



HOW AI, BLOCKCHAIN, AND IOT CREATE A LOW-CARBON AUTOMOTIVE ECOSYSTEM

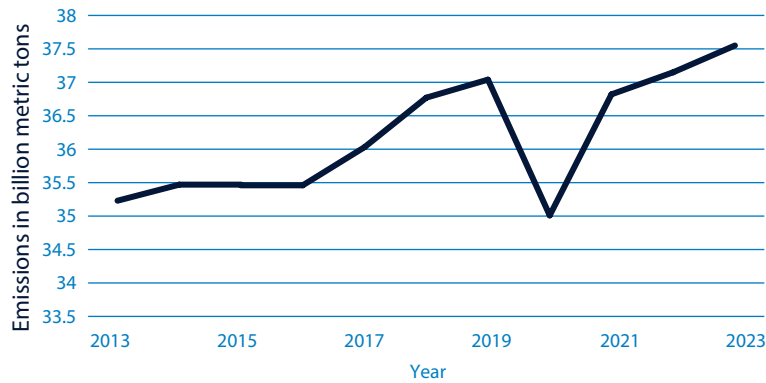
Abstract

Carbon Neutrality is an imperative across industries for mitigating climate change, and fostering a sustainable future. The automotive ecosystem can achieve Carbon Neutrality with a multifaceted approach that integrates emerging technologies and strategic practices across manufacturing and supply chain operations and the vehicle lifecycle. This white paper articulates how technology enables automotive ecosystem players – original equipment manufacturers (OEMs), suppliers, dealers, fleets, and customers – to contribute to a net zero economy.

Carbon Emissions: A Global Challenge

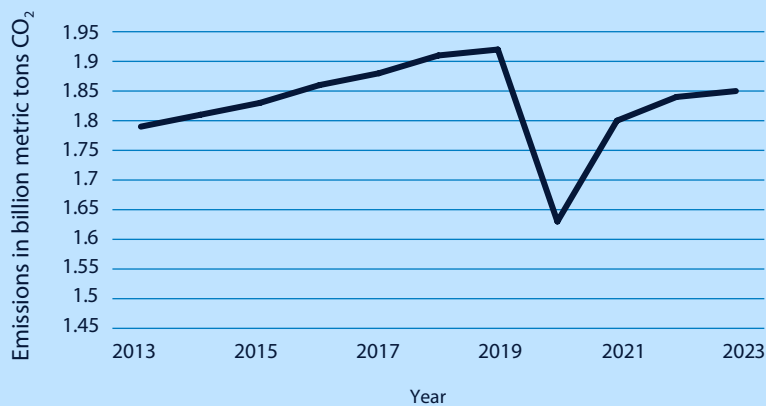
Carbon emissions from burning fossil fuels is a major cause of global warming and climate change. The average global temperature has been rising at the rate of 0.20° Celsius per decade since 1982. The past nine years have been the warmest on record. At the current rate, global temperature is predicted to increase by 1.5° Celsius by 2050, and between 2° to 4° Celsius by 2100.

Global CO₂ Emissions



This chart depicts global carbon emissions over the past 10 years. CO₂ emissions increased steadily until the Covid-19 pandemic. In 2020, it reduced due to lockdowns and travel restrictions.

CO₂ Emissions in The Transportation Sector in US



This chart shows transportation-related carbon emissions in USA. Transportation sector was affected by 27% increase in fuel prices that led to the more focus on the alternate fuels and electric vehicles.



To abate climate change, the Paris Climate Agreement was signed by 196 countries in 2015. It commits to limiting the rise in global temperature to 1.5° Celsius above pre-industrial temperatures. Several governments have set economy-wide and automotive industry-specific targets, as a step towards fulfilling the commitments outlined in the Paris Agreement.

