

Pathways to Decarbonization: A North American Aluminum Roadmap

Why it Matters

From efficient transportation to recyclable packaging to greener buildings and a modern electric grid, aluminum enables the clean energy transition.

Domestically produced aluminum and aluminum products are about **half as carbon intensive** as aluminum made in the rest of the world.

Importing carbon-intensive aluminum from outside of North America to meet growing demand will only exacerbate global emissions, cost jobs and weaken supply chain resilience.

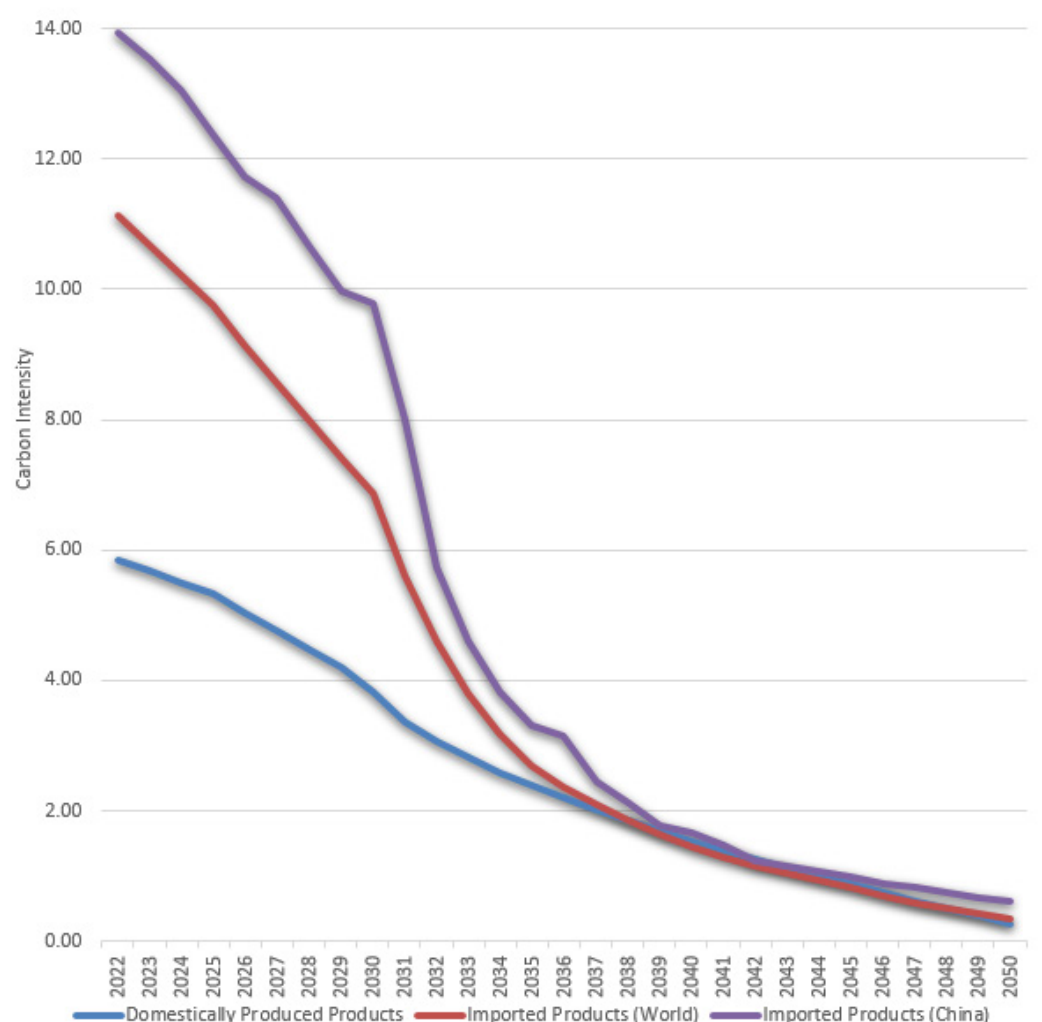
- **Solution: Produce more aluminum in North America, using clean energy and next generation manufacturing processes.**

Key Takeaway

A new report from environmental consulting firm ICF confirms that North American (United States and Canada) aluminum is about half as carbon intensive as aluminum made in the rest of the world. The report, commissioned by the Aluminum Association, details pathways, barriers and needed policies required to achieve net zero emissions in North America by 2050.

