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Electrifying India's EV Ecosystem: Policy Recommendations

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Executive summary

India's electric vehicle (EV) ecosystem is at the forefront of its transition to clean mobility. The Ministry of Heavy Industries (MHI) is driving this shift through supply- and demand-side incentives targeted at EV manufacturers, component suppliers and battery producers. These incentives are designed to boost domestic manufacturing, drive adoption, build supporting infrastructure and nurture a robust growth environment for the EV sector. While the journey presents numerous challenges, it also offers many opportunities. India can learn from experiences, both global and local, to finetune its transition and enhance the ease of doing business.

A consortium of EV stakeholders, *Electrify Bharat*, seeks to converge insights from industry partners to advance policy development. This report delves into seven key themes within the EV value chain, highlighting areas for potential government intervention. These include:

 **Production Linked Incentives (PLI)**	The current PLI favours larger businesses with scalability over startups. India could expand the scheme by lowering eligibility thresholds to include smaller companies. Devising criteria beyond investment thresholds can enable startup participation, and broaden the scheme's impact. The government may also consider including charging equipment and other critical EV components in the PLI scheme.
 **Faster Adoption and Manufacturing of Electric Vehicles in India (FAME)**	To optimise the FAME scheme, MHI could implement a standard operating procedure (SOP) similar to the PLI scheme, which involves desk appraisals, field visits, and periodic assessments. Developing a taxonomy of domestically manufactured components in consultation with the EV industry and transitioning to a direct benefit transfer system for consumer incentives would increase efficiency, and support industry growth.
 **Demand incentives**	While diverse state policies foster competitive federalism, greater harmonisation can provide businesses and consumers with greater certainty. MHI could issue guidelines to standardise incentives like purchase subsidies, registration tax, road tax, interest subventions and scrappage incentives. Establishing a central agency to oversee these efforts could better target the implementation of state incentives.

 **Charging technology**	India endorses various charging standards, instead of enforcing a standardised EV charging technology. MHI could issue guidelines for standardised and interoperable chargers, with room for variability through multiple standardised options. Regular reviews every two to three years could ensure these standards remain beneficial and minimally detrimental.
 **Scrappage policy**	There is no specific directive on EV scrappage in India, presenting an opportunity to widen the scope of vehicle testing and scrapping infrastructure in the country. Promoting private investments in upgrading these facilities to meet high safety standards will be critical. Moreover, there is a need to define timelines for mandatory EV testing and distinguish these from internal combustion engine (ICE) vehicles, which the existing timelines are based on.
 **Goods and Services Tax (GST**	Reducing GST rates for lithium-ion batteries similar to the rates on ethanol for petrol blending could invigorate the EV industry. Rationalisation of GST rates across the entire EV ecosystem, encompassing manufacturing components and charging services is also recommended.
 **Priority Sector Lending (PSL)**	To include EVs in the PSL scheme, MHI must identify specific high-potential segments for prioritised lending. Additionally, policy guidelines can be issued that set lending limits for individuals and fleets which can prevent disproportionate benefits to large institutions. MHI can collaborate with the EV and banking sectors to develop training programmes for bankers to accurately assess EV loan applications and address unique industry concerns such as residual battery values and depreciation patterns.

Overview

This is a collaborative and forward-thinking report about the dynamism and potential of India's EV ecosystem. The sector not only supports the country's energy transition goals but also drives economic growth, manufacturing and job creation, positioning India as a potential global leader in the EV revolution.

Over the past decade, MHI has launched numerous initiatives to jumpstart India's EV space. The ministry is well-placed to unlock the full potential of the EV ecosystem, including an array of products (two-, three- and four-wheelers), the entire value chain of components and software, supportive infrastructure like charging stations and supplementary services such as charging and battery swapping.

This report aims to provide a wealth of ideas for MHI's consideration at a pivotal time when policymakers reflect on the progress made and plan for substantial future growth, leading up to Viksit Bharat 2047.

The report is the result of extensive consultations with private-sector stakeholders across the EV ecosystem. This collaborative effort is part of a new thought leadership group *Electrify Bharat*, which seeks to offer rigorous, comprehensive, and data-backed policy analysis and recommendations for MHI and other stakeholders.