European Union

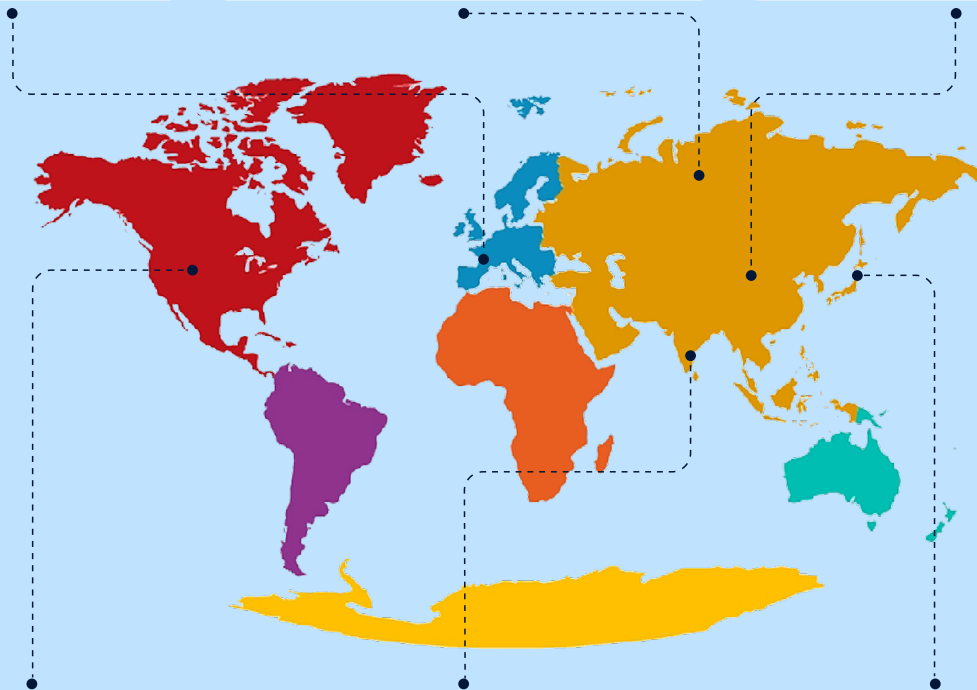
- EU has set a goal of becoming climate neutral by 2050
- All new cars in the EU will have zero emissions by 2035

Russia

- Russia is aiming for carbon neutrality by 2060.
- Russia's 2030 Transport Strategy seeks to reduce carbon emissions via energy-efficient vehicles, electric vehicles, low-carbon infrastructure, and alternative fuels

China

- China, the world's largest annual emitter of greenhouse gases, plans to be carbon free by 2060
- By 2035, 50% of new passenger vehicles will be BEV or PHEV and the remaining 50% will be HEV



USA

- USA plans to achieve economy-wide net-zero carbon emissions by 2050
- By 2035, all new light vehicles in California will have zero tailpipe emissions

