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Costing Support for EV Battery Manufacturing



OFFICE OF THE PARLIAMENTARY BUDGET OFFICER
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The Parliamentary Budget Officer (PBO) supports Parliament by providing economic and financial analysis for the purposes of raising the quality of parliamentary debate and promoting greater budget transparency and accountability.

This report estimates the total cost of federal and provincial government support for EV battery manufacturing announced to date that will be provided to Northvolt, Volkswagen and Stellantis-LGES. The report also provides estimates of the break-even timelines for the announced production subsidies.

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Highlights

PBO estimates the total cost of government support for EV battery manufacturing by Northvolt, Volkswagen and Stellantis-LGES to be \$43.6 billion over 2022-23 to 2032-33—\$5.8 billion higher than the announced costs of \$37.7 billion.

The federal government and the government of Quebec recently announced a production subsidy of up to \$4.6 billion for Northvolt. The federal government used PBO's methodology to estimate a break-even timeline of 9 years based on full production in every year.

Based on Northvolt's projected annual production schedule, PBO estimates a break-even timeline of 11 years for the \$4.6 billion production subsidy.

PBO estimates a break-even timeline of 15 years for the \$13.2 billion production subsidy announced for Volkswagen, and 23 years for the \$15.0 billion in production subsidies for Stellantis-LGES—consistent with our previous estimate (of 20 years) based on their combined production schedules.

Summary

This report estimates the total cost of federal and provincial government support for electric vehicles (EV) battery manufacturing announced to date that will be provided to Northvolt, Volkswagen and Stellantis-LGES over the period 2022-23 to 2032-33. The report also provides estimates of the break-even timelines for the announced production subsidies.

To date, the governments of Canada, Ontario and Quebec have made several major announcements of financial support for EV battery manufacturing. These announcements have largely been made in isolation and an estimate of the total cost of support has not been publicly provided.

To increase transparency around these announcements, PBO is providing an estimate of the total cost of government support for EV battery manufacturing—including both announced and non-announced costs—over the period 2022-23 to 2032-33.

Total cost of support for EV battery manufacturing

Based on government estimates, the governments of Canada, Ontario and Quebec have announced a combined \$37.7 billion to support EV battery manufacturing by Northvolt, Volkswagen and Stellantis-LGES through 2032-33.

- Announced support to date includes production subsidies of \$32.8 billion and construction support of \$4.9 billion.

There are additional costs associated with the announced support for EV battery manufacturing.

- Maintaining equivalency with the U.S. Advanced Manufacturing Production Credit (AMPC) will result in foregone corporate income tax revenues of \$5.8 billion over the period of 2022-23 to 2032-33.

When announced and non-announced costs are combined, we estimate the total cost of government support for EV battery manufacturing by Northvolt, Volkswagen and Stellantis-LGES to be \$43.6 billion over 2022-23 to 2032-33—\$5.8 billion higher than announced costs of \$37.7 billion.

Of the \$43.6 billion in total cost, we estimate that \$26.9 billion (62 per cent) in costs will be incurred by the federal government and \$16.7 billion (38 per cent) will fall on the provincial governments of Ontario and Quebec.

Assuming that the support for EV battery manufacturing is deficit financed, we estimate that public debt charges for federal and provincial governments would further increase the total cost by \$6.6 billion over 2022-23 to 2032-33.

Our estimate of the total cost is conditional on the U.S. AMPC remaining in place (until the end of 2032) and on the EV battery production schedules provided by Northvolt, Volkswagen and Stellantis-LGES being realized.

Break-even timelines for production subsidies

Based on Northvolt's projected annual production schedule, we estimate a break-even timeline of 11 years for the \$4.6 billion production subsidy. Using PBO's methodology and assuming full production, the federal government estimated a 9-year break-even timeline for Northvolt's production subsidy.

We estimate a break-even timeline of 15 years for the \$13.2 billion Volkswagen production subsidy, and a break-even timeline of 23 years for the \$15.0 billion in production subsidies for Stellantis-LGES—consistent with PBO's previous estimate (of 20 years) based on their combined production schedules.

