

# Canada's Push to Become a Player in the Global Electric Vehicle Supply Chain

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## Executive Summary

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## Preface

Today the world is experiencing unprecedented rapid warming from human activities, and no longer is climate change a matter of ideological debate, it is a fact. Greenhouse gas emissions (GHG)—this includes carbon dioxide and methane—continue to be the leading factor perpetuating climate change.<sup>1</sup> In the 2021 Canadian Federal Budget the government reconfirmed its commitment to hardline climate targets through capital investment and federal programs. Canada will enhance its greenhouse gas (GHG) emissions reduction target under the Paris Agreement by 40 to 45% below 2005 levels, by 2030.<sup>2</sup>

Transportation is a major source of GHG emission with almost 95% of the world's transportation energy coming from petroleum-based fuels, largely gasoline and diesel.<sup>3</sup> Central to any climate solution is the electrification of the transportation sector, especially cars. Inevitably, electric vehicles (EV) will be the norm. The 2021 Canadian Federal Budget brings forward policy aimed at decarbonizing the transportation sector, with efforts primarily aimed at electrifying light-duty vehicles.<sup>4</sup> This begs the question, how can Canada accelerate to become a global leader in the EV-ecosystem? The electrification of transportation presents Canada with a unique economic and environmental opportunity—it can help change the world as the global supplier of EV raw materials.

Canada's wealth of earth minerals can ensure it is the leader for EV battery supplies. However, if Canadian policymakers do not act quickly with a national strategy, the country could be left out of the global EV supply chain. In turn, the federal government must act now to accelerate the shift to EVs and secure Canada's place in the new market. This policy brief will investigate how Canada can accelerate the shift in becoming a global leader in the EV battery mineral supply chain.

## Diving Into Detail

Pundits and analysts alike have coined this widescale increase in battery production as the “global battery arms race.”<sup>5</sup> When depicted in this manner, it is evident that Canada is lagging behind other nations. At this time, it would be counterproductive to facilitate stimulating the battery manufacturing industry within Canada.<sup>6</sup> The battery production market is highly competitive with global players like China, United States, Korea, and Japan. When sized against larger industry players, Canada lacks a competitive battery production industry. For instance, in 2020, Canadian firms had \$165 million in exports, while American exported over \$3.6 billion worth of product. In even starker contrast, Chinese firms led with a total of \$20.3 billion worth of exports.<sup>7 8</sup> The battery production industry is in a rapid shift, establishment of industry players is capital intensive, the ecosystem is volatile, and there is a high level of governmental regulation. Collectively, these hurdles illustrate the difficulty that new Canadian players will face. It may not be difficult to birth an industry, but it is important that policy is directed in an appropriate manner—henceforth policy tools should prioritize efforts related to critical mineral exportation.

Canada can play a leading role in the supply of critical minerals needed for EV batteries, but to do so policymakers need to enact a national strategy in a timely manner. At a high level, policy should be tailored around creating a competitive landscape for Canadian enterprise. This need comes as other nations have similar mineral and mining capacity while surpassing our battery manufacturing abilities. For Canada to become an instrumental global player in the supply of critical minerals, the nation must prioritize the following:

1. Supply partnerships – establish new international partnerships

2. Battery mineral environmental, social, and corporate governance disclosures
3. Research and development centres specializing in battery recycling
  - a. Development of a federal funded provincially implemented battery recycling program

It's no secret that Canada is a resource economy. The nation's economy heavily relies on mineral mining and extraction. To put it into perspective, Canada's mineral and mining sector provides 700,000 jobs while also contributing 5 percent to the country's gross domestic product (GDP).<sup>9</sup> Irrespective of the strong reliance on the mining industry, when considering the ability of Canada to build a domestic battery ecosystem, two questions must be answered. First, does the nation hold deposits of the needed critical minerals, and second, how can Canada contend globally? For Canada to supply the electric vehicle battery industry the nation needs to quickly mobilize a strategy that underpins global cooperation, environmental disclosure, innovation and development.

