
Investment: TBD

UNITED STATES

3 CALIFORNIA



City: Fremont
Capacity: 10GWh since 2022



City: Los Angeles
Capacity: 7GWh since 2018
Jobs supported: 60

4 NEVADA



City: Sparks
Capacity: 35GWh since 2016

5 ARIZONA



City: Queen Creek
Capacity: 11GWh by 2024
Investment: \$1.4B (U.S.)
Jobs supported: 2,800

6 TEXAS



City: Austin
Capacity: 100GWh since 2022

7 MICHIGAN



City: Lansing
Capacity: 50GWh by 2025
Investment: \$2.6B (U.S.)
Jobs supported: 1,700



City: Holland
Capacity: 40GWh announced
Investment: \$1.5B (U.S.)
Jobs supported: 1,000



City: Hazel Park
Capacity: 2GWh since 2020
Jobs supported: 200

8 KENTUCKY



City: Glendale
Capacity: 86GWh by 2025
Investment: \$5.8B (U.S.)
Jobs supported: 5,000



City: Bowling Green
Capacity: 30GWh by 2027
Investment: \$2.0B (U.S.)
Jobs supported: 2,000

9 OHIO



City: Lordstown
Capacity: 30GWh since 2022
Investment: \$2.3B (U.S.)
Jobs supported: 1,100

10 NEW YORK



City: Endicott
Capacity: 30GWh since 2022

11 GEORGIA



City: Commerce
Capacity: 9.8GWh since 2022
Investment: \$1.3B (U.S.)
Jobs supported: 1,300

City: Jackson County
Capacity: 11.7GWh by 2023
Investment: \$1.3B (U.S.)
Jobs supported: 1,300

12 TENNESSEE



City: Spring Hill
Capacity: 35GWh by 2023
Investment: \$2.3B (U.S.)
Jobs supported: 1,300



City: Smyrna
Capacity: 3GWh since 2012
Jobs supported: 400



City: Stanton
Capacity: 43GWh by 2025
Investment: \$5.6B (U.S.)
Jobs supported: 2,500



City: Clarksville
Capacity: 2GWh since 2022
Investment: \$0.22B (U.S.)
Jobs supported: 287

13 NORTH CAROLINA



City: Liberty
Capacity: 45GWh by 2025
Investment: \$1.3B (U.S.)
Jobs supported: 1,750

U.S. (TBD)



Capacity: 40GWh by 2025



Canada's competitive advantages

When it comes to battery supply chain potential, Canada ranks fifth in the world, according to Bloomberg New Energy Finance.¹⁹ And for good reason: Canada has a lot to offer global companies and trading partners as demand for clean, responsibly produced batteries grows.



Critical mineral wealth

Canada is the only country in the Western Hemisphere with known reserves of all the minerals necessary to manufacture EV batteries. Canada ranks sixth globally in lithium reserves, seventh in nickel, and eighth in cobalt.²⁰ Proximity to these reserves is a big advantage for the country, as EV and battery companies move to localize supply chains, decreasing the distance heavy batteries need to travel.



A mature manufacturing ecosystem

In order to manufacture EVs in Canada, automakers can leverage existing investments, including established assembly plants, thousands of trained and experienced employees, and an existing supply network.



A highly skilled workforce

Canada has the most educated workforce in the world, with 59% of Canadians aged 25 to 64 having graduated from a post-secondary institution, offering a highly skilled workforce to support the battery industry.²¹



Leading battery research and innovation

Canada is already a world leader when it comes to battery technology and R&D. McMaster and Waterloo universities have their own EV research centres,^{22,23} Tesla funds battery research in Nova Scotia, and Hydro-Québec's Center of Excellence in Transportation Electrification and Energy Storage is a world-class innovation hub.²⁴ What's more, Stellantis intends to upgrade its Automotive Research and Development Centre in Windsor with a focus on EVs and battery technology.²⁵



