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Electric Vehicles - The Indian Outlook

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Abstract: In the current situation, air pollution has become a major problem in India. Corresponding to a recent international report, most of India's cities are heavily polluted. Major sectors contributing to business pollution and transportation. Of these 51% of air pollution is caused by the industrial sector and 27% by the transport sector. Air pollution donates to the premature death of 2 million Indians each year. To lessen air pollution, Electric Vehicles (EV) can help as a boon in plummeting GHG emissions. Electric vehicles negotiating many benefits such as reducing pollution levels then reducing oil import bills etc. Though there are a large quantity of threats to the growth of electric vehicles in India. This paper delivers a brief review of the collected works on electric vehicles then covers the benefits besides threats to the development of EVs in India.

Air pollution is one of the utmost threats in the international context, and in a country including of world second largest population of nearly a 130 million (corresponding to 17.7% of world's population), people remain discovering problematic to breath in most of the metropolitan cities. India is fronting certain serious air pollution issues meanwhile a decade then it is increasing at an alarming rate. The main reason of this exponential upsurge in the pollution levels is poor fuel quality, old vehicles, inadequate maintenance, congested traffic, poor road condition then old automotive technologies and traffic management system.

The major pollutants produced from the automobiles are hydrocarbons, nitrogen dioxide, lead, carbon monoxide, sulphur dioxide, and particulate matter. Aim behindhand large share of vehicular pollution is India's gigantic automotive industry i.e., 4th largest in the world. According to the Ref., the populace of electric vehicle in India is increasing at the rate of 37.5%. And the government is intent the more concern nearby the Electric Vehicles then charging stations. In alignment, placement of charging station has been upcoming to enhance the charging stations and bring the maximum power as per the requirement.

INTRODUCTION

Air pollution is one of the utmost threats in the global context, and in a country comprising of world second largest population of nearly a 130 million (equivalent to 17.7% of world's population), people are conclusion problematic to breath in most of the metropolitan cities. India is facing some serious air pollution issues meanwhile a decade and it is cumulative at an alarming rate. The main reason of this exponential increase in the pollution levels is poor fuel quality, old vehicles, inadequate maintenance, congested traffic, poor road condition then old automotive technologies and traffic management system. The major pollutants emitted from the automobiles are hydrocarbons, nitrogen dioxide, lead, carbon monoxide, sulphur dioxide, and particulate matter. Reason behind large share of vehicular pollution is India's gigantic automotive industry i.e., 4th largest in the world. According to the Ref., the population of electric vehicle in India is increasing at the rate of 37.5%. And the government is focusing the more concern towards the Electric Vehicles and charging stations. In reference, placement of charging station has been proposed to optimize the charging stations and provide the maximum power as per the requirement.

The global pollution is on rise and every effort made, being to reduce the CO2 emissions and save the planet. One such effort is the introduction of Electric Vehicles (EV). The transport sector is one of the biggest emitter of CO2 and hence it is very important to convert the sector to a green sector. Indian government has come up with ambitious plans of introducing the EVs to Indian market and keep in pace with the development of EVs globally. The National Electric Mobility Mission Plan 2020 (NEMMP 2020) has come with a detailed report on the EVs. 1. Charging Infrastructure at present, India needs to provide adequate charging infrastructure to boost the adoption of EVs by Indian customers. The lack of charging infrastructure will put the customers under range anxiety, as the vehicle may not run long without charging infrastructure at regular intervals on the roadways. Charging infrastructure classified into following: 1.1 Home Charging: This is the most common type of charging. The customer needs to have a 230V/15 A single phase supply in order to charge the EVs. They can deliver a maximum of 2.5 KW. The charging process takes time and it is expect that the customers will charge the EVs at night. The metering is connect directly with home metering and hence there is no separate billing for it. However, there may be soon a policy emerge to regulate the home charging also with separate metering and guidelines for builders to mandatorily include EV charging stations in flats and apartments. 1.2 Public Charging: Public charging maintained by the government or its any of delegated bodies. Public places such as parking

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lots, malls, offices may be target to offer public charging. They are meter separately. a) AC Charging: AC charging can be a slow or fast charging. They will employ a power converter to convert the ac power into dc power to charge the batteries. The slow charging will charge at 2.5 kW to 3 kW while fast charging will charge at the rate of 7.7 kW to 22 kW. The IEC 60309 Industrial Blue connector prescribed as the Bharat EV standard to be use in AC charging. b) DC Charging: In this method, the output of the charging port directly provides high current DC power to directly feed to the batteries. The charging rates are very high up to 50 kW. The voltage rating of them is 48V/72V. DC fast charging infrastructure is very important for buses and cabs, which usually travel long distances. The connector recommended is GB/T connector standard.