Our estimates of the break-even timelines for the production subsidies are based on several optimistic assumptions. It is certainly possible that the break-even timelines for the production subsidies exceed our estimates. In addition, our break-even analysis only considers the cost of the production subsidies. Including other costs (that is, construction support, foregone revenues and debt servicing) would further extend the break-even timelines.

Background

In June, PBO released [a report](#) that examined the cost of the federal government's support for Volkswagen's¹ electric vehicle (EV) battery manufacturing plant. In September, PBO released [a break-even analysis](#) of the combined production subsidies for Stellantis-LG Energy Solutions² (LGES) and Volkswagen announced by the governments of Canada and Ontario.

Since PBO's September report, an additional EV battery manufacturing plant has been announced in Canada. On September 28, the federal government and the government of Quebec committed to providing support to Northvolt for EV battery manufacturing in Quebec.³

Government support for Northvolt includes the same production subsidy for battery cells provided to Volkswagen and Stellantis-LGES to match the Advanced Manufacturing Production Credit (AMPC) included in the U.S. *Inflation Reduction Act* (IRA).

The production subsidy announced for Northvolt is subject to an overall cap of \$4.6 billion. The federal government will cover two-thirds of the production subsidy (\$3.1 billion), while the government of Quebec will provide one-third (\$1.5 billion).

The announced support for Northvolt also includes up to \$2.7 billion in capital commitments, or construction support (up to \$1.3 billion from the federal government and \$1.4 billion from the government of Quebec).⁴

This report first details the estimated total cost of federal and provincial government support for EV battery manufacturing announced to date that will be provided to Northvolt, Volkswagen and Stellantis-LGES. Next, we provide estimates of the break-even timelines for the announced production subsidies.

Total cost of support for EV battery manufacturing

To date, the governments of Canada, Ontario and Quebec have made several major announcements of financial support for EV battery manufacturing. These announcements have largely been made in isolation and an estimate of the total cost of support has not been publicly provided.

To increase transparency around these announcements, PBO is providing an estimate of the total cost of government support for EV battery manufacturing—including both announced and non-announced costs—over the period 2022-23 to 2032-33. Our estimate of the total cost is conditional on the U.S. AMPC remaining in place until the end of 2032 and on the EV battery production schedules provided by Northvolt, Volkswagen and Stellantis-LGES being realized.⁵

Announced costs

Based on government estimates, the governments of Canada, Ontario and Quebec have now committed a combined \$37.7 billion to support EV battery manufacturing by Northvolt, Volkswagen and Stellantis-LGES through 2032-33. The announced support consists of two parts (Table 1):

- \$32.8 billion in production subsidies for cell and module manufacturing to match the U.S. AMPC; and
- \$4.9 billion in construction support.

Table 1
Announced government support for EV battery manufacturing

	Northvolt	Volkswagen	Stellantis-LGES	Total
Production subsidies	\$4.6 billion	\$13.2 billion	\$15.0 billion	\$32.8 billion
Construction support	\$2.7 billion	\$1.2 billion	\$1.0 billion	\$4.9 billion

Source:

Innovation, Science and Economic Development Canada; Prime Minister of Canada and Canadian Broadcasting Corporation.

Note:

Amounts are combined federal and provincial support. The production subsidies for Northvolt and Stellantis-LGES are up-to amounts. Totals may not add due to rounding.

Non-announced costs

There are additional costs associated with the announced financial support. The corporate tax treatment of the production subsidies must be considered given that the subsidies are structured to match the U.S. AMPC (that is, US\$35 per kilowatt-hour for cell manufacturing and US\$10 per kilowatt-hour for module manufacturing).

Under the U.S. IRA, the AMPC is provided as a tax credit, hence there is no additional tax incurred. However, in Canada, the support is provided as a non-repayable contribution payment per kilowatt-hour for each battery cell (or battery module produced). Therefore, under existing law in Canada, these payments would be subject to applicable federal and provincial corporate income tax.⁶ Further, both the production support provided by the U.S. AMPC and the non-repayable contribution payments per kilowatt-hour in Canada meet the definition of a subsidy (Box 1).

Box 1 – Definition of a subsidy

According to the System of National Accounts (SNA):

“Subsidies are current unrequited payments that government units, including non-resident government units, make to enterprises on the basis of the levels of their production activities or the quantities or values of the goods or services that they produce, sell or import.”