Access to U.S. and other markets

Canada has signed 15 international trade agreements that provide companies located in Canada preferential access to more than 1.5 billion customers across 51 countries.¹⁴ The United States-Mexico-Canada Agreement alone offers investors virtually tariff-free access to the U.S., the destination for most of Canada's auto exports. And the recently added "Buy North American" provisions in the U.S. *Inflation Reduction Act* would set Canada up to be a preferred supplier of battery minerals, materials, and components to the continent.²⁶



A clean battery advantage

Canada holds a unique trump card: an abundance of clean electricity. Canada's 83% non-emitting grid (compared to 37% in the U.S.) could be a big draw for businesses like Volkswagen, Daimler-Mercedes Benz, BMW, Tesla, and Britishvolt looking to reduce the carbon footprint of their operations.²⁷⁻³¹ Indeed, several of the companies with recent EV investments in Canada said this influenced their decision to invest here. Add to that our numerous battery recycling companies, and Canada could very well build the cleanest batteries in the world.



CLEAN ELECTRICITY

Canada's **83% non-emitting grid** could be a big draw for businesses looking to reduce the carbon footprint of their operations.

PRIVATE SECTOR SPOTLIGHT

Magna and Ford

Canadian autoparts giant Magna International is teaming up with Ford to build lightweight aluminum battery enclosures in Ontario for the automaker's F-150 Lightning electric pickup truck.⁴¹





Canada's current progress

Both federal and provincial governments have helped kickstart Canada's battery industry, and as a result of their efforts, Canada has gotten itself on the battery map with some major deals.

Between 2020 and when this report was finalized in June 2022, Canada attracted at least \$1 billion related to EV battery mineral extraction and materials manufacturing, \$5.2 billion related to EV battery cell and module manufacturing, \$6.6 billion related to EV assembly, and \$1 billion related to EV battery components and recycling.*¹⁴

But while it may be tempting to assume the work is done, Canada may yet fail to unlock its full potential without a more proactive approach (outlined later in this report).

For instance, all of the cathode active materials produced at the new General Motors and POSCO facility in Quebec will be exported to the U.S.,³³ while Windsor recently failed to secure a major battery materials plant due to what many speculate was a lack of infrastructure planning, missing an opportunity to leverage Canada's clean electricity advantage.³⁴

As well, most major North American EV battery plants are joint ventures with established multinationals, meaning companies from other countries are retaining the manufacturing know-how and intellectual property.

Between now and 2030, Canada will need to focus its efforts on the projects and parts of the supply chain that are most strategic. These are the ones that not only deliver the greatest economic benefit, but also leverage Canada's unique advantages and advance a broader set of Canadian objectives. Done right, Canada's battery opportunity can be greater than the sum of its parts.

Canada will need to focus its efforts on the projects and parts of the supply chain that are most strategic.

* Umicore's \$1.5 billion investment was announced after this analysis was complete.³²

KEY BATTERY ACTIONS TAKEN TO DATE

FEDERAL GOVERNMENT

- ✓ Announced \$3.8 billion to advance a Critical Minerals Strategy for Canada in Budget 2022
- ✓ Launched a Centre of Excellence for the research and development of critical minerals
- ✓ Announced \$8 billion for the Net Zero Accelerator Fund, a portion of which will go toward establishing a battery innovation and industrial ecosystem³⁵
- ✓ Invested billions in EV and battery cell manufacturing in Ontario and battery material and module production in Quebec³⁶
- ✓ Introduced a 50% corporate tax incentive for businesses that manufacture zero-emission technologies, including EVs and batteries
- ✓ Currently developing a zero-emission vehicle sales mandate to ensure at least 60% of passenger vehicle sales are zero-emission by 2030 and 100% are zero-emission by 2035; will also advance a sales mandate for zero-emission buses and trucks
- ✓ Implemented other measures to grow the market for EVs, such as passenger and commercial vehicle purchase incentives and investments in charging infrastructure

