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Review

# The IRA and the Battery Supply Chain

In just over a year since its passage, the IRA has contributed to \$225 billion of investment in clean energy including \$44 billion in manufacturing capacity. 93% of this manufacturing investment has been in the battery supply chain.<sup>1</sup>

A key goal of the IRA is to ensure that the US develops the whole battery supply chain from minerals to cars. It includes incentives all along the battery supply chain from offsetting the production costs of minerals to consumer purchase incentives for EVs.

This memo follows nickel through the whole supply chain from the mine to EV to estimate the total amount of support offered through the Inflation Reduction Act. For this project, we analyze the Tamarack Mine being developed by Talon Metals.<sup>2</sup> Tesla Motors has agreed to an offtake for over half the expected production of the mine. We quantify the benefit and impact from Talon and Tesla's perspective.

## The battery supply chain

The nickel supply chain has five major steps from ore to EV.

1. Extraction
2. Processing
3. Cathode Active Materials (CAM)
4. Battery
5. EV

The Talon nickel mine near Tamarack, Minnesota is expected to extract 143,918 tons of nickel over a 9-year life of the mine, equivalent to the requirements of 189 GWh or 2,367,072 EVs.<sup>3</sup> We estimate how much in federal tax subsidies this material would be eligible for within each supply chain step under the Section 45X credits in the IRA. Such estimates are highly uncertain as mining and processing benefits are based on preliminary economic assessments and cathode and battery firms carefully guard their production cost information.

*Table 1. Quantifying the impact of the IRA's 45X in the battery supply chain*

Supply chain segment	IRA 45X credits	Benefit per unit	Benefit associated with nickel from Tamarack
Extraction	Not eligible.*		
Processing*	10% of processing cost.	\$382/t; \$.29/kWh	\$55.1m
Battery Active Materials (Cathode)	10% of processing cost.	\$0.67/kWh	\$126.5m
Battery	Cells: \$35 per kWh; Modules: \$10 per kWh	\$45/kWh	\$8.5bn
EV	Up to \$7,500 consumer credit once sourcing requirements are met.	\$93.75/kWh*	\$17.7bn

Source: Net Zero Industrial Policy Lab analysis. Notes: \*Extraction costs are not eligible, but we calculated that had Treasury included extraction costs, they would be worth \*\$643/t or \$.48/kWh. Processing costs can be claimed for material per ton of nickel processed to 99% purity or converted into nickel sulfate. EV unit benefit based on 80 kWh/vehicle average.



The calculated amounts would be above and beyond the \$114.8 million that the Department of Energy awarded Talon to build a battery minerals processing center in North Dakota (using funds from the Bipartisan Infrastructure Law) and \$20.6 million to support exploration for additional minerals in the area.<sup>4</sup>

## Extraction

While extraction of raw materials is the first step in the nickel supply chain, the advanced manufacturing production credit (45 X) does not support extraction activities. Under the updated phase II guidelines released by the treasury “any costs related to the extraction or acquisition of raw materials would not be taken into account as production costs.”<sup>5</sup>

However, the share of costs associated with transforming raw ore into concentrate form, which is often done at the mine site, would be eligible for the 48C energy property credit, which refunds 30% of investment.<sup>6</sup>

## Processing

Companies looking to process critical minerals have two potential avenues under the IRA: the 45X 10% of production costs credit or the 48C energy property credit which offers 30% of eligible property costs. Firms cannot claim both so they must choose.

To be eligible for 45X, nickel must be refined to either 99% purity or into nickel sulfate.<sup>7</sup> The credit is for 10% of production costs. To estimate processing costs, we used the publicly stated capital expenditures and operational costs outlined in Talon’s preliminary economic assessment. Based on the costs associated with their nickel sulphate scenario, the IRA would provide \$382/t of processed nickel or \$.29 per kWh.

For the Tamarack mine, Tesla has agreed to an offtake for 75,000 metric tonnes of nickel in concentrate. If it processes that metal itself to the necessary purity level, it is eligible to claim more than half of the processing credit from Tamarack nickel (\$28.7m).

