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Electric Mobility in India: Policy Push and the Road Ahead

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ECONOMY

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GS3

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Electric Mobility in India: Policy Push and the Road Ahead


PIB Special Features Chapter 3 · 4 min read ·

WHY IN NEWS

India's EV sector recorded a landmark milestone — from 1.74 lakh EVs in FY2019-20 to **19.68 lakh EVs in FY2024-25**, an approximately 11-fold surge in five years. Backed by the PM E-DRIVE scheme, PLI for ACC batteries, and a growing charging infrastructure, India is positioning itself as a global electric mobility hub while tackling its 85%+ oil import dependence.

WHY ELECTRIC MOBILITY MATTERS FOR INDIA

CHALLENGE	EV RELEVANCE
Oil import dependence	India imports 85%+ of crude oil — EVs reduce forex outflow
Transport GHG emissions	Transport = ~14% of India's total GHG emissions
Urban air pollution	Vehicular pollution = primary cause in Delhi NCR, Mumbai
Energy security	Shift from imported fossil fuel to domestically generated electricity
Critical mineral leverage	India has lithium reserves (J&K) + cobalt, graphite potential

TYPES OF ELECTRIC VEHICLES

TYPE	FULL FORM	HOW IT WORKS	RANGE
BEV	Battery Electric Vehicle	100% electric; plugged in to charge	200–600 km
HEV	Hybrid Electric Vehicle	Petrol + electric; self-charges via regenerative braking	No external charging needed
PHEV	Plug-in Hybrid EV	Petrol + electric; can be charged externally	50–80 km electric range
FCEV	Fuel Cell Electric Vehicle	Hydrogen fuel cell generates electricity	500+ km; zero emission

EV GROWTH TRAJECTORY IN INDIA

YEAR	EVS SOLD (APPROX.)
FY2019-20	1.74 lakh
FY2021-22	4.72 lakh
FY2022-23	10.5 lakh
FY2023-24	16.7 lakh
FY2024-25	19.68 lakh

Dominant segments: Two-wheelers (largest share); Three-wheelers (fastest growing in urban last-mile); Four-wheelers (rising with Tata Nexon EV, MG Windsor, Mahindra BE)

KEY GOVERNMENT SCHEMES

PM E-DRIVE (2024 onwards)

- **Budget:** ₹10,900 crore
- **Coverage:** Two-wheelers, three-wheelers, electric ambulances, electric buses
- Successor to FAME II; demand-side incentive scheme
- Focus on **public transport electrification** over private vehicles

FAME II (Faster Adoption and Manufacturing of EVs — Phase II)

- **Budget:** ₹10,000 crore | **Period:** 2019–March 2024
- Subsidised 10 lakh+ EVs; 7,432 electric buses; 2,877 charging stations
- Ended March 2024; succeeded by PM E-DRIVE

PM e-Bus Sewa

- **Target:** 38,000+ electric buses across cities
- **Payment Security Mechanism (PSM):** ₹3,435 crore — ensures operators are paid even if ridership lags
- Covers state transport undertakings (STUs) and city bus services

PLI — Advanced Automotive Technology (PLI-Auto)

- **Budget:** ₹25,938 crore
- Incentivises manufacturing of advanced automotive components including EV powertrains

PLI — ACC Battery Storage

- **Budget:** ₹18,100 crore
- **Target:** 50 GWh domestic battery manufacturing capacity
- **ACC (Advanced Chemistry Cell):** Next-generation battery cells — key to reducing EV cost

BATTERY TECHNOLOGY LANDSCAPE

BATTERY TYPE	CHEMISTRY	STATUS	KEY ADVANTAGE
Lithium-ion (Li-ion)	LiCoO ₂ / NMC	Dominant today	High energy density
LFP (Lithium Iron Phosphate)	LiFePO ₄	Growing fast	Safer, longer cycle life, cheaper
Solid-State Battery	Solid electrolyte	Future (2028+)	Higher safety, greater energy density
Sodium-ion	Na-ion	Emerging	Avoids lithium dependency

CHARGING INFRASTRUCTURE — STATUS AND GAP

METRIC	DATA
Public charging stations (Dec 2024)	12,146
Target by 2030	3 lakh
Gap	~2.88 lakh stations needed in 6 years
Fast chargers	Limited to highways and metro cities
Home charging	Dominant mode but inaccessible in apartments

Challenges:

- **Range anxiety:** Fear of running out of charge before finding a charging point
- **Grid reliability:** EV charging adds peak load; requires smart grid management

- **Interoperability:** Multiple connector standards (CCS2, CHAdeMO, GB/T) — India standardising on **CCS2** for DC fast charging

BATTERY RECYCLING AND EPR

Extended Producer Responsibility (EPR) for Batteries (2022 Rules):

- EV manufacturers must take back and recycle batteries at end of life
- Targets: 70% collection by 2026; 90% by 2030
- Critical for recovering **lithium, cobalt, nickel, manganese** — scarce and import-dependent

CRITICAL MINERALS — INDIA'S STRATEGIC CHALLENGE

MINERAL	USE IN EV	INDIA'S POSITION
Lithium	Cathode (Li-ion)	Reserves found in J&K (Salal-Haimana); imports from Australia, Chile
Cobalt	Cathode (NMC)	Largely imported; DRC dominates supply
Nickel	Cathode (NMC)	Imported; Indonesia is major supplier
Graphite	Anode	Imported from China (~70% global supply)
Manganese	Cathode (LFP, NMC)	India has some reserves

UPSC ANGLE

- **GS3 — Economy:** PLI schemes for EVs, import substitution, manufacturing competitiveness, energy security.
- **GS3 — Environment:** India's climate NDC — EVs reduce transport sector emissions; battery waste management.
- **GS3 — Science & Technology:** Battery chemistry, EV types, ACC technology, critical minerals.
- **GS2 — Governance:** Policy evolution from FAME I → FAME II → PM E-DRIVE; subsidy design.
- **Mains Q:** "India's EV transition is necessary but requires solving the critical mineral dependency problem. Analyse."

Prelims-ready facts:

- PM E-DRIVE budget: ₹10,900 crore

- PLI-Auto: ₹25,938 crore | PLI-ACC: ₹18,100 crore (50 GWh target)
- FAME II: ₹10,000 crore, ended March 2024
- Public charging stations (Dec 2024): 12,146; target 3 lakh by 2030
- EV sales FY2024-25: 19.68 lakh (~11x growth in 5 years from FY2019-20)
- India's oil import dependence: 85%+; transport = 14% of GHG emissions

FACTS CORNER

EV growth: 1.74 lakh (FY2019-20) → 19.68 lakh (FY2024-25) — ~11x in 5 years

PM E-DRIVE: ₹10,900 crore — successor to FAME II (₹10,000 crore, ended March 2024)

PLI-Auto: ₹25,938 crore | PLI-ACC Battery: ₹18,100 crore (50 GWh target)

PM e-Bus Sewa: 38,000+ electric buses; ₹3,435 crore Payment Security Mechanism

Charging stations: 12,146 (Dec 2024); target 3 lakh by 2030

India's oil import: 85%+ of crude oil imported; transport = ~14% of GHG emissions

ACC: Advanced Chemistry Cell — key to domestic battery manufacturing

EPR for batteries: 70% collection target by 2026; 90% by 2030

Lithium in India: Reserves found in Salal-Haimana, Reasi district, J&K

India's EV standard: CCS2 connector standardised for DC fast charging



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