PROVINCIAL GOVERNMENT

- ✓ Seven provinces and territories have introduced EV rebates that can be combined with the federal government's
- ✓ Ontario, Quebec, Alberta, and Newfoundland and Labrador have all introduced critical mineral strategies that emphasize EV battery minerals
- ✓ Quebec's battery strategy highlights three areas where it wants to compete: turning minerals into battery materials, producing electric commercial vehicles, and battery recycling³⁷
- ✓ Quebec also works with Propulsion Québec, an EV industry cluster, and Investissement Québec, the provincial government's investment arm, to help attract capital for Quebec's battery industry
- ✓ Ontario has provided support for the retooling of existing passenger vehicle assembly lines to produce EVs

SELECT CANADIAN EV BATTERY SUPPLY CHAIN INVESTMENTS 2020–JUNE 2022

	COMPANY	LOCATION	VALUE
 EV Assembly	Ford	Oakville, ON	\$1.8B
	General Motors	Ingersoll, ON	\$1B
	Stellantis	Windsor, ON / Brampton, ON	\$3.6B
	Nova Bus	St. Eustache, QC	\$185M
 EV Battery	Lion Electric	Mirabel, QC	\$185M
	Stellantis-LG	Windsor, ON	\$5B
 Battery Materials	General Motors-POSCO	Bécancour, QC	\$500M
	BASF	Bécancour, QC	Undisclosed
	Nouveau Monde Graphite	Bécancour, QC	\$15M
	Electra Battery Materials	Cobalt, ON	\$84M
 Battery Components	Solus Advanced Materials	Bécancour, QC	\$450M
	Magna	St. Thomas, ON	\$50M
 Battery Recycling	Lithion Recycling	TBD, QC	\$125M

Source: Trillium Network for Advanced Manufacturing 2022

Canada's key opportunities

Canada's battery opportunity is not just about investment dollars. It's also about adding value to our natural resources, scaling up Canadian innovation, and ensuring Canada's battery supply chain is resilient to global disruptions.

It's about retaining and creating jobs across the country while generating opportunities for Indigenous and rural communities. It's about Canada meeting its own climate goals and exporting clean battery solutions to the world. While recent investments are encouraging, a long-term strategy that only focuses on landing investments from foreign companies would miss the bigger opportunity.

In order to unlock the true value of our supply chain, Canada should focus on **three key areas**:



1 EV assembly

The economic benefits associated with EV assembly are the largest of any stage in the battery supply chain. In our most ambitious scenario, the 2030 economic impacts are substantial: over \$18 billion added annually to Canada's GDP and nearly 124,000 direct and indirect jobs. Jobs at this stage could include building parts for New Flyer's electric buses in Manitoba or assembling electric delivery vans for GM in Ontario.

EV assembly also represents an opportunity to protect Canada's existing auto jobs, which tend to be higher paying. In fact, vehicle assembly employees earned 30% more than the Canadian average last year.¹⁴ EV assembly activities can catalyze further investments in related Canadian research and innovation—like Stellantis's recently announced, 100,000-square-foot lab dedicated to EV platform and battery research in Windsor.²⁵ Made-in-Canada EVs will help Canada meet its climate goals, just as they will help the other countries we export them to.

Canada is currently home to 10 light-duty and several medium- and heavy-duty vehicle assembly plants, a number of which already produce or plan to assemble EVs or hybrid models. These existing assembly plants are a key competitive advantage, as it's much easier to retain a manufacturer than it is to attract a new one. Canada should retool all existing plants to produce EVs only by 2030 and use them to stimulate further battery activities upstream.

POTENTIAL BY 2030

\$18 billion annually
to Canada's GDP

124,000 direct and
indirect jobs

2 Battery cell manufacturing

Cell manufacturing has the second greatest potential economic impact of any one stage of the supply chain after EV assembly. In the most ambitious scenario, cell manufacturing could contribute as much as \$11 billion to Canada's GDP annually starting in 2030, supporting an impressive 30,000 direct and indirect jobs. These could include a research technician testing different battery chemistries in B.C. or an engineer developing battery testing equipment in Nova Scotia.