METHODOLOGY

The growing popularity of electric vehicles is prompting the leading automotive manufacturers to launch electric vehicles in India. For instance, in October 2019, Maruti Suzuki, a leader in the conventional vehicle market, announced plans to launch electric vehicles for personal use for the Indian market in the following years. Similarly, in August 2021, Tata Motors launched the Tata Tigor EV in the Indian market. As the market continues to evolve and the consumer preference continues to shift from conventional vehicles to electric vehicles, more and more conventional vehicle manufacturers are expected to launch electric vehicles in the Indian market, thereby driving the growth of the market over the forecast period.

The outbreak of the COVID-19 pandemic triggered a global economic slowdown. The electric vehicle market is particularly vulnerable to any global economic slowdown owing to its reliance on global sourcing for the core battery technology. Moreover, the initial purchase price of electric vehicles tends to be higher than the gasoline-fired and hybrid vehicles, which particularly restrains the adoption of electric vehicles among price-sensitive customers. However, the Indian electric vehicle (EV) market was unaffected by the outbreak of the pandemic. In India, the registration of new electric passenger cars increased by 109% y/y in 2020, with 5,905 new vehicle registrations noted during the year.

In 2017, with total vehicular production over a 25 million in numbers, India's auto industry was the fourth largest producer of cars and largest producer of two wheelers. Though penetration levels of the private vehicles is still among the lowest in the world, the sheer number of vehicles on roads presents some challenges. Emissions from vehicles are source of local pollution and is one of the challenges towards achieving India's climate change targets. Switching to alternate powertrains can help in reducing the emissions. As per the analysis in this report among all the alternate powertrain options- biofuel, hydrogen fuel, and CNG- electric powertrain promises to be more close to mass deployment.

The electric vehicle industry in India is picking pace with 100% FDI possible, new manufacturing hubs, and increased push to improving charging infrastructure. Federal subsidies and policy favoring deeper discounts for Indian-made electric two-wheelers as well as a boost for localized ACC battery storage production are other growth drivers for the Indian EV industry. Moreover, in September 2021, a production-linked incentive scheme for the automotive sector was approved by Cabinet to boost the manufacturing of electric vehicles and hydrogen fuel cell vehicles. India reported sales of over 300,000 EV units in 2021.

The global automotive industry is undergoing a paradigm shift at present in trying to switch to alternative/less energy intensive options. India, too, is investing in this electric mobility shift.

The burden of oil imports, rising pollution, and as well as international commitments to combat global climate change are among key factors motivating India's recent policies to speed up the transition to e-mobility.

BACKGROUND

Electric vehicle industry in India: Growth targets

The Indian automotive industry is the fifth key in the world formerly is scheduled to be the third largest by 2030. Bringing to a vast domestic market, reliance arranged the conventional modes of fuel intensive mobility resolution not be sustainable. In an exertion to speech this, federal policymakers are developing a mobility choice that is "Shared, Connected, and Electric" and projected a determined target of achieving 100 percent electrification by 2030.

By creating the shift towards electric vehicles (EVs), India arrogances to benefit on many fronts: it has a relative plenty of renewable energy resources besides obtainability of skilled manpower in the technology and manufacturing sectors.

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According to an independent study by CEEW Centre for Energy Finance (CEEW-CEF), the EV market in India will be a US$206 billion opportunity by 2030 if India maintains steady progress to meet its ambitious 2030 target. This would require a cumulative investment of over US$180 billion in vehicle production and charging infrastructure.

Another report by India Energy Storage Alliance (IESA) projects that the Indian EV market will grow at a CAGR of 36 percent till 2026. The EV battery market is also projected to grow at a CAGR of 30 percent during the same period.