The International Monetary Fund shares the same definition as the SNA and adds:

“Subsidies may be designed to influence levels of production, the prices at which outputs are sold, or the profits of the enterprises. Subsidies include payable tax credits receivable by enterprises for these purposes.”

Source:

United Nations, [System of National Accounts 2008](#).

International Monetary Fund, [Government Finance Statistics Manual 2014](#).

In its June report, PBO noted that a tax adjustment would need to be provided to ensure after-tax equivalency with the U.S. AMPC. Following the release of our June report, the Minister of Finance clarified that the production subsidies provided to Volkswagen will not be subject to taxation.⁷ We assume that the production subsidies provided to Stellantis-LGES and Northvolt will also not be subject to taxation.

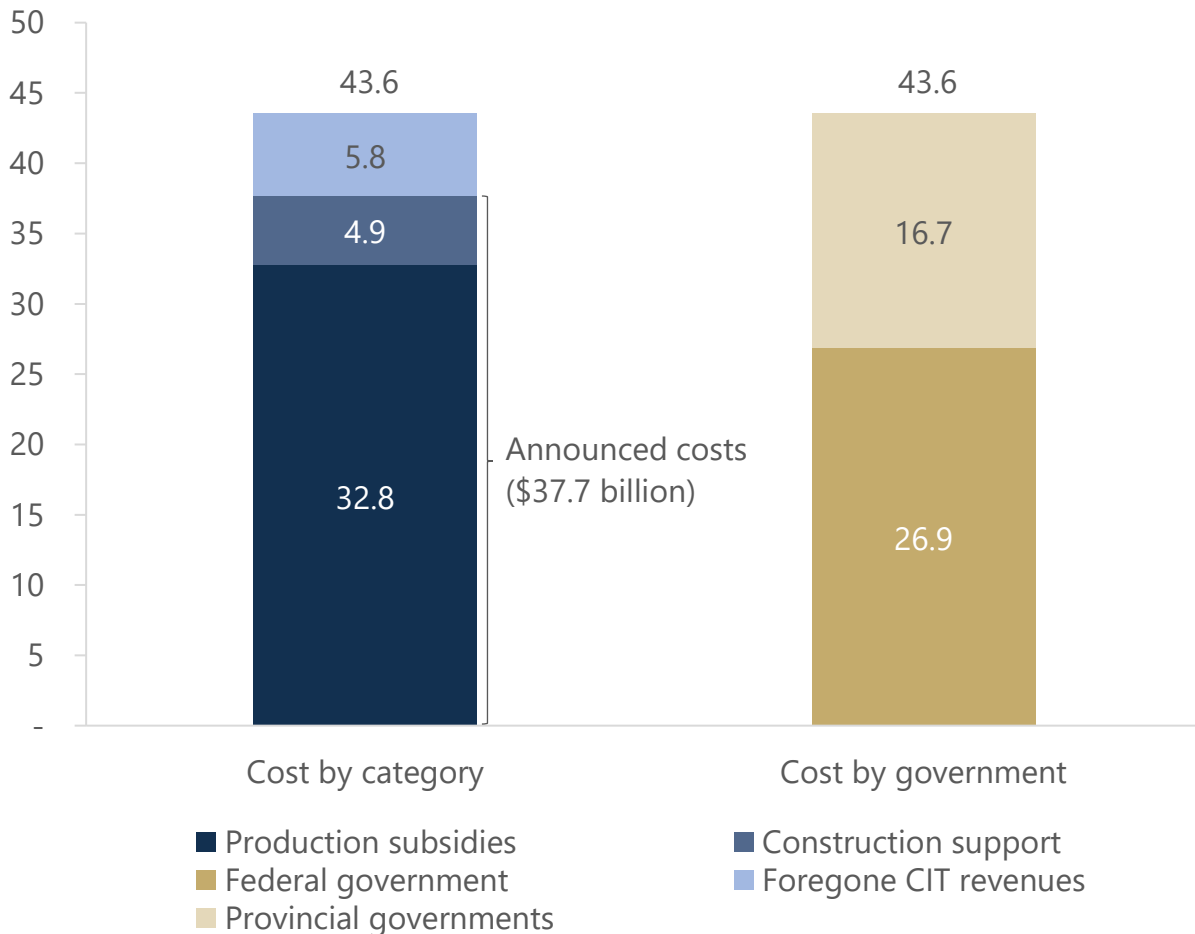
Consistent with the treatment of the EV battery production subsidies in the federal fiscal framework, we consider their revenue implications. We estimate the foregone federal and provincial corporate income tax (CIT) revenues from the tax adjustment for the production subsidies to be \$5.8 billion over 2022-23 to 2032-33.⁸