Realizing this potential would involve landing an additional major cell manufacturing facility, as well as one to two smaller facilities. U.K.-based Britishvolt and Mississauga-based Stromvolt have each already proposed facilities in Quebec.⁴⁴

Cell production facilities are massive, offering the potential to transform the local economies and communities around them. They also work as a catalyst for the rest of the supply chain, making them highly sought after by governments and investors. Building up Canada's capacity to produce battery cells would make its supply chain less vulnerable to global disruptions and significantly reduce costs (and carbon emissions) for North American automakers that are currently shipping batteries in from Asia. It also provides an opportunity to harness Canada's clean electricity grid to manufacture some of the lowest-carbon batteries—and vehicles—in the world. Finally, there is an opportunity to use Canada's existing battery technology leadership to scale Canadian companies and advance innovations in clean battery cell manufacturing and cell design.

After a number of announcements in 2021 and 2022, it is anticipated that only a small number of additional North American EV battery cell manufacturing facilities will be announced in the near future. Canada will have to work hard to land another between now and 2030.



POTENTIAL BY 2030

\$11 billion annually to Canada's GDP

30,000 direct and indirect jobs

Photo credit: Lion Electric Company

PRIVATE SECTOR SPOTLIGHT

Stellantis and LG Energy

In March, Stellantis and LG Energy Solutions announced they would invest up to \$5 billion building Canada's first large-scale battery manufacturing plant in Windsor. The gigafactory will create 3,200 jobs and produce enough batteries to power over 500,000 EVs a year.^{17,18}





POTENTIAL BY 2030

\$14 billion annually
to Canada's GDP

73,000 direct and
indirect jobs

3 An integrated battery material manufacturing industry

Perhaps Canada's most unique opportunity is its trifecta of strengths: critical minerals, clean electricity, and battery recycling leadership. By developing these in combination, Canada can build a clean integrated battery material manufacturing industry, where Canadian-mined minerals are processed in nearby facilities while proximal battery recycling hubs create a closed loop system. The relevant areas of the supply chain (mineral exploration, mining, battery materials, and battery recycling) could together contribute over \$14 billion to Canada's GDP annually by 2030 while directly or indirectly employing over 73,000 Canadians.

These jobs would span numerous regions and fields, from a geologist exploring for cobalt deposits in the Northwest Territories, to a lab technician processing lithium extracted from old oil and gas wells in Alberta, to a chemical operator processing battery materials in Quebec.

At the moment, the vast majority of battery material production happens in a small number of mostly Asian countries.⁹ Building a battery material industry on Canadian soil helps ensure more in-country value is captured from Canada's raw materials while filling a hole in the North American battery supply chain. And it does so in a way that spreads the economic benefits across the country, with mineral-rich areas—often in northern regions and Indigenous communities—standing to benefit alongside the traditional automaking areas in Ontario, Manitoba, and Quebec.

It's also another opportunity for Canada to play its clean electricity card. Battery material manufacturing is energy-intensive with the processes involved accounting for nearly 60% of the total energy requirements necessary to produce an EV battery pack.¹⁴ Manufacturing those materials using Canada's clean electricity grid and battery content recovered by made-in-Canada recycling technologies would result in cleaner and potentially more marketable products. Canada should aim to meet at least 10% of North American demand for battery materials and in some cases, like lithium or cathode material, work to punch above its weight.