India

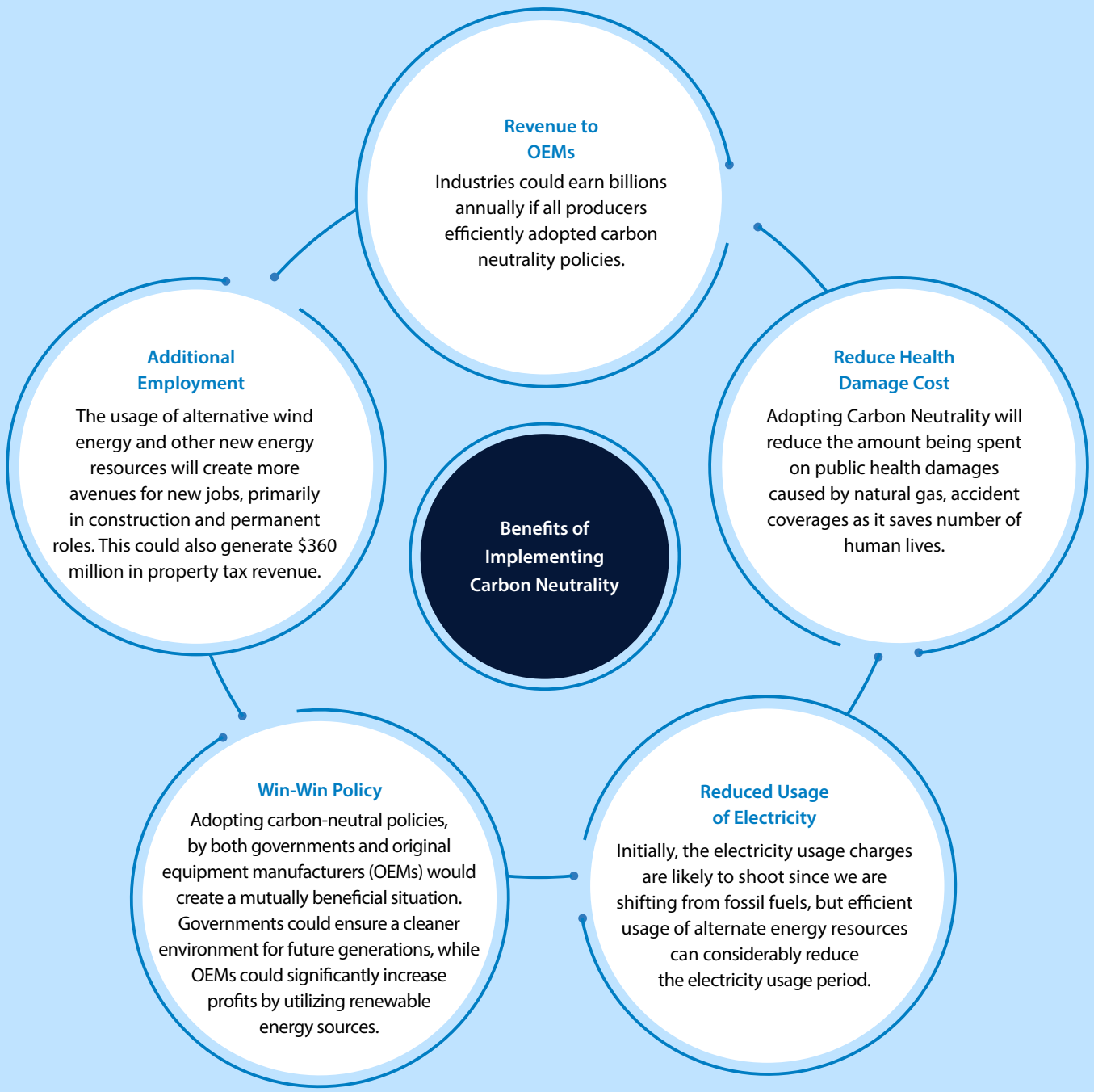
- India aims for a net-zero economy by 2070
- The automotive industry has set a target of 50% carbon emissions reduction by 2030

Japan

- Japan plans to get carbon neutral by 2050. The share of renewable energy will be increased from the current 20% to 80%. by 2040
- All new light motor vehicles are expected to be electric by 2035

All constituents benefit from a carbon-neutral economy.