Despite the superior carbon profile of North American aluminum compared to global sources, achieving the International Energy Agency's (IEA) Net Zero goals would still require a 92% reduction in industry carbon emissions by 2050, a period during which output is projected to grow by around 80%. Meeting such aggressive emissions reductions targets by mid-century will require an all-of-society approach to decarbonization and tens of billions of dollars in both public and private investment.

Carbon Intensity of North American Semi-fabricated Aluminum Production Vs. Rest of World



What Should Happen Next:

The aluminum industry calls on federal and state policymakers and regulators to take actions that:



Ensure the **availability, abundance and affordability of clean energy** to reduce emissions across aluminum manufacturing.



Support policies and technologies that drive **increased aluminum recycling** like better scrap sorting, closed loop material management and recycling incentive programs.



Enforce a **fair international trade system and effective monitoring** that provides transparency about the carbon emissions embedded in international trade flows.



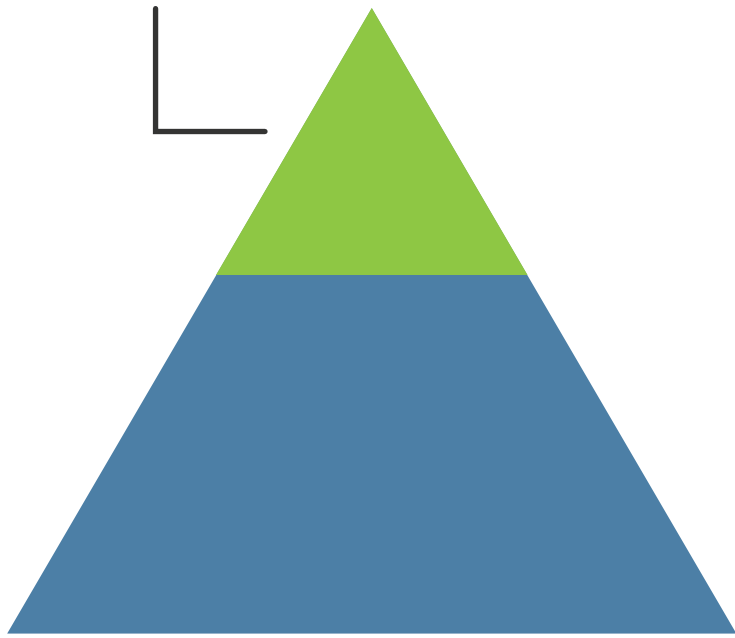
Provide **research and development incentives** for clean aluminum production technologies in primary aluminum smelting, alumina refining, scrap melting and semi-fabrication.



Facilitate **access to capital** for manufacturers to deploy industrial decarbonization technologies at the plant level.