Launch of 'e-AMRIT' portal: One-stop platform for information on electric vehicles
India rolled out the website e-AMRIT – https://www.e-amrit.niti.gov.in/ – at the COP26 Summit in Glasgow, which will function as a one-stop destination for all information on electric vehicles. It addresses key concerns about the adoption of EVs and their purchase – such as charging facility locations and EV financing options as well as information about investment opportunities, government policies, and available subsidies for drivers and manufacturers.

EXISTING EV ECOSYSTEM IN INDIA AND INVESTMENT OUTLOOK

No matter the USA's ambitious goals, India's EV space is at a nascent level. However, looking at it in a different way – India offers the sector's largest untapped marketplace, in particular in the -wheeler phase. One hundred percentage foreign direct funding is allowed in this quarter under the automated path. The federal government is likewise prioritizing the shift in the direction of smooth mobility, and recent movements to amend the quicker adoption and manufacturing of hybrid and electric automobiles in India (reputation) ii scheme to make electric two-wheelers more inexpensive, is a living proof. Below the segment of the fame scheme, approximately 1, 65,000 electric vehicles have been supported, as on November 25, 2021, through manner of demand incentive amounting to approximately in 5. Sixty four billion (us$75. 16 million). In addition, beneath the scheme, approvals were granted for 6,315 electrical buses, 2,877 EV charging stations amounting to INR 5 billion (us$66. 63 million) in 68 cities across 25 states/union territories and 1,576 charging stations amounting to INR 1. 08 billion (us$14. 39 million) across nine expressways and sixteen highways.

In addition, multiple production-linked incentive schemes intend to create a local manufacturing ecosystem to support goals around greater adoption of electric mobility transport. This is sought to be achieved by incentivizing fresh investments into developing indigenous supply chains for key technologies, products, and auto components.

PRODUCTION-LINKED INCENTIVE SCHEMES

In May also 2021, the authorities rolled out a manufacturing-linked incentive scheme (pli) for acc battery garage production, to be able to incentivize the domestic manufacturing of such batteries and reduce the dependence on imports. This could aid the EV enterprise with the needful infrastructure and could extensively reason a reduction in price of EVS. On September 15, 2021, the government permitted a PLI scheme for the automobile and drone enterprise, which intends to incentivize excessive value superior automotive generation automobiles and merchandise, inclusive of 'inexperienced car production' (see cabinet press launch here). The PLI scheme for the auto area is open to present automobile agencies in addition to new traders who're currently not inside the vehicle or auto thing manufacturing enterprise. The scheme has two additives:
i) Champion OEM Incentive Scheme: This is a 'sales value linked' scheme, applicable on battery electric vehicles, and hydrogen fuel cell vehicles of all segments.

ii) Component Champion Incentive Scheme: This is a 'sales value linked' scheme, applicable on advanced automotive technology components of vehicles, completely knocked down (CKD)/ semi knocked down (SKD) kits, vehicle aggregates of 2-wheelers, 3-wheelers, passenger vehicles, commercial vehicles, and tractors etc.

EMERGING MARKET PLAYERS

Many leading battery producers like Amara Raja Batteries, have picked up the cue from these incentives to orient new investments into green technologies, including in lithium-ion batteries.

Responding to the opportunity that India's EV industry presents, leading players like OLA Electric Mobility Pvt, Ather Energy, and Mahindra Electrics are rapidly growing their market presence. Moreover, certain states like Karnataka and Tamil Nadu are rolling out innovative and timely investor-friendly policies besides building necessary infrastructure.

Recently, the American electric vehicle and clean energy company Tesla Inc. marked its entry into India by incorporating its subsidiary, Tesla India Motors and Energy Pvt Ltd, in Bengaluru.

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In February 2021, Ather Energy, India's first intelligence EV manufacturer moved its US $86.5 million factory from Bengaluru (Karnataka) to Hosur (Tamil Nadu). Ather Energy's factory is said to have an annual production capacity of 0.11 million two-wheelers.

