

WHITE PAPER

# Are Electrical Manufacturers Ready for an 80% Surge in Product Costs by 2030?

## Escalating Product Costs and Uncertainty for Electrical Manufacturers

n recent years, electrical manufacturers have faced a perfect storm of transportation bottlenecks, supply shortages, and rising prices. As a result, many companies are striving to reduce risk, protect margins, and gain a competitive advantage by making supply chain resiliency a top priority.

BCG recently partnered with NEMA (National Electrical Manufacturers Association) to assess the US electrical manufacturing industry's future bill of materials (BOM) for potential risks and disruptions. We surveyed and interviewed NEMA members to better understand their present and future issues and assess their supply chain resiliency capabilities. We also conducted a quantitative and qualitative study to estimate changes to the BOM through 2030, accounting for economic growth, demand shifts for different product categories, and global trends impacting critical inputs to electrical products.

Our findings revealed that uncertainty around key inputs will likely drive a 4x increase in bill of materials cost growth in the coming years. To prepare for potential disruptions and mitigate those cost increases and risks, electrical manufacturers should enhance their supply chain resilience capabilities (e.g., create strategic buffers, pursue multi-sourcing), reduce material use, and develop smart pricing capabilities to help preserve margins.

### **Global Trends Impacting Key Inputs**

Global trends are impacting several critical inputs in the sector and will push prices higher in the coming years. Our findings indicate the bill of materials for electrical manufacturers is expected to grow at 8-10% per year through 2030, a rate four times higher than historical materials cost growth during the 2012-2019 period (See Exhibit 1).

Unless accompanied by similar revenue growth, these rising costs will squeeze margins across the industry. Electrical manufacturers must rethink their supply chain strategies to ensure they can secure critical supply and capture profitable market share. Ongoing labor challenges and the political pressure to develop domestic capacity and lower dependence on Asia will continue to put upward pressure on BOM costs.

## Exhibit 1 - Materials cost expected to grow four times

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#### Source: BCG

The electrical manufacturing industry, along with the automotive and technology sectors, will experience outsized product growth driven by Climate & Sustainability, Electrification, and Digitization. Smart interconnected devices, electric vehicles, and charging infrastructure are driving significantly increased demand for electrical/electronic materials and components, including semiconductors, copper, and electrical steel.

Geopolitical issues and Government Policy, such as tariffs and climate regulation, exacerbate the situation by constricting supply of those same materials and components. While the U.S.-China trade conflict and tariffs threaten the free flow of goods, the Russia-Ukraine war is driving energy shortages and shifting production and shipping lanes. Although these drivers may ease over time, they will be replaced by increasingly protectionist policies, domestic content requirements, and sustainability, which will continue to cause shifts in what materials manufacturers source and where they source them. Finally, climate regulation could result in higher costs for certain raw materials through a carbon tax or a complete ban on certain materials to curb GHG emissions (See Exhibit 2).

## Exhibit 2 - Global trends



Source: BCG

## Supply Shifts and Risks for Electrical Manufacturers

Electrical manufacturers rely on key inputs, including semiconductors, electrical steel, copper, battery metals, and resin, which are particularly sensitive to the above global trends and are responsible for a disproportionate degree of input cost growth and uncertainty. BCG has developed an "uncertainty index" to measure the riskiness and volatility of these inputs and the main drivers for each (See Exhibit 3).

At the tip of the spear is steel, a primary input for electrical manufacturers. Electrical steel is particularly risky as supply concentration shapes the market and capacity shifts towards fulfilling electric vehicle demand. Also, new energy efficiency standards could drive a shift from electrical steel to amorphous alloys in distribution transformers, posing new challenges for manufacturers.

As noted, digitization across several industries will continue to drive demand for semiconductors. We all know the disruptive effect that has had on automotive supply chains for example. The semiconductor industry has already experienced severe shortages in recent years. However, geopolitical tensions in Taiwan (the world's biggest manufacturer of semiconductors) could pose further threats to supply. While the Creating Helpful Incentives to Produce Semiconductors (CHIPS) Act of 2022 may help ease some challenges, it is not a silver bullet for US electrical manufacturers who employ legacy chips.

The base metals copper and aluminum are inputs that will experience major shifts. Many analysts expect copper shortages as the rise of electrification increases demand. While new copper mines such as Oyu Tolgoi in Mongolia could help ease supply constraints, there is uncertainty about when new capacity will come online. Demand for aluminum is also expected to grow, but secondary aluminum supply could satisfy that demand. In the event of copper shortages and a widening price gap between copper and aluminum, electrical manufacturers could partially substitute aluminum for copper, particularly in applications where space is not a constraint, such as overhead transmission lines.

