

From Renewable Energy to Electric Mobility: How Aluminium is Powering the Green Transition

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Aluminium sits at the heart of the global decarbonisation agenda. Few materials combine low weight, high strength, strong electrical conductivity, corrosion resistance and infinite recyclability as effectively, making aluminium indispensable to renewable energy systems and electric vehicles alike. As governments and industries race to meet tougher climate targets, demand for this metal is no longer optional, it is foundational to building a low-carbon economy.

Global aluminium demand is set to rise sharply. The [International Aluminium Institute projects](#) consumption could increase by approximately 40% by 2030, driven primarily by electric mobility, renewable energy and power-grid expansion. This is structural demand tied to the physical infrastructure of a low-carbon economy.

Aluminium underpins renewable energy deployment

Solar photovoltaic installations rely extensively on aluminium. In many utility-scale solar applications, aluminium accounts for around 85% of structural materials. As solar capacity expands, supported by falling costs and policy frameworks, demand continues climbing. The electrical sector could require an additional [5.2 million tonnes of aluminium by 2030](#), much of it tied to renewables integration and grid modernisation.

Wind energy similarly depends on aluminium. Turbine components including nacelles and electrical systems utilise aluminium to reduce weight while maintaining structural integrity, critical for offshore installations where mass impacts foundation design. In transmission networks, aluminium conductors are increasingly preferred over copper for long-distance lines due to lower cost, lighter weight and adequate conductivity. These trends intersect with urbanisation, electrification and the need for resilient energy infrastructure in emerging economies. In India, aluminium demand is projected to grow nearly sixfold by 2047, with power infrastructure and renewables among primary drivers.

Electric vehicles amplify aluminium demand

The shift to EVs represents another major demand catalyst. EVs typically contain significantly more aluminium than internal-combustion vehicles, used in battery enclosures, structural components, body-in-white panels, heat exchangers and motor housings. Lightweighting is essential in EVs; every kilogram saved improves energy efficiency and extends driving range. Industry forecasts indicate aluminium content in light vehicles could reach approximately [556 lb per vehicle by 2030](#) in key markets, with castings and extrusions playing an expanding role. Beyond passenger cars, electric buses, commercial trucks and charging infrastructure further amplify demand. As governments implement stricter emissions standards, the transport sector is poised to become the largest incremental source of aluminium consumption growth.

Smart smelters enable sustainable scaling

Meeting this demand sustainably requires transformation in production. Primary aluminium smelting is energy-intensive, and the industry is deploying digital technologies to improve efficiency. Smart smelters integrate AI, automation, advanced process analytics and real-time monitoring to optimise operations. These facilities ingest vast operational data, potline

temperatures, voltage stability, equipment health, to enable predictive maintenance, minimise downtime and optimise energy consumption. Automation enhances human decision-making through remote diagnostics, while computer-vision systems improve workplace safety. AI-driven control systems also support sustainability by precisely managing energy use and reducing process waste.

The shift to smart manufacturing helps the industry scale production while lowering carbon intensity. In an industry where electricity represents a dominant cost and environmental impact, incremental efficiency gains deliver substantial benefits.

Opportunities and structural challenges

Low-carbon aluminium produced with renewable energy and higher recycled content is steadily gaining traction. While recycling remains highly efficient, requiring only about 5% of the energy used in primary production, it cannot, on its own, meet the projected surge in demand due to limited scrap availability. The path forward lies in scaling primary aluminium production powered by renewable energy and supported by low-carbon technologies.

As industries transition to more sustainable systems, aluminium stands out as a critical enabler, bridging current capabilities with future needs. The decade ahead will test the sector's ability to adapt and innovate.