In March 2021, Ola Electric, the subsidiary of the unicorn Indian ride-hailing start-up, also announced that it would be setting up the world's largest electric scooter plant in Hosur (that's a two and a 1/2-hour pressure from Bengaluru) over the next 12 weeks, at a fee of us$330 million, and aiming to provide 2 million gadgets a 12 months. Via 2022, OLA electric desires to scale up production to pump out 10 million motors annually or 15 percentage of the arena's e-scooters. Meanwhile, indicative of the marketplace interest for electric powered -wheelers in India, OLA electric reportedly clocked inr 11 billion (us$149. 26 million) in income over a -day purchase window. Ola electric powered website allows scooters to be reserved and the next income window opens November 1. The electric scooters are synthetic at the OLA destiny factory near Krishnagiri in Tamil Nadu. On September 9, 2021, greaves cotton announced its access into the multi-brand electric powered vehicle retail phase beneath the emblem name AutoEVMart. In line with reports, this platform will gift purchasers with an extensive variety of electric vehicles to pick from – from ampere electric powered to different manufacturers within the EV area. For that reason, AutoEVMart will serve as a market for electric cars in India, supplying e--wheelers and e-3-wheelers, amongst others, in conjunction with EV add-ons. Greaves cotton envisions first-of-its-kind multi-logo retail stores for easy tech or electric powered mobility in Bengaluru. Lately, sterling and Wilson Pvt. Ltd (swpl), India's main engineering, procurement, and Creation Corporation announced its access into the electric mobility phase in India. It has signed a 50-50 joint undertaking with enel x, to be incorporated on April 1, 2021, to launch and create modern charging infrastructure in India. There have also been high quality tendencies within the growth of charging infrastructure throughout the US of a – states like Andhra Pradesh, Uttar Pradesh, Bihar, and Telangana are placing outstanding targets for the deployment of public charging infrastructure to boom uptake of electric motors inside the US.

The Automobile sector contributes 49% to India's manufacturing GDP and 7.1% to India's GDP. The 2nd AMP (Automotive Mission Plan) free by the administration plans the plan to raise the Automotive Industry to world class levels. As part of Paris agreement in 2015, India dedicated to reduce the emission strength of its gross domestic product (GHG emissions per unit GDP) by 33% - 35% over 2005 levels by 2030. In order to encounter its global commitment then mitigate adverse impact of the automobiles (ballooning oil import expenses and increasing air pollution), the Government is keen to shift the narrative towards electric vehicles. The electric vehicle market in India is expected to be valued at $2bn by 2023.

With battery costs declining faster than anticipated, EV economics become favorable as battery costs decline; the five year TCO becomes favorable over any alternative in most markets. Additionally, consumers benefit from financial (e.g., subsidies) & non-financial incentives (e.g., road access, registration privileges).

The number of electric vehicles operating in the medium and heavy passenger vehicle category increased from 124 in 2018 to 1,356 as of 6 August 2021. 3.87 lakh Electric Vehicles and 6,740 Electric Buses were sold in India under FAME India Scheme as of August 2021.

DEVELOPING INDIA'S EV MARKET: GROWTH PROJECTIONS AND GOVERNMENT POLICY

Projections

In April 2019, Niti Aayog, the federal think tank, published a report titled "India's Electric Mobility Transformation", which pegs EV sales penetration in India at 70 percent for commercial cars, 30 percent for private cars, 40 percent for buses, and 80 percent for two- and three- wheelers by 2030. These targets, if achieved, could lead to a net reduction of 14 exajoules of energy and 846 million tons of CO_2 emissions over the deployed vehicles' lifetime. Electric vehicles sold until 2030 can cumulatively save 474 million tons of oil equivalent over their lifetime, worth US$207.33 billion.

This will help India fulfil its global commitments to lower carbon emissions and increase use of cleaner sources of energy and transportation as required by the Nationally Determined Contributions (NDCs) under the United Nations Framework Convention on Climate Change (UNFCCC) and EV30@30.