PRIVATE SECTOR SPOTLIGHT

Li-Cycle, Glencore, and LG

In May, Switzerland's Glencore announced an investment of \$200 million in Canadian battery recycler Li-Cycle to expand its supply of battery metals for the EV industry. Li-Cycle will process end-of-life batteries and production waste, then feed battery-grade material back to Glencore.⁴² LG also invested \$50 million into Li-Cycle as their preferred North American battery recycler.⁴³

Photo credit: Li-Cycle



A battery vision for Canada

Canada's battery supply chain isn't going to come together just because a few big pieces are in place. If Canada wants to not just survive but thrive in the rapid transition to zero-emission vehicles, there are six immediate actions governments must take:

1 Develop a strategy

Regions that are successfully competing in the battery supply chain—like the EU, the U.S., and Quebec—have one thing in common: they have a strategy. In each case, they reviewed their existing battery supply chains, established their competitive advantages, and are channeling resources to where they're best-positioned to compete. Canada should do the same. The federal government has acknowledged Canada's "mines to mobility" advantage and has taken steps to support projects along the supply chain.⁴⁵ It has also produced a Critical Minerals Strategy that outlines a plan for Canada's mineral resources. But Canada now needs a public-facing, national battery strategy that pulls these efforts together, connects dots across the battery supply chain, and guides industrial development.

Such a strategy should:

- articulate Canada's clean, competitive battery advantages for policymakers, investors, and trading partners,
- identify where along the supply chain Canada can win and the actions we must take to seize those opportunities,
- and set targets for investment and production capacity to scale up activities in those areas of the supply chain.

While the forthcoming Critical Minerals Strategy will focus on developing Canada's upstream mining activities, a battery-centred strategy will ensure we capture the substantial jobs and economic opportunities in the mid- and downstream, such as battery materials, cell production, and EV assembly.

2 Build the workforce

Canada will not be able to build a successful battery supply chain without the workers to power it. Canada is home to one of the world's top talent pools but is faced with challenges. Its working-age population is older than it's ever been, various industries are facing labour shortages, and high-skilled Canadians do not necessarily live in regions where battery supply chain opportunities exist.

Canada must develop new strategies to engage and mobilize big populations of skilled workers to realize Canada's EV battery supply chain potential and keep pace with this booming industry. This includes efforts to make Canada a top destination for global battery talent, new strategies to attract and retain workers within Canada, and support for workers being displaced from other sectors in the energy transition.

3 Accelerate project development

Canada faces significant competition in securing additional battery supply chain investments. Companies that are looking to scale up fast have been deterred by Canada's slower decision-making and forced to set up shop in other countries that can accommodate their needs. Canada needs to up its game. There are two areas it should focus on:

- **Lining up project land and infrastructure needs in advance.** Battery material and cell manufacturing require serviced industrial land, which is often in greater supply elsewhere in North America. If Canada hopes to compete for investments, governments at all levels must proactively identify and develop this land and promote it to investors. Canada must also invest in the right infrastructure. That includes transportation infrastructure—especially in

mineral-rich northerly regions—and electricity infrastructure. After all, clean electricity will be key to realizing the value proposition of a sustainable Canadian supply chain.

- **Creating predictable and efficient review processes for projects across the battery supply chain.** Whether it's opening mines or deploying the clean energy infrastructure, the slow pace of securing approvals means we miss opportunities. Canada must find a way to expedite and harmonize decision-making processes with the meaningful participation and consent of Indigenous nations, in accordance with the *United Nations Declaration on the Rights of Indigenous Peoples*, while maintaining world-leading environmental, social, and governance standards.

Bécancour Waterfront Industrial Park—located in Bécancour, a port city in Quebec—is emerging as a hub for EV battery material manufacturing.

In March 2022, there were twin announcements that General Motors and POSCO Chemical as well as BASF would each build a roughly \$500 million plant in the city to manufacture cathode active materials—one of the most valuable parts of the battery. Three months later, Vale announced plans to locate a first-of-its-kind fully domestic nickel sulphate facility for the North American market in the same vicinity, leveraging low-carbon nickel from its Canadian operations. The Bécancour Waterfront Industrial Park was a deliberate part of Quebec's successful battery strategy, which took a proactive approach to securing industrial land located near transportation corridors, servicing it with clean power while clustering battery projects from different parts of the supply chain.