Towards innovation-ready and ecosystem-wide production-linked incentives

Background

The MHI governs two production-linked incentive (PLI) schemes that incentivise the production of EVs - PLI for Advanced Chemistry Cells (ACC) and PLI for Automobiles and Auto Components (AAC). These schemes provide subsidies to EV, advanced EV battery and EV component manufacturers, based on their production capacities. These subsidies contribute to offsetting the high upfront cost of EVs made by manufacturers that meet prescribed minimum eligibility criteria.[1]

To be eligible for the benefits under the PLI ACC, manufacturers need to set up a facility with a minimum of 5 GWh of ACC capacity and an investment of ₹225 crore/GWh. In addition, they need to ensure domestic value addition of at least 25 percent in the first year and 65 percent by the fifth year of the scheme tenure. Meanwhile, the PLI for AAC has two components - the Champion Original Equipment Manufacturer (OEM) Incentive Scheme meant for Advanced Automotive Technology (AAT) vehicles which include EVs and Hydrogen Fuel Cell Vehicles, and the Component Champion Incentive Scheme that covers various AAT components. Table 1 defines the eligibility criteria for manufacturers under each scheme. The sub-schemes under PLI AAC also lay down the minimum domestic investment conditions for manufacturers between 2023 and 2027. For instance, PLI for two- and three-wheelers (Champion OEM) requires a domestic investment of at least ₹400 crore by manufacturers before March 31, 2024, which needs to be increased to ₹1,000 crore by 2027 (Refer to Annexure).

Eighteen companies (11 domestic and 7 foreign) under the 'Champion OEM' category, and 67 companies (34 foreign and 33 domestic) under the 'Component Champion' category, were approved under the Scheme as of January 2024, and are implementing the PLI Automobile and Auto Components Scheme.[2]

Table 1: Features of the PLI Schemes

<table>
<tr><th></th><th>Advanced Chemistry Cell[3]</th><th>Automobile (Champion OEM Incentive Scheme)[4]</th><th>Auto Components (Component Champion Incentive Scheme)[5]</th></tr>
<tr><td>Budget</td><td>₹18,100 crore</td><td colspan="2">₹25,938 crore</td></tr>
<tr><td>Duration</td><td>FY 2022-23 to FY 2026-27</td><td colspan="2">FY 2022-23 to FY 2027-28</td></tr>
<tr><td rowspan="4">Eligibility</td><td rowspan="4">1. Setting up at least 5 GWh battery capacity
2. Initial domestic value addition of at least 25 percent
3. Investment of at least ₹225 crore/GWh</td><td colspan="2">Existing companies</td></tr>
<tr><td>1. Global group revenue of at least ₹10,000 crore
2. Global investments of at least ₹3,000 crore
3. Domestic value addition of at least 50 percent</td><td>1. Global group revenue of at least ₹500 crore
2. Global investments of at least ₹150 crore
3. Domestic value addition of at least 50 percent</td></tr>
<tr><td colspan="2">New non-automotive companies</td></tr>
<tr><td colspan="2">1. Global net worth of ₹1,000 crore
2. Compliance with minimum new domestic investment conditions of performance (Refer to Table 1 in the Annexure)</td></tr>
<tr><td>Subsidy disbursal</td><td>1. Quarterly, over five years after the commissioning of the manufacturing facility</td><td colspan="2">1. Disbursed quarterly over five years starting FY 2023-24
2. Awarded to OEMs based on the determined sales value of AAT products</td></tr>
<tr><td rowspan="2">Current beneficiaries</td><td>1. Ola Cell Technologies Pvt. Ltd. (20 GWh)
2. Reliance New Energy Battery Storage Ltd. (5 GWh)
3. Rajesh Exports (5 GWh)

In addition, seven companies including ACME Cleantech Solutions, Amara Raja Advanced Cell Technologies, Anvi Power Industries, JSW Neo Energy, Reliance Industries, Lucas TVS, and Waaree Energies have applied for 10 GWh ACC Battery PLI.