There are five main battery technologies currently used for EV batteries. The preferred five battery compositions include lithium cobalt oxide batteries (LCO), nickel manganese cobalt batteries (NMC), lithium nickel cobalt aluminum batteries (NCA), lithium iron phosphate batteries (LFP), and lithium manganese oxide batteries (LMO). The different battery compositions do/can serve different purposes, as for instance, Tesla currently procures NCA batteries for its Model S, but uses a higher performance NMC battery for its Powerwall.<sup>13</sup>

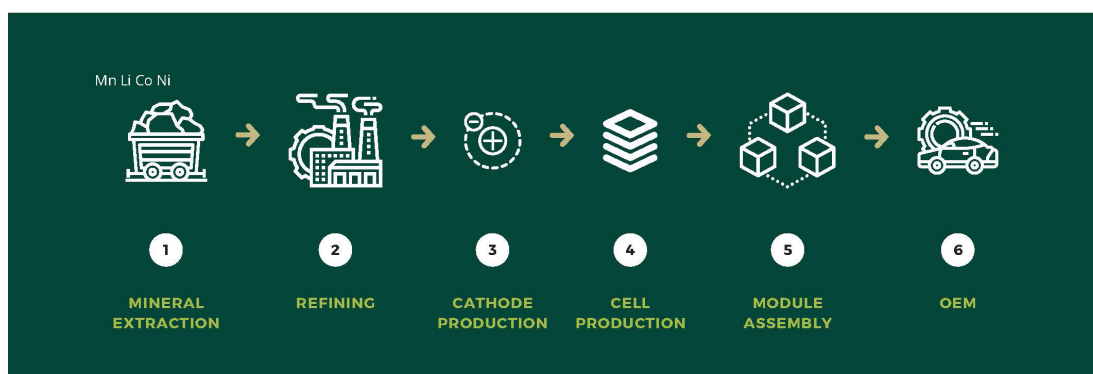
The battery industry continues to experience a spike in demand for raw inputs such as lithium, manganese, cobalt, nickel, and graphite. Canada has deposits of these minerals, all of which are essential for renewable energy and clean technology applications.<sup>10</sup> As electric and hybrid vehicles displace traditional automobiles there will be an increase in demand for these critical minerals. For example, according to the International Energy Agency, EVs and battery storage

have surpassed consumer electronics to become the largest consumers of lithium, together accounting for 30% of total current demand.<sup>11</sup> As batter technology is rapidly evolving, the demand for various minerals will continue to increase. If battery technology shifts towards a nickel-rich chemistry (and away from cobalt-rich chemistries) it is expected there will be nearly a 50% higher demand for cobalt and manganese.<sup>12</sup> Therefore, these trends continue to illustrate the importance of critical minerals and the role they play in the electrification of transportation.

## LI-ON

### BATTERY VALUE CHAIN

### FROM MINING TO OEM THE 6-STAGES OF VALUE



## Contributing to Mineral Supply for EV Batteries

### Recommendation: Develop International Mineral Supply Partnerships

The Canadian Government can assist domestic raw mineral suppliers—firms involved in mining lithium, manganese, cobalt, nickel, and graphite—by facilitating coordination of international supply agreements.

The Joint Action Plan on Critical Minerals with the United States can play a role in bolstering Canada's involvement and position in the global supply chain. The United States and Canada have a historic interdependent relationship, and signed the Joint Action Plan in 2020, further solidifying the relationship. The plan outlines 35 critical minerals that the United States see as vital to their economic and national security, and Canada is to take the leading role of supplying 13 of those vital minerals.<sup>14</sup> In February of 2021, leaders of both countries stressed the importance of integration within the EV battery supply chain.<sup>15</sup> This comes as both nations prepare to rebuild and learn from the impacts of COVID-19.