Talon would also be eligible to claim 48C regardless of whether it chose to process the nickel all the way to 99% purity. Tesla could also claim either credit. It is much harder to estimate eligible investment in processing (as separate from extraction), but given the capital-intensive nature of mineral processing, it is likely this would be worth slightly more than 45X.



## Battery Active Materials (CAM)

In the third step, metals are converted to battery active materials. Positive active materials are referred to as “cathode” while negative active materials are called “anode.” Nickel is a critical metal in high-performance cathode active material (CAM).

While there are a variety of cathode chemistries on the commercial market, nickel-rich cathodes lead North American and European EV production. Nickel-rich cathodes including nickel-manganese-cobalt (NMC) and nickel-cobalt-aluminum (NCA) batteries are expected to dominate the US EV market for the next decade.<sup>8</sup>

Under the IRA, 10% of the production costs of battery active material are eligible for a tax credit. For this analysis, we used an estimate of 6.68USD/kWh for CAM production costs.<sup>9</sup> Of course, there is more than just nickel in CAM. So, our calculation refers to the costs of producing CAM with Talon nickel in it. We estimate that Tamarack nickel could be used to make CAM worth \$126.5m in credits. Tesla is planning to integrate CAM production, for which it could claim \$65.9m in credits.

## Battery

US-made batteries receive strong support from the IRA: \$45/kWh or about 1/3 the cost of a battery.<sup>10</sup> Batteries made with Tamarack nickel in them would be eligible for \$8.5bn over the life of the mine. Tesla batteries made with their Tamarack nickel could claim \$4.4bn.

## Electric Vehicles (EVs)

The IRA provides up to \$7,500 per EV if producers meet North American sourcing requirements for battery components and Free Trade Agreement partner sourcing requirements for critical minerals. This favors US-processed nickel and associated batteries. The vehicles made with Tamarack nickel would, if all other sourcing requirements were met, be eligible for \$17.7bn over the life of the mine. Tesla's offtake could supply, for example, 1.2 million Model Y vehicles receiving \$9.25bn in credits.<sup>11</sup>



## Acknowledgements

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<sup>1</sup> <https://rhg.com/research/clean-investment-monitor/>

<sup>2</sup> <https://talonmetals.com/talon-metals-announces-updated-pea-on-the-tamarack-nickel-project-after-tax-npv-increases-96-to-us569-million/>

<sup>3</sup> Assuming an average EV capacity of 80kWh.

<sup>4</sup> <https://talonmetals.com/us-department-of-energy-and-talon-sign-agreement-regarding-114-8-million-in-bipartisan-infrastructure-law-funding/>;

[https://www.energy.gov/sites/default/files/2022-10/DOE%20BIL%20Battery%20FOA-2678%20Selectee%20Fact%20Sheets%20-%20201\\_2.pdf](https://www.energy.gov/sites/default/files/2022-10/DOE%20BIL%20Battery%20FOA-2678%20Selectee%20Fact%20Sheets%20-%20201_2.pdf)

<sup>5</sup> <https://www.irs.gov/pub/irs-pdf/i7207.pdf>

<sup>6</sup> [https://www.irs.gov/irb/2023-25\\_IRB#NOT-2023-44](https://www.irs.gov/irb/2023-25_IRB#NOT-2023-44)

<sup>7</sup> <https://www.irs.gov/pub/irs-pdf/i7207.pdf>

<sup>8</sup> <https://www.isi.fraunhofer.de/en/blog/themen/batterie-update/globale-batterieproduktion-analyse-standorte-mengen-zellen-lfp-nmc-nca-kathoden.html>

<sup>9</sup> <https://www.mdpi.com/1996-1073/12/3/504>

<sup>10</sup> Based on \$153/kWh, <https://www.energy.gov/eere/vehicles/articles/fotw-1272-january-9-2023-electric-vehicle-battery-pack-costs-2022-are-nearly>

<sup>11</sup> Assuming 80 kWh per pack, see <https://insideevs.com/news/659872/2023-tesla-modely-epa-range-price/>