The remaining 10 GWh remain unallocated as of April 2024.[6]</td><td colspan="2">As of January 2024, out of the 85 approved applicants, only Mahindra & Mahindra, Tata Motors and Ola Electric have received domestic value addition certification on 22 variants of AAT products. The remaining applicants are expected to be certified by July 2024.[7] [8]</td></tr>
<tr><td>18 companies (11 domestic and 7 foreign)</td><td>67 companies (34 foreign and 33 domestic)</td></tr>
</table>

Source: Ministry of Heavy Industries, various authors

Opportunities

Startups are among the early movers in India's EV ecosystem and display an impressive ability to innovate. For example, GPS-Renewables, a Bangalore-based startup, created a biogas-powered EV charging station, in an attempt to make EVs end-to-end green. Another startup, Exponent Energy, claims to rapidly charge an EV from 0 to 100 percent within 15 minutes.[9]

The current PLI designs place businesses with a capacity to scale at an advantage over startups. For instance, the PLI Auto Champion OEM Scheme favours companies with a minimum global group revenue of ₹10,000 crore and a prior investment of ₹3,000 crore in fixed assets. In addition, two- and three-wheeler manufacturers need to invest at least ₹1,000 crore over the next five years after the commissioning of the manufacturing facilities, making many startups ineligible for the scheme. This highlights an opportunity to refine PLIs to better support and catalyse innovation as well as scale.

Additionally, PLI schemes could support the production of charging equipment, given its criticality for the EV ecosystem. The MHI is reportedly exploring the addition of new components to the PLI AAC.[10] Taken together, with refinements, the PLI schemes could enhance innovation for the entire EV ecosystem.

Analysis and recommendations

Best practices

There are examples of incentive schemes that are agnostic of scale and designed to benefit the entire ecosystem. China and the US, which contribute around 66 percent of the global EV production, serve as good examples.[11]

In China, demand-side incentives drive EV adoption. The country subsidises manufacturers based on the number of EVs produced, provided they manufacture EVs in China using Chinese batteries.[12] The government also exempts EV manufacturers from consumption tax to reduce production costs for EVs, a tax producers pay for luxury and environmentally unfriendly goods including cars. In 2018, the country introduced a "dual-credit" scheme to encourage manufacturers to produce more new energy vehicles (NEVs), which include EVs. The scheme incentivises vehicles to offer a longer range per charge cycle. These incentives are based on two factors: average fuel consumption and the production of NEVs. Companies meeting or exceeding benchmarks earn positive credits, while those falling short receive negative credits. Companies can balance negative scores by purchasing NEV credits from other companies.[13]

America's Inflation Reduction Act 2022 includes tax incentives for automobile manufacturers and customers to scale EV production. The Act features a 'Clean Vehicle Tax Credit' that sets three conditions for EV models to qualify for federal tax credit benefits of up to US$ 7500.[14] These include (i) production of 50 percent of the value of battery components in North America, with the percentage increasing annually, (ii) procuring 40 percent of the value of critical minerals from countries the US has a free trade agreement with, with the share increasing annually, and (iii) final assembly of the vehicle in North America. There is no cap on how many EVs a manufacturer can sell to avail tax credits.[15] Even though the US EV automotive Industry is dominated by large brands like Tesla, General Motors and Ford, the eligibility conditions are agnostic of pre-existing business revenue.[16]

Recommendations

- As is the case in a few other PLI schemes, MHI could expand the reach and impact of PLI schemes for the EV sector by creating an additional segment with lower eligibility thresholds to include smaller companies and innovative startups. For example, many non-legacy players like Ather, Ola Electric, Torq, Okinawa, Altigreen and Greaves Electric Mobility have contributed to expanding the uptake of EVs in India, especially in the two- and three-wheeler vehicle segment.

- Additionally, India can learn from the US and China, home to innovative companies like Tesla, Lucid Motors, BYD and NIO, where startups can participate based on criteria other than investment thresholds to avail manufacturing incentives. MHI could therefore consider a segment of the PLI schemes for small and innovative companies, with proportionate incentives, suited to their annual revenue.

- India could also refine the PLI schemes to benefit the entire ecosystem, including key EV components and charging equipment. MHI could consider extending provisions similar to PLI to new players in the EV components manufacturing and charging space, which is currently not covered in any such scheme.