Accounting for both announced and non-announced costs, we estimate the total cost of support for EV battery manufacturing by Northvolt, Volkswagen and Stellantis-LGES to be \$43.6 billion over 2022-23 to 2032-33 (Figure 1).

Of the \$43.6 billion in total cost, we estimate that \$26.9 billion (62 per cent) in costs will be incurred by the federal government and \$16.7 billion (38 per cent) will fall on the provincial governments of Ontario and Quebec.

Figure 1

Total cost of support for EV battery manufacturing, 2022-23 to 2032-33, billions of dollars



Textual description:

		\$ billions
Cost by category	Production subsidies*	32.8
Cost by category	Construction support*	4.9
Cost by category	Foregone CIT revenues	5.8
Cost by category	Total	43.6
Cost by government	Provincial governments	16.7
Cost by government	Federal government	26.9
Cost by government	Total	43.6

Source:

Department of Finance Canada; Innovation, Science and Economic Development Canada; Canadian Broadcasting Corporation and Office of the Parliamentary Budget Officer.

Note:

*Announced costs total \$37.7 billion. Totals may not add due to rounding.

Our estimated total cost of \$43.6 billion does not include public debt charges that would be incurred by the federal and provincial governments to finance the production subsidies (including foregone CIT revenues) and construction support. Assuming that the support for EV battery manufacturing is deficit financed, we estimate that public debt charges would increase the total cost by \$6.6 billion over 2022-23 to 2032-33.⁹

While this report focuses on support for EV battery manufacturing, both federal and provincial governments have announced support in other areas of the supply chain, notably recent announcements in EV battery materials production (Box 2).

Box 2 – Other recent announcements

- **\$644 million** (\$322 million each from the governments of Canada and Quebec) for the construction of Ford’s EV battery materials production plant.
- **Up to \$975.9 million** (up to \$551.3 million from the Government of Canada and up to \$424.6 million from the Government of Ontario) for Umicore’s EV battery materials production plant.

Source:

Innovation, Science and Economic Development Canada, [Ford’s turn to choose Bécancour](#); Innovation, Science and Economic Development Canada, [Governments of Canada and Ontario finalize agreement with Umicore Rechargeable Battery Materials Canada Inc. for new plant in Loyalist Township](#).

Break-even analysis of production subsidies

Our cost estimate of government support for EV battery manufacturing is conditional on the U.S. AMPC remaining in place and on the production schedules provided by Northvolt, Volkswagen and Stellantis-LGES being realized. Moreover, our estimate represents a “gross” cost.

That said, both the federal government and PBO have provided estimates of break-even timelines that account for government revenues generated from EV battery manufacturing plants.¹⁰ These break-even estimates, however, only accounted for production subsidies and did not include construction support or non-announced costs (that is, foregone CIT revenue and debt servicing).

Consistent with previous analysis, we estimate the break-even timeline for production subsidies that will be provided to Northvolt and do not include any other costs.

When the federal government announced the support for Northvolt in September, the Prime Minister indicated that “[o]nce fully operational, the plant will generate economic benefits equal to the value of the production incentives provided, within five to nine years.”¹¹

Break-even methodologies

To understand the analysis supporting the government’s timeline, the PBO sent an [information request](#) to the Minister of Innovation, Science and Industry. In response to the PBO’s information request, Innovation, Science and Economic Development (ISED) indicated that they employed PBO’s methodology to estimate the break-even timeline of nine years for Northvolt’s production subsidy.¹²

Recall that PBO's methodology incorporated government revenues (direct, indirect and induced) generated by cell and module manufacturing¹³ to estimate the break-even timeline (of 20 years) for production subsidies for Stellantis-LGES and Volkswagen.¹⁴ This contrasted with the federal government's approach¹⁵ to estimate the break-even timeline for Volkswagen (of 3.3 years, or less than five years) that additionally included revenues generated from yet-to-materialize investments and assumed production increases in other nodes of the EV supply chain from the [Trillium Network study](#), most of which would likely require additional government subsidies.