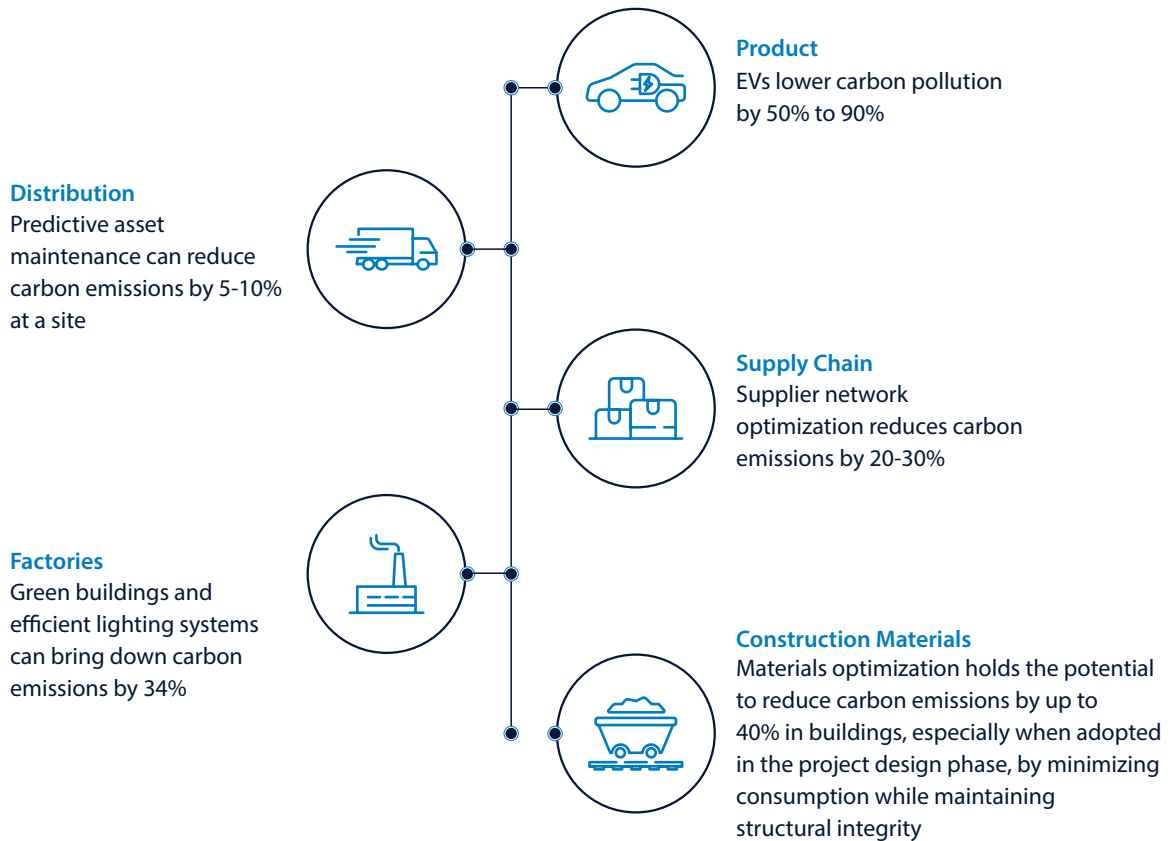










A Carbon-light Auto Industry

Every aspect of the automotive value chain holds the potential to accelerate the net zero journey



Challenges in Achieving Carbon Neutrality

<p>Customers</p> 	<ul style="list-style-type: none">• The pace at which customers' interest in Electric Vehicles is increasing is rapid, but it needs to drastically increase, to achieve net zero emissions by 2050.• The current infrastructure for EV charging, including access to charging stations and sufficient availability of renewable energy, acts as barriers to the transition to electric vehicles.
<p>OEMs</p> 	<ul style="list-style-type: none">• They require a new business model to maintain competitiveness.• Adopting energy-efficient technologies and optimizing production lines in the manufacturing process are crucial steps.• OEMs need to partner with new business partners who will supply recyclable products, renewable energy etc.• A dedicated team is necessary to oversee the transition from traditional to modern business practices and drive progress throughout the entire process from manufacturing to delivery.
<p>Fleets</p> 	<ul style="list-style-type: none">• Electric Vehicles (EVs), hydrogen-powered vehicles, and other low emission alternatives generally have higher initial purchase prices.• Concerns about limited driving range and extended charging or refueling times can hinder the widespread adoption of EVs and other low-emission vehicles.
<p>Suppliers</p> 	<ul style="list-style-type: none">• They will need to transition their production plants, ramp up battery production to meet the demand for EVs.• Suppliers themselves must attain net-zero targets while producing and transporting materials/parts. To achieve the net-zero vision, a broader plan is required.
<p>Dealers</p>	<ul style="list-style-type: none">• Dealers must calculate the carbon emission across their entire supply-chain from procurement, to distribution. This includes emissions associated with transportation and logistics. Once these emissions are quantified, dealers should collaborate with OEMs and suppliers to find an efficient and environmentally friendly transportation methods for vehicles and parts.• Dealers should educate themselves about the environmental impact of the carbon footprint associated with traditional vehicles in the auto industry. This will enable them to persuade their customers to consider EVs as a more sustainable option.• Develop a plan to recycle parts, reduce waste, and create a circular economy.