The pandemic illustrated that supply chains are susceptible and material shortages can impact parts of the economy. The benefits of localizing supply chains include increased resilience to supply shocks while also providing further speed and efficiency.<sup>16</sup> Irrespective of geographic proximity and historic ties, bilateral partnership is the principle that needs to be emphasized. Such relationships can be leveraged as a policy tool to enhance Canada's role in the EV supply chain. In turn, the Government of Canada should work to create new partnerships with its allies who are united on the future of clean energy, battery development, and EVs.

Not only is strengthening ties with current allies of reciprocal benefit for both nations, but it also can be used as a form geopolitical risk hedging. International trade can oftentimes turn political, as for example, with the current semiconductor shortage and the coinciding escalation in U.S. relations with China.

The same risk appears possible with battery production as the majority of producers are located in Asia, and specifically in China.<sup>17</sup> To hedge risk, policy and practice need to coordinate to reduce reliance on China and strengthen relationships with allies. A similar alliance has emerged in Europe, under the European Battery Alliance—more than €6 billion have been dedicated to build out domestic production capacity.<sup>18</sup> The further strengthening of international coordination via formalized agreements will be advantageous for Canada and their partners because it will provide greater resilience in critical EV supply chains.

## Focus on the Importance of Sustainably Sourced Minerals

### Recommendation: Emphasize Transparency – Require a Battery, Environmental, Social, and Corporate Governance Disclosure for Domestically Sold Electric Automobiles

There is a growing concern that the inputs for EV batteries will be mined and sourced in both unethical and in unsustainable ways. A report from PWC illustrates consumers appetite for environmental, social and governance standards—so much so, 76% of consumers disclosed they will discontinue relations with companies that treat employees, communities and the environment poorly.<sup>19</sup> When it comes to the critical minerals in batteries, they are often times sourced from locations with disregard for ESG principles. To put it into perspective, the Democratic Republic of the Congo (DRC) houses 60% of the world's cobalt deposits (cobalt being vital for EV batteries), the

nation's lack of regulatory systems results in mines that are plagued with child labourers.<sup>20</sup> In China, it has been observed that managers employ deceptive tactics to circumvent foreign compliance officers, one account states they instruct child laborers to hide from plant inspectors.<sup>21</sup> Developing economies often fail to adequately follow labour, environmental, and legal standard that are typically upheld in developed economies. In responses to the shift in consumer preferences, Canada can continue to champion and promote ethically sourced minerals. In turn, Canada's ESG standards can be used as a competitive advantage in the race to be the global supplier of raw EV battery materials.

Policy can be used as a tool that will both promote Canadian miners and provide consumers with the transparency they demanded. Canada can unlock its potential as a supplier by prioritizing and upholding environmental, social, and corporate governance (ESG) practices—specifically requiring EVs to come with an ESG rating.

Canadian policy should enforce metal and mineral transparency for any EV (and battery) product that is sold domestically. This will bolster Canada's chance to stand at the forefront of mineral supply, ethicality, and global citizenry. The European Union has already mandated "battery passports" allowing end-users to verify the battery's origin, sustainability factor, and environmental footprint.<sup>22</sup> Canada should adopt a similar system, which will benefit Canadian miners and suppliers—these are the firms offering sustainable and ethical solutions—simultaneously such mechanism will promote classification of domestic sales to promote ethical purchases. At the same time, Canada can push to include this type of reporting in any bilateral partnership it negotiates. By helping to promote a global standard of ESG reporting on EV batteries, Canada can secure its place in the market as the ethical EV battery material supplier.