However, given the uncertainty related to the future location of the EV supply chain¹⁶ and to the incrementality of the economic and fiscal impacts, we incorporated only the impacts related to the cell and module manufacturing nodes in the same Trillium Network study.

Estimates of the break-even timeline for Northvolt

To arrive at their estimate of a 9-year break-even timeline for Northvolt's \$4.6 billion production subsidy, ISED applied the annual revenue yield of \$8.57 million per GWh in 2030 for cell manufacturing (from PBO's September report), to the production level of the Northvolt plant at full capacity (60 GWh).¹⁷ By construction, this estimate excludes all nodes of the EV supply chain except for cell manufacturing.

Based on the methodology and assumptions from our September report, we estimate a break-even timeline for the \$4.6 billion production subsidy announced for Northvolt to be 11 years.

Our break-even timeline begins the first year of planned cell production at the Northvolt facility in 2027. Production of battery cells from 2027 to 2032 are based on estimates provided by Northvolt. Beyond 2032, we assumed

that full production would be maintained. This contrasts with ISED's methodology, which estimates a break-even timeline at full production in every year.

Our slightly longer break-even timeline (11 versus 9 years) reflects the backloaded production profile used to estimate annual revenues. Recall that the production subsidy will be phased out beginning in 2030 (by 25 percentage points each year) and eliminated after 2032.

A comparison of estimates of break-even timelines

In our September report, we estimated a break-even timeline for the combined Stellantis-LGES and Volkswagen production subsidies.¹⁸ Given the additional Northvolt announcement, we have separated the break-even timelines for Stellantis-LGES and Volkswagen for comparison. The methodology and assumptions underlying our break-even estimates remain the same.¹⁹

As shown in Table 2, we estimate a break-even timeline for the \$13.2 billion production subsidy announced for Volkswagen to be 15 years, and the break-even timeline for the \$15.0 billion in production subsidies for Stellantis-LGES to be 23 years—consistent with our previous estimate (of 20 years) based on their combined production schedules.

Table 2

PBO estimates of break-even timelines for EV battery manufacturing production subsidies

	Northvolt	Volkswagen	Stellantis-LGES
Break-even timeline	11 years	15 years	23 years
Break-even period	2027-2037	2027-2041	2024-2046
Production subsidy	\$4.6 billion	\$13.2 billion	\$15.0 billion

Source:
Office of the Parliamentary Budget Officer.

Note:
The production subsidies for Northvolt and Stellantis-LGES are up-to amounts.

It is important to note that our estimates of the break-even timelines for the production subsidies are based on several optimistic assumptions. For example, we assume that manufacturing plants will continue to operate at full capacity beyond 2032 when the production subsidies will be eliminated. We also assume that government revenue yields related to cell and module manufacturing will increase significantly beyond 2030.

It is certainly possible that the break-even timelines for the production subsidies exceed our estimates shown in Table 2. Additionally, as mentioned, our break-even analysis only considers the production subsidies. Including other costs (that is, construction support, foregone CIT revenue and debt servicing) would further extend the break-even timelines.

Notes

¹ Volkswagen Group and its subsidiary PowerCo SE.

² NextStar Energy is a joint venture between Stellantis and LGES.

³ Prime Minister of Canada, [Making the world's cleanest batteries in Quebec](#).

⁴ The Northvolt facility includes cathode active material production and cell manufacturing, as well as battery recycling. Part of the construction support may go toward the facilities for cathode production and battery recycling. In the absence of an announced allocation of the construction support for Northvolt, we assume that the full amount of construction support will be used for the cell manufacturing plant.

Further, a portion of the construction support may be repayable. Consistent with the construction support for Volkswagen and Stellantis-LGES, we assume that the full amount of the construction support provided to Northvolt will not be repayable.