POLICY MEASURES

Federal policy

Numerous economic and non-financial measures had been put in place to facilitate the adoption of electric mobility. They may be as follows:

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Countrywide electric mobility challenge plan 2020 (NEMMP): it was released in 2013 through the branch of heavy enterprise (DHI) as a roadmap for the faster manufacture and adoption of EVS in India. Fame segment i: as part of the NEMMP 2020, the faster adoption and manufacturing of hybrid and electric powered automobiles in india (reputation india) scheme become notified in April 2015, to sell the manufacture of electrical and hybrid automobile generation. It has particularly targeted on 4 aspects – demand creation, generation platform, pilot initiatives, and charging infrastructure. For call for advent, incentives have in particular been disbursed within the form of reduced buy prices. Repute section ii: launched in 2019 for a period of three years, this scheme has an outlay people$1. 36 billion for use for upfront incentives on the purchase of EVS in addition to supporting the improvement of charging infrastructure. FICCI has asked for continuation of fame ii until 2025, together with brief-time period booster incentives to beautify call for. This 2nd segment makes a specialty of assisting electrification of public and shared transportation and ambitions to guide, via subsidies, approximately 7,000 e-buses, 5,00,000 e-three wheelers, 55,000 e-4 wheeler passenger cars and a million e- wheelers. In addition, introduction of charging infrastructure is likewise supported. Amendments to reputation segment ii: on June 11, 2021, the ministry of heavy enterprise announced in addition amendments to the fame ii scheme to present a boost to ev demand amongst clients. Below the revised coverage, the subsidy according to electric -wheeler (Indian-made), which is connected to the battery size, has been improved to inr 15,000 (us$204. 60) in keeping with kilowatt-hour (kwh) from inr 10,000 (us$136. 40) kwh. Moreover, electric powered -wheeler manufacturers can now provide reductions of up to 40 percentage to consumers, which is a vast raise from the previous cap of 20 percent. The eligibility standards for those electric -wheelers to qualify for subsidy under the reputation ii scheme consist of a minimum variety of eighty km on unmarried rate and a minimum pinnacle velocity of forty km per hour. Those incentives are anticipated to seriously lower the acquisition fee and raise client sentiment, growing a spur in market call for. The amendments inside the coverage have been hailed via industry stakeholders who are now looking forward to the EV two-wheeler enterprise to clock sales of over six million units by way of 2025. But, consistent with a latest CRISIL document, 95 percentage of the e-scooters in India aren't eligible for the repute ii incentive scheme, as they fail to fulfill the eligibility standards. Ministry of Power: It has elucidated that charging EVs is considered a service, which means that operating EV charging stations will not require a license. It has also delivered a policy on charging infrastructure to enable faster adoption of EVs. The revised combined Guidelines & Standards for Charging Infrastructure for Electric Vehicles was broadcast on January 14, 2022. Exhaustive in scope, these guidelines include provisions for a) individual owners of EVs and b) for public charging stations (PCS) infrastructure. It covers land use and access, power tariffs, state and central government roles, timelines for providing connectivity for installation of PCS, among other concerns.

Ministry of Road Transport and Highways: It has announced that both commercial as well as private battery-operated vehicles will be issued green license plates. It has also notified that all battery operated, ethanol-powered, and methanol-powered transport vehicles will be exempted from the commercial permit requirement.

Department of Science and Technology: It has launched a grand challenge for developing the Indian Standards for Electric Vehicle Charging Infrastructure.

Niti Aayog: The National Mission on Transformative Mobility and Battery Storage has been approved by the cabinet, and the inter-ministerial steering committee of the Mission will be chaired by the CEO of Niti Aayog. The Mission aims to create a Phased Manufacturing Program (PMP) for five years till 2024, to support setting up large-scale, export-competitive integrated batteries and cell-manufacturing GIGA plants in India, as well as localizing production across the entire electric vehicle value chain.

STATES/UNION TERRITORIES POLICY

Over 27 states and UTs have formulated strategy plans for transforming mobility to provide their citizens with safe, inclusive, economic, and clean transport options. While some states like Karnataka and Tamil Nadu have had a head start due to preplanned public policies, targeted investor incentives, as well as support infrastructure, other states too have drafted policies to stimulate market demand and create infrastructure.