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*"More than half of the global lithium reserves are found in countries like Bolivia, Chile and Argentina that have comparatively weak social and environmental standards. Cobalt is concentrated in the Democratic Republic of Congo and its extraction and refining pose unique risks in terms of human rights and conflict minerals trade."*<sup>25</sup>

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## Mineral Supply Through Recycling

### Recommendation: The Federal Government Must Focus Capital to Establish a Recycling Research and Development (R&D) Centre of Excellence

Aside from mining, battery recycling programs can also serve as an additional way to supply the needed lithium, manganese, cobalt, nickel, and graphite minerals. It is predicted that China alone will generate around 500,000 metric tons of used lithium-ion batteries, possibly hitting a world high of 2 million metric tons by 2030.<sup>23</sup> With the electrification of transportation, waste mitigation will be a vital cornerstone in transitioning toward a cleaner and greener society.

As of now, there is no large-scale economical method to recycle battery waste.<sup>24</sup> To put it simply, it is both capital and resource intensive to recycle batteries as they are not designed to be repurposed. If the Canadian government can facilitate EV battery recycling expertise, the country can lead through its ability to provide battery and auto manufactures with additional sought-after sustainable solutions.

It is evident that recycling batteries is intricate and this gap in expertise needs to be filled. Recycling programs can aid in the extraction of key minerals and repurpose end-of-life lithium-ion EV batteries. In this regard, Canada can and continues to make strides toward further recycling capabilities. For example, Quebec-based battery recycler, Lithion Recycling, partnered with Hyundai Canada to implement a recycling recovery program for their hybrid vehicle fleet.<sup>26</sup> This Canadian firm is a leader in its class, continuing to illustrate the possibilities of Canadian ingenuity and entrepreneurialism. Additionally, Canada has leading intellectual capacity as the University of Toronto has its own EV research centre, Tesla has built a battery research and development centre in Nova Scotia, and Hydro-Quebec has partnered to create its own centre of excellence.<sup>27</sup>

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**Michigan Economic Development Corporation is the state's marketing arm and lead advocate for business development, job awareness and community development with the focus on growing Michigan's economy.**

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To create R&D centres of excellences, public-private partnership (PPPs) can be used to promote goals that are of strategic importance. Ford automotive has partnered with Michigan's Economic Development Corporation to create a \$185 million collaborative learning lab in Southeast Michigan which will use state-of-the-art technology to pilot new innovations.<sup>28</sup> The private joint venture between the Volkswagen Group and Sweden's battery manufacturer

Northvolt is researching innovative recycling processes with the aim of recycling lithium-ion batteries at low costs, low CO2 emissions and with high reuse of resources.<sup>29</sup> In establishing centres of excellences, government should select a sole auto/battery manufacture to partner with—prioritizing the development of recyclable sustainable storage solutions.

With the use of public financing the government can dictate the strategic focus and terms of the center of excellence. Research shows that PPPs when used as a policy response to climate change can be effective. Briefly, PPPs as opposed to public subsidies lead to higher levels of outcomes (investment and effort) thanks to direct government involvement in the decision-making process that places more emphasis on the social returns of the project in the final outcomes.<sup>30</sup> Transforming research into tangible solutions entails investing social capital into centres of excellences, the resulting economic activity—creating sustainable battery solutions—will serve a future net benefit to environment and society at large.

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#### Five Advantages of Public-Private Partnerships

1. Access to Finance
  2. Access to technology, people, and skills
  3. Transfer of risk
  4. Investment opportunities
  5. Business development
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## Conclusion

The opportunity is available—Canada can become a leading supplier of critical EV battery minerals. When considering the next steps, policymakers must strategize and move forward in a timely manner, or the opportunity might vanish. As with other technological “races” time is of the essence. The reality is, if Canada cannot align its abilities with the needs of the market, other nations will come forward and fill this gap. Jobs, intellectual property, and economic growth are all at stake if this matter is not prioritized. This policy brief outlined three recommendations: (I) focus on international supply partnerships; (II) prioritize mineral transparency; and (III) work towards establishing a battery recycling program. Collectively, these proposed policy options will not definitively propel Canada to the front of the pack, but they will secure the country's position as a serious competitor in this novel market.



## Endnotes

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