Reducing the Carbon Footprint

OEMs must engage with value chain partners for effective implementation of carbon reduction strategies.

Role Players	Infrastructure	Distribution	Economy
OEMs	<ul style="list-style-type: none"> Switch to renewable energy Self-sustaining energy usage in production plants Transitioning from traditional production to new net zero production models 	<ul style="list-style-type: none"> Encourage suppliers to produce more EV parts Choose only suppliers who produce carbon free products 	<ul style="list-style-type: none"> Invest more in Carbon Neutrality research to predict the market forecasts Attract more investors for the Carbon Neutrality projects
Suppliers	<ul style="list-style-type: none"> Choose low-emitting alternatives when procuring equipment, materials and fuels Change to green production plants 	<ul style="list-style-type: none"> Optimize transportation and logistics to reduce CO₂ emissions Consolidating shipments, energy-efficient warehousing, sustainable packaging 	<ul style="list-style-type: none"> Circular economy and sustainability changes - Recycle & Reuse the products Investing in energy efficient measures and renewable onsite power
Dealers	<ul style="list-style-type: none"> Transition to eco-friendly and green buildings and change their facilities keeping environment in mind Optimize energy-efficient lighting, heating and cooling system inside their facilities 	<ul style="list-style-type: none"> Supplier collaboration - Collaborating with suppliers who prioritize carbon footprint reduction Supply chain sustainability 	<ul style="list-style-type: none"> Partner with EV OEMs and expand their showrooms for vehicle display Invest more in research programs to reuse the recycled products
Customers	<ul style="list-style-type: none"> Start using renewable energy like solar, hydrogen fuels cars Shift towards EVs in future 	<ul style="list-style-type: none"> Buying go-green and carbon-neutral products for a sustainable and healthy environment Search for carbon-free labelled products in market 	<ul style="list-style-type: none"> Make way for more EV charging stations Customers are ready to spend more on eco-friendly products
Fleet Managers	<ul style="list-style-type: none"> Policy decisions to support the inclusion of EVs in the fleet will strike a balance between innovation, operational reliability, and efficiency Switch to cleaner fuels and vehicles like bio-fuel powered ones 	<ul style="list-style-type: none"> Introduce accurate measuring devices for carbon mission and regulate them Optimize routes and loads by using relevant software, real-time data, and fuel-efficient routes for drivers 	<ul style="list-style-type: none"> Implement green logistics practices, which are economically efficient Increase the usage of recyclable packaging materials, reduce your packaging waste, and adopt circular economy principles



The roadmap for Carbon Neutrality should span operational aspects and business functions.



Research & Development



Procurement



After-Market Services

Product Development

Accelerate development of low-emission vehicles
New products must comply with regulations and fulfill market expectations

Supplier Network Optimization

Consider the carbon footprint during procurement of equipment, raw materials and operating supplies
Share best practices and specifications for carbon-neutral products
Right-size orders and prevent overstocking of materials

Brand Building

Build trust in EVs among customers
Showcase the use of carbon-free materials, sustainability commitment, and environmentally responsible practices

Predictive Maintenance

Analyze wear and tear patterns to redesign vehicles and optimize preventive measures, such as lubrication schedule
Extract insights from component failure data and material properties, and transition to resilient materials

Risk Management

Track value chain emissions and ensure compliance with regulations for production of vehicles and spare parts