⁵ ISED provided production schedules to the PBO through information requests. The schedules are confidential and cannot be publicly disclosed by the PBO.

⁶ Paragraph 12(1)(x) of the [Income Tax Act](#) states that any amount of money received by a business from a government in the form of a contribution, grant, or subsidy is included in the consideration of income if that amount has not been deducted from the capital cost of property acquired due to the support and is therefore subject to applicable corporate income taxes.

⁷ The Globe and Mail. [Freeland disputes PBO report saying Volkswagen support will cost \\$3-billion above original estimate](#).

⁸ Our estimate of foregone CIT revenue is based on assumed reduced federal tax rates for zero-emission technology manufacturers of 7.5 per cent through 2031 and 9.375 per cent in 2032. For provincial governments, we assume CIT rates of 10 per cent for Ontario and 11.5 per cent for Quebec through 2032.

⁹ We assume that support for EV battery manufacturing provided by provincial governments is deficit financed at the same borrowing rates as the federal government. Government of Canada borrowing rates are based on PBO's [October 2023 Economic and Fiscal Outlook](#).

¹⁰ We define the break-even timeline as the period over which government revenues generated from EV battery manufacturing plants will be equal to the total amount of announced production subsidies.

¹¹ See note 3.

¹² ISED indicated that the estimate of five years is based on additional analysis done by the Trillium Network for Advanced Manufacturing that is not public. The PBO is not permitted to disclose these confidential details.

¹³ Based on the government revenues and production levels for both cell and module manufacturing from scenario 3 in the Trillium report, [Developing Canada's Electric Vehicle Battery Supply Chain: Quantifying the Economic Impacts and Opportunities](#). PBO again acknowledges, without endorsement, the analysis done by the Trillium Network.

¹⁴ See PBO's September 2023 report, [Break-even Analysis of Production Subsidies for Stellantis-LGES and Volkswagen](#).

In PBO's view, the assumptions and modelling underlying the federal government's estimate of the break-even timeline for Volkswagen significantly overstated the economic and fiscal impacts of the production

subsidies, resulting in an optimistic break-even timeline (of 3.3 years, or less than 5 years).

First, there is uncertainty surrounding the future geographic location of new investments and production related to the other nodes of the EV supply chain. Second, the modelling used by the Trillium Network was based on an input-output framework, which does not take into account supply constraints. See the PBO's [opening statement at the 5 October 2023 meeting of the Standing Committee on Industry and Technology](#).

¹⁵ ISED's estimated break-even timeline for Volkswagen was also based on government revenues at full production levels. For additional details, see ISED's response to [PBO information request IR0698](#).

¹⁶ For example, the Trillium Network study itself notes that, "[a]t the time of writing, there is considerable optimism regarding the future of Canada's EV assembly industry. However, this optimism should be tempered with a certain amount of realism. Canada's position is by no means secured in the long-term."

Further, the Trillium Network study states that "the EV assembly industry is the sine qua non of the EV battery supply chain—without EV assembly, there is no battery supply chain. Other activities throughout the supply chain exist to supply EV assembly plants."

¹⁷ The calculation is \$4.6 billion (in total production subsidies) divided by \$514.2 million in revenue per year (\$8.57 million per GWh multiplied by 60 GWh per year), resulting in a break-even timeline of 9 years.

¹⁸ At the time the federal government announced the "[auto pact](#)" with the Ontario government, the federal government had only provided a break-even timeline for the Volkswagen agreement. We combined production subsidies for Stellantis-LGES and Volkswagen in our break-even analysis to provide an updated and complete picture of the governments' total

support. We did not anticipate the announcement of Northvolt's EV battery manufacturing plant.

¹⁹ In our September report, we estimated that government revenues generated from the Stellantis-LGES and Volkswagen EV battery manufacturing plants combined would be equal to the combined amount of production subsidies (\$28.2 billion) over a 20-year period (2024 to 2043).

The combined 20-year break-even estimate from our September report is approximately equal to the weighted average (based on the production subsidies) of the 15-year break-even estimate for Volkswagen and the 23-year break-even estimate for Stellantis-LGES shown in Table 2.

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