Taking FAME to greater heights

Background

The government of India launched the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) scheme in 2015 to boost the uptake of electric and hybrid vehicles. It is a key initiative to drive EV adoption in India and has been implemented in two phases. The first phase (FAME I) operated from 2015 to 2019, while the second phase (FAME II) began in 2019 and concluded on March 31st 2024. The government thereafter introduced the Electric Mobility Promotion Scheme (EMPS) to support the electric two-wheeler (E2W) and electric three-wheeler (E3W) segments as it contemplates the architecture of FAME III.

Table 2: Allocation under Central EV promotional schemes

Scheme	Duration	Budget (₹ crore)
FAME I	1st April 2015 - 31st March 2019	895
FAME II	1st April 2019 - 31st March 2024	11,500
EMPS	1st April 2024 - 31st July 2024	500

Source: Ministry of Heavy Industries, various authors

Opportunities

Despite the stellar growth, particularly in the electric two- and three-wheeler segments, India's EV industry is still relatively nascent. The support provided by the FAME scheme remains critical for the industry's growth. It is essential that FAME continue and that it continue covering the segments already supported by FAME II. A critical way to ensure that is by refining FAME III based on learnings from earlier iterations of the scheme which can advance the growth of the EV ecosystem, specifically in the E2W and E3W segments.

The MHI and testing agencies have vastly enhanced guidance, testing protocols, and certification mechanisms for the FAME schemes. This includes, for instance, guidelines for domestic value addition (DVA) requirements and exempted components and price ceilings. There is an opportunity to further increase the robustness of these guidelines. For example, the guidelines could be supplemented with more details about methods to determine DVA for a component if sub-parts are imported. There could also be more insight into the mechanisms for audits, random sampling of products as well as guidelines for the turnaround time for certifications being issued by certification agencies.

The FAME scheme would also be rendered much more efficient in terms of monitoring and implementation through direct benefit transfers to the consumer, rather than by routing the incentive through the seller. This could result in a more dynamic and real-time system that would be a model for other such demand-side incentives in India and worldwide.

Recommendations

- MHI could consider providing the incentive in the FAME scheme to consumers as a direct benefit transfer. In addition to the efficiency gains for MHI, this refinement would be more tangible and value-adding to consumers, thereby increasing their awareness and support for the initiative. Additionally, direct benefit transfers would cause fewer fluctuations in the cash flow and liquidity of EV companies, particularly India's innovative startups, thereby enhancing their ability to invest more aggressively in R&D and expansion.

- MHI created a standard operating procedure (SoP) to assess DVA requirements under the PLI AAC.[17] This SoP provides for desk appraisal, field visits and periodic surveillance assessment of the applicants and their supplier's manufacturing facility. A similar exercise could be conducted for the FAME scheme by consulting all relevant stakeholders.

- In addition, the SoP could also include a taxonomy of components which could be domestically manufactured based on the availability of components and raw materials. This could be developed in close consultation with the EV industry.

Greater harmonisation of demand-side incentives

Background

Bihar, Odisha and Delhi provide interest subsidies for select EV categories, while Assam, Rajasthan, Chandigarh and Telangana provide retrofitting subsidies. Eleven states including Uttar Pradesh, Haryana, Telangana, Karnataka and Gujarat offer dedicated EV manufacturing incentives. On the other hand, 10 states including Maharashtra, Madhya Pradesh, Kerala, and West Bengal base the subsidies to EV manufacturers on their state manufacturing policies.[18]

The incentives offered across states vary considerably. For example, states including Uttar Pradesh, Gujarat and Maharashtra provide additional purchase subsidies over FAME. Delhi is one of the few offering interest subventions for electric three-wheelers. In contrast, Telangana offers retrofitting incentives while skipping on interest subvention. Most states with dedicated EV policies offer road tax and registration fee exemptions for new EV purchases.