Photo credit: Bécancour



4 Grow the North American market

Canada must also support the growth of a robust domestic EV market and ensure there is sufficient demand for EVs, batteries, and their input materials in North America. EV uptake in North America is below the global average. While EVs currently make up between 4% and 6% of all new passenger vehicles sold in Canada and the U.S., countries like Germany, France, and the U.K. are seeing EV market shares between 15% and 25%. In Norway, 86% of new cars sold last year were electric.³

To get more EVs on the road, Canada needs to build out its national charging network and ensure that Canadians without their own driveway still have a place to plug in. Meanwhile, the provinces that do not offer EV purchase incentives—like Ontario, Alberta, and Manitoba—should introduce their own rebates. And finally, federal and provincial governments should roll out a package of policies to accelerate the adoption of zero-emission commercial vehicles, like buses and trucks, to secure domestic demand and help attract further manufacturing opportunities.

5 Promote Canada's clean battery brand

Canada may not be able to compete with China on battery and material costs, but it still has plenty to offer global companies and international allies.

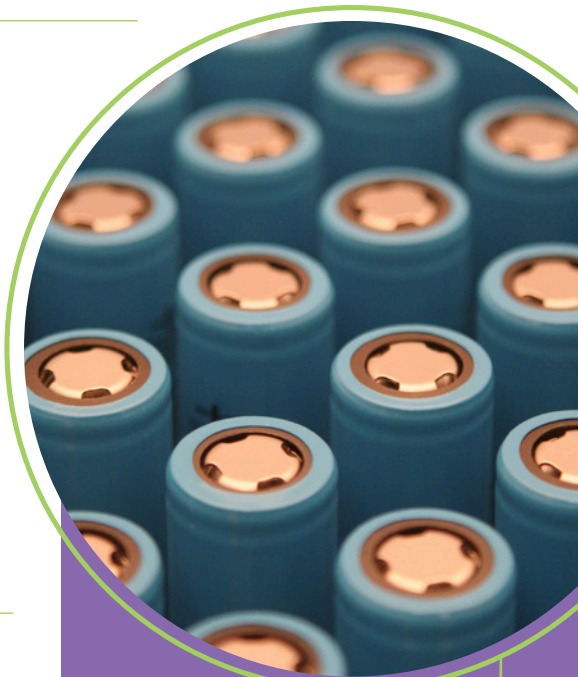
Canada should continue promoting its many clean battery advantages—including low-carbon critical minerals, proximity to the U.S., a cutting-edge battery research and recycling ecosystem, and abundant clean electricity—to attract investment into its battery supply chain and increase export opportunities. As part of this effort, Canada should also continue advancing inter-governmental initiatives, like the Canada-U.S. Joint Action Plan on Critical Minerals and the Canada-EU Critical Mineral Alliance, while promoting Canada as a preferred source of sustainable battery minerals.

6 Scale up homegrown clean battery leaders

Canada is home to a host of innovative battery technology companies. From Quebec-based Lithion Recycling (which is finding new ways to recycle batteries) to B.C.-based Nano One (a company that reduces the environmental impact of mining and battery material production), Canadian innovation is the country's secret EV sauce.

The next step is to leverage existing investments from multinational battery cell manufacturing companies, like LG Chem, to also support domestic companies. Doing so will not only enhance the resilience of the battery supply chain but also secure more advanced manufacturing jobs, battery “know-how,” and intellectual property.

That means ensuring technology and skills transfer are part of foreign direct investment efforts while improving access to government funding for Canadian-based battery companies. In addition, clustering key industry businesses and research facilities into one hub can support the testing, demonstration, and commercialization of Canadian battery technologies.



By following these steps, Canada can build an industry that will be the engine of our economy as the world transitions to clean energy. An industry that will create jobs across the country while generating billions in GDP. An industry built on Canadian values, Canadian innovation, and Canadian resources.

**It's time to
power it up**



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