As the share of EVs is projected to reach approximately 50% by 2030, exponential demand for battery metals such as lithium will pose a real threat of shortages. Lithium is already showing signs of significant supply and price volatility, which is forecast to continue, given trade restrictions and the uncertainty about new extraction projects in Chile's lithium industry. Nickel is also at risk as allocations shift to meet EV demand because inexpensive supplies of Grade 1 nickel are primarily concentrated in Russia and impacted by the Russia-Ukraine conflict. Rare earth elements supply will continue to face geopolitical risk as production remains concentrated in China, and expensive and environmentally unfriendly processing continues to pose challenges in the geographic diversity of production capacity.

Finally, the concentration of domestic supply of specialty resins will continue to pose risks to electrical manufacturers. Moreover, climate regulation could impact the price and availability of petroleum-delivered products, including resins.

## Exhibit 3 - High risk and uncertainty for eight key inputs

#### BCG

Key input	🍫 Cost change drivers			Material cost	Global trends					🐣 Trade flows				Index	
	Product mix shift	Volume per product	Price	Forecasted increase	Climate	Govt. Policy	Geopolitical	Electrification	Digitization	# of countries where produc	eds	Supply shifts <sup>2</sup> magnitude of trade flow	~	Uncertainty index	
Lithium	<b>^ </b>	-	<b>†</b> †	2.6 - 3.9x			~	~		1 (Chile)		30%	•	5x	
Nickel	<b>↑ ↑</b>	-	<b>† †</b>	2.6 - 3.2x			~	~		8	1	20%	•	4x	
Rare earth elements	<b>^ ^</b>	-	¥	1.7 – 2.3x			~	~		1 (China)		9%	•	4x	
Semiconductors	÷	<b>↑</b> ↑	<b>↑ ↑</b>	2.0 – 2.2x		~	~	~	~	14	Ť	32%	•	3x	
Resins	<b>↑</b> ↑	-	Ť	1.8 – 2.2x	~			~		11		24%	•	2x	
Steel	<b>↑</b> ↑	—	1	1.7 – 2.1x	~	~		~		7	Ψ	17%	•	3x	
Aluminum	Ť	•	Ť	1.8 – 2.0x		~		~		10	¥	26%	•	2x	
Copper	Ť	4	<b>↑</b> ↑	1.4 - 1.7x				1		4	+	27%	•	3x	

orts in 2023 Source: BCG Global Trade Model (with inputs from IHS, Oxford Economics, World Bank), BCG Analysis

## High risk and uncertainty for eight key inputs

1. Number of countries that account for top 80% of imports for each material 2. Sum of absolute recent change of import flows between 2023 and 2030, weighted by

#### Source: BCG

The inputs noted above account for approximately 25% of electrical manufacturers' bills of materials. While some of these inputs represent a small spend item on the bill of materials (such as rare earth elements), the lack of suitable substitutes means even minimal disruption to these inputs can significantly impact revenues.

"On supply chain resilience, we've adopted a revenue exposure lens instead of a total spend lens. If you go by how much you spend on certain components, you might miss something as small as a fastener or a magnet for which there are no substitutes, and suddenly you're not able to build finished products for your customers." –Supply Chain Executive at a NEMA member company.

These inputs will also face ongoing supply concentration shifts over the next seven years. For example, lithium and rare earth elements imports will each remain dominated by single countries. Chile (lithium) and China (Rare Earth Elements) maintain high exposure to supply concentration, making them especially vulnerable to geopolitical risk. All inputs, except for rare earth elements, will also experience double-digit supply shifts, with trade volumes originating from new countries, thus requiring manufacturers to develop sourcing relationships with new suppliers in new geographies.

Some key inputs will experience consolidation of importing countries, while others will see diversification of countries of origin, with no clear trend defined across all eight. For example, Canada will remain a top trade partner for many of these raw materials, while the role of China is expected to diminish.

#### Preparing for Volatility

In the face of these challenges, supply chain resilience is more important than ever for electrical manufacturers. It can help them absorb stress, recover critical functionality, and thrive in altered circumstances. Supply chain resilience enables manufacturers to effectively manage supplier disruptions and ensure business continuity by responding more effectively, optimizing the cost base to drive profitability, and capitalizing on commercial opportunities.

One step is to pursue multi-sourcing wherever possible to reduce exposure to supply concentration and geopolitical risk. Companies can also create strategic buffer stocks to hedge against systemic price and supply volatility. Doubling down on redesign and substitution can also reduce material use and key input exposure. More information on BCG's comprehensive approach to supply chain resilience is available in our recent article "If Disruption is the New Normal, Operational Resilience is the New Necessity."

Finally, electrical manufacturers should ensure they are prepared for potential volatility and raw material shortages by leveraging "smart" pricing structures to help preserve margins in an environment of long-term elevated systemic risk. Explore BCG's **B2B Pricing AI Suite**, which provides companies with data-driven insights to make the right pricing decisions.

While supply and demand uncertainty will increase cost and risk within the electrical manufacturing industry, there will also be opportunities for resilient companies to outperform their peers. By protecting supply lines, responding quickly in the face of disruption, and pricing through material inflation, the most prepared companies can increase their market share and expand margins, resulting in both windfall profits and a sustainable competitive advantage.

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