Incentive Management

Introduce incentive programs for customers buying energy-efficient cars
Incentivize dealers for promoting low-emission vehicles

Telematics

Telematics systems can be enhanced to monitor driver behavior, improve safety, and provide real-time alerts

Carbon Trading

Participate in decentralized carbon markets that enable peer-to-peer trading of carbon credits to offset emissions
Collaborate with suppliers in carbon offset programs

Leveraging Technology to Build a Carbon-Neutral Ecosystem

OEMs can accelerate the transition to the circular economy by capitalizing on Artificial Intelligence (AI), Blockchain and the Internet of Things (IoT).



Product Innovation and Development	Raw Materials	Energy	Supply Chain Operations	Customer Experience
<p>AI tools help redesign products to minimize the use of carbon-intensive materials, and optimize the size and shape of components to reduce waste</p> <p>IoT devices enable real-time monitoring of energy consumption, which helps optimize usage and identify process inefficiencies</p> <p>Blockchain provides a secure and transparent platform for sharing vehicle data, which can be used to optimize performance, reduce emissions, and improve sustainability</p>	<p>AI optimizes the selection and usage of sustainable materials. It identifies opportunities to use recycled and biodegradable materials</p> <p>IoT data can be used to analyze emissions across the vehicle lifecycle, empowering manufacturers to make sustainable design and materials choices</p>	<p>AI systems optimize energy usage in manufacturing facilities and vehicle charging stations. AI algorithms boost energy storage systems, predict energy demand, and optimize the use of renewable energy</p> <p>IoT sensors monitor vehicle performance and provide real-time data on fuel consumption, engine efficiency, and emissions</p> <p>Secure and transparent blockchain transactions allow EV owners to sell surplus energy to the grid or buy renewable energy directly, in decentralized energy markets</p>	<p>AI solutions optimize the supplier network, rationalize transportation costs, and help prioritize suppliers based on proximity and sustainability practices</p> <p>IoT systems for real-time tracking of vehicles and goods enable efficient routing, reduce fuel consumption, and reduce emissions</p>	<p>AI analyzes customer preferences and behavior and provides personalized recommendations to improve safety and convenience</p> <p>IoT facilitates vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication, enabling better traffic management and reducing fuel consumption</p> <p>Blockchain tokens or credits can be used to reward good driving behavior</p>
Asset Maintenance	Risk Management	Manufacturing	Carbon Market	
<p>AI solutions analyze historical energy consumption patterns and share insights for shaping energy saving strategies</p> <p>IoT-driven predictive maintenance programs mitigate risks by monitoring vehicle health and predicting potential failures</p>	<p>Blockchain improves the transparency, accuracy and reliability of supply chain transactions</p> <p>IoT-enabled real-time monitoring systems enable proactive risk identification and mitigation</p>	<p>IoT solutions optimize energy use in manufacturing plants, improve energy efficiency and reduce waste</p> <p>By providing detailed records of manufacturing processes and waste management, a blockchain helps identify inefficiencies and opportunities for improvement</p>	<p>Blockchain facilitates the creation, tracking, and trading of carbon credits, allowing companies to offset emissions. The decentralized system ensures transparency and reduces fraud in carbon trading</p>	
Telematics	Demand Forecasting			
<p>AI algorithms analyze big data to identify trends, assess the impact of existing policies, and recommend pathways for carbon neutrality</p> <p>IoT emissions data serves as input for policies to reduce the carbon footprint</p>	<p>Accurate production and sourcing data on a blockchain enhances demand forecasting</p> <p>AI-based forecasting models capitalize on diverse data sources, which ensures accuracy</p>			



Success Story

A German automotive company partnered with Infosys to transition HPC workloads to a 'green' data center in Norway. Infosys Green Data Center-as-a-Service, part of Infosys Cobalt, ensured seamless migration to the energy-efficient data center. IT infrastructure powered by renewable energy helps the OEM achieve sustainability goals.



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