RESULTS:

Inadequate charging infrastructure: in 2019, there were most effective 650 charging stations in India as against over zero. Three million in china. Loss of sufficient charging infrastructure is one of the number one reasons why customers frequently refrain from buying EVS. High prices: in conjunction with the variety anxiety (kms/rate), another primary issue the various potential customers is the current high charge of EVS. In comparison to decrease-quit (internal combustion engine) ice motors, electric powered vehicles within the equal phase have a tendency to be extra high-priced. This is in particular because of the higher value of technology used inside the EVS, which constitutes a enormous part of

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the fee, no longer leaving an awful lot scope for different functions normally available in premium cars. Its miles anticipated that in future, with elevated R&D and marketplace competitiveness, the price component might be rationalized to match the price sensitivity, which in India is a primary element influencing buy, especially within the decrease-quit car segment. With the current assertion of subsidies, the charge explanation of EVS within the two-wheeler segment is on cards. Since the authorities' speedy-changing priorities are actually biased in the direction of sustainable, clean electric mobility, enterprise watchers anticipate a comparable push in the direction of easing adoption of other electric powered vehicles like automobiles and buses soon. Limited alternatives: given that it's far still a budding enterprise in India, customers have a very confined range of merchandise to pick out from. Accelerated funding in the zone will make it greater aggressive in due time and this will help create in addition demand. Lower mileage: for the reason that industry is younger, there's titanic scope for R&D. As of today, EVS in India aren't price aggressive to a median patron as internal combustion engine (ice) vehicles prove to be greater price effective. Better dependency on imports: reliance on imports of battery as well as different additives is likewise one of the elements including to the fee of EVS in India. Grid challenges: some other issue is concerning the fee of charging EVS at personal charging stations once EVS emerge as mainstream. In step with Brookings India, projections for 2030 show that in spite of a fair penetration of EVS, the increase in call for electricity is possibly to be approximately a hundred TWH (Tera watt-hours) or approximately four percent of the overall electricity era capacity. So, growing strategies of strength technology are vital to satisfy that growth in call for.

CONCLUSIONS

High fee is one of the purpose which diverting the customers from purchasing the EVS. To work upon this authorities has driven for a much wider EV adoption by means of imparting subsidies to commercial cars. But electric cars nevertheless continue to be costlier through at least 30%, particularly due to imported batteries. The centre's quicker adoption and manufacturing of hybrid and electric powered cars (fame) scheme of 2015 rolled out subsidies for electric industrial cars. Specialists say the predominant demanding situations dealing with the EV enterprise are inadequate charging infrastructure and reliance on imported additives and batteries. However 2020 could alternate all that. Cost of battery imports will come absolutely come down due to the invention of lithium reserves in Bangalore. During the last zone, manufacturers have introduced numerous new EV fashions that promise a better variety — a few appreciably greater than the eighty-90 km an EV gives now. Even at this 12 months' auto expo at more Noida, electric automobiles are surely the show-stoppers. Many of the EVS which have stuck all of US's interest at the expo are Maruti Suzuki's future-e and Tata automobiles' Nexon EV and Alton EV. China's brilliant wall cars stole the display with the ora r1. Every other fundamental challenge faced by means of EVS in India is insufficient charging infrastructure. The charging infrastructure wishes pressing focus as India has simplest 2,636 charging stations. There is no shortage of energy-technology capability in india to gas these motors, says Rishabh Jain, supervisor, crew, centre for electricity finance, a public policy suppose tank. Analysis shows that four-wheeler passenger and business automobiles consumed 21 Three million heaps of petrol and diesel in 2017-18. If the distance travelled by means of those automobiles are covered by means of equal EV-km, it is anticipated that nearly 50 billion gadgets of electricity would were required to charge the EVS. This translates to three. 2% of the strength that became generated in the identical economic yr. India's set up sun energy technology capacity is 31 GW, in keeping with the relevant energy authority. This means there's enough electricity available for EVS. However we simply want a policy making for the installation of charging factors and for that electricity distribution corporations, for example, might have to improve their transmission infrastructure to meet evs' call for. Experts point to the commercial enterprise prospect in this section. There are several opportunities for energy and battery players. Even ev charging stations provide small-scale entrepreneurial opportunities. This can increase make in india initiative and will deliver opportunities to indian corporations. By means of growing those segments, india can lessen its reliance on imported oil and fuel. Some other precise opportunity that may be availed is thru storing surplus sun electricity in ev batteries which can be bought returned to the grid.

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