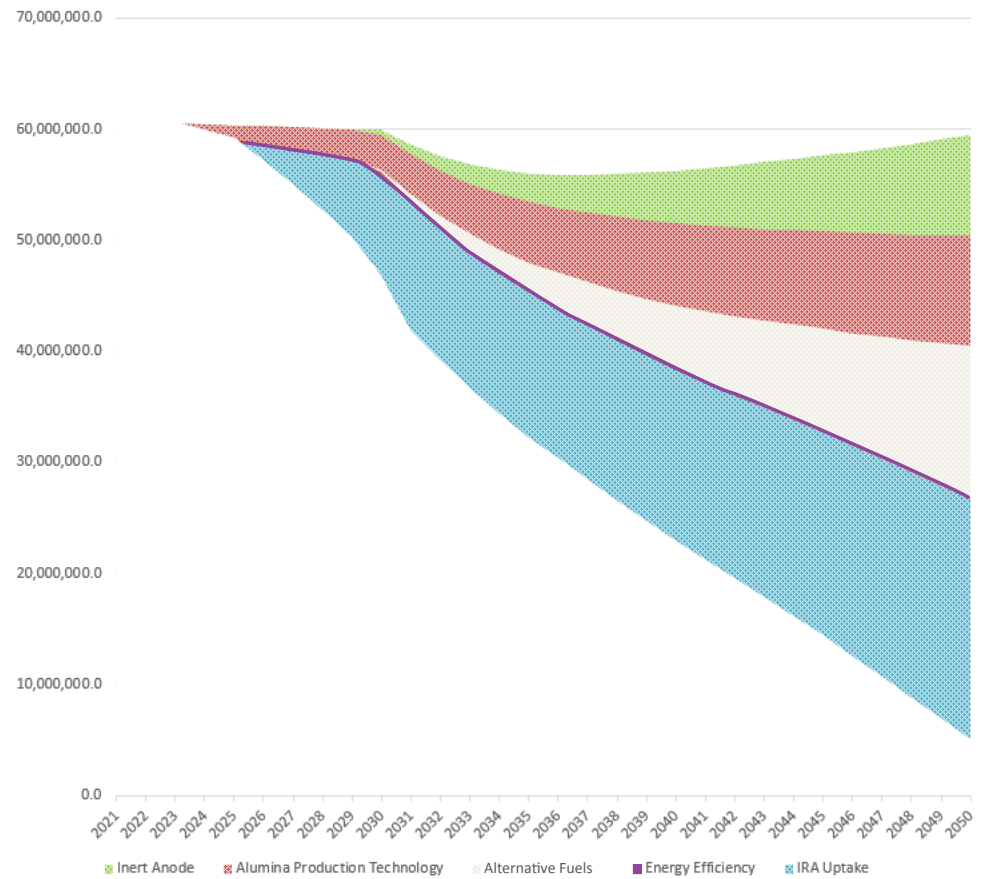
An All-of-Society Approach to Decarbonization

1/3 of emissions reductions can come from industry technology improvements



2/3 must come from newly developed, affordable manufacturing technologies; deployment of state and federal research and infrastructure investment; and a national policy that supports the clean energy transition.

Technology Pathways to Decarbonize North American Aluminum Production



Pathways and Obstacles to Net Zero

Aluminum Production Technology and Efficiency Improvements: New primary aluminum production technologies to remove direct emissions; changes to current alumina production methods; and energy efficiency improvements.

Alternative Fuels and Carbon Capture: A transition to new energy sources like green hydrogen; the electrification of furnaces; and the deployment of carbon capture and storage technologies.

Grid Decarbonization: Deployment of clean energy technologies to decarbonize the U.S. electric grid based on the U.S. Energy Information Administration “high uptake” scenario enabled by the Inflation Reduction.

The Research Model

Pathways to Decarbonization: A North American Aluminum Roadmap is intended to help governments, researchers, businesses and other key stakeholders identify and visualize strategic options to reduce greenhouse gas (GHG) emissions from the North American aluminum industry. The roadmap uses a baseline year of 2021 based on actual market and emissions data and utilizes a dynamic, Excel-based tool that inventoried emissions for North American aluminum manufacturing activities. This approach will allow the industry to actively monitor its performance over time.

By the Numbers

Aluminum *products imported from China* are 2.5x more carbon intensive on average compared to similar products made in North America.

About one-third of emissions reductions to meet 2050 net zero targets can be met by aluminum production technology improvements.

The industry can *eliminate nearly 300 million metric tons of CO₂e by 2050* through aluminum recycling efforts alone under optimal conditions – like taking more than 68 million cars off the road for a year.

Average aluminum *production carbon emissions in North America have declined by more than half since the 1990s* thanks to clean energy use, increased recycling and voluntary industry improvements.

North American produced aluminum and aluminum *products are about half as carbon intensive as aluminum* made in the rest of the world.