Table 3: Incentives under state EV policies

States	Purchase subsidy	Road tax & registration fee exemption	Interest subvention	Vehicle scrappage incentive	Retrofitting incentives	Electricity tariff benefits for consumers
Maharashtra	✓	✓		✓		✓
Uttar Pradesh	✓	✓				✓
Delhi	✓	✓	✓	✓		✓
Tamil Nadu		✓				✓
Andhra Pradesh		✓				
Telangana		✓			✓	✓
Madhya Pradesh		✓				✓
Gujarat	✓	✓				
Kerala		✓				✓
Haryana	✓	✓				✓

Source: Climate Trends, 2023

Opportunities

While diversity in policies can foster competitive federalism among states, greater harmonisation can provide businesses and consumers with greater certainty. Harmonisation could cover and impact and range of aspects and costs, including purchase subsidy, road tax, registration tax, interest subvention and vehicle scrappage incentives.

Institutions like the National Automotive Board oversee and implement the development of the EV ecosystem. However, there is scope to enhance oversight for schemes like FAME and PLI as well as to better monitor the impact of state-level EV policies. While part of this responsibility is voluntarily shouldered by industry-led consortiums and independent think-tanks, there is room for more interface between the central government, industry, and the states, to inform the coordinated design and implementation of effective state EV policies.

Analysis and recommendations

Best practices

Lessons from India's solar power policy regimes may help shape coordinated policymaking for EVs. The central government supports solar power growth through subsidies, competitive bidding frameworks and payment guarantees. States can pursue independent strategies to supplement these. For instance, Madhya Pradesh aligns its growth strategy in solar power with global energy policies. States have also acted as hubs for independent experimentation in renewable energy. For example, Karnataka implemented innovative land aggregation methods, Madhya Pradesh was an early mover in positioning solar as an exportable commodity, and Maharashtra introduced an agriculture solar scheme. This suggests that while central targets and policies provide a foundational layer for programme implementation, states supplement the objectives of the policies through innovation.

For example, in the case of the Solar Rooftop Programme, the Centre has deployed the Rural Electrification Corporation (REC) as the nodal agency to monitor its implementation on a national scale. REC does so by coordinating with owners of solar rooftops, distribution companies (discoms), vendors and financing companies.[19] Their influence remains focused on parameters like lending, base subsidy disbursal, payment guarantees and discoms rescue provisions. States, on the other hand, hold the power to undertake more granular roles of programme implementation like licensing, metering, grid integration, and improving user access.[20]

Gujarat is a prominent example of state-centre policy harmonisation, constituting nearly two-thirds of all residential solar rooftop power in India. The state supplements central initiatives like the National Solar Mission and Solar Rooftop Programme with its own state-level ‘Surya subsidy system, designed to expand the solar rooftop presence in Gujarat. Other factors contributing to its growth include: (i) digitisation to enhance the ease-of-operation of solar rooftop units for vendors and consumers, (ii) use of SMS and social media to build awareness and strengthen demand, and (iii) timely disbursal of subsidies enabled via digital platforms.[21]

Recommendations

- MHI could consider issuing guidelines and frameworks to states to standardise incentives directly linked to the cost to consumers for an EV, to the extent possible. This includes purchase subsidy, registration tax, road tax, interest subvention and scrappage incentive. The experience from Gujarat hints at how a clear division of roles between the state and the centre, assisted by a monitoring agency, can aid policy implementation. This model can assist EV manufacturers in designing a more uniform market strategy, with minimum deviation in ex-showroom prices of vehicles.

- MHI could also consider guiding states in determining a central agency to oversee and support the standardisation of the selected subsidy parameters.

Fuelling innovation in EV charging technology

Background

India's growth in charging infrastructure is linked to innovation in EV charging technology. There are around 12,146 charging stations and 63,000 charging points for EVs in the country.[22] This includes slow and fast chargers, both almost equally distributed in numbers.[23] Slow chargers are typically based on alternating current (AC) technology, which requires overnight charging to fully charge a vehicle. Fast chargers are based on direct current (DC) technology that can charge up to 80 percent of the vehicle within an hour. DC chargers are predominantly used for vehicles with high battery capacities, while AC chargers are used for lower battery capacity vehicles like two and three-wheelers.

Globally, EV chargers are broadly split into three levels based on their power rating. These include Level 1 AC (slow charging), Level 2 AC (fast charging) and Level 3 (DC charging). EVs and charging points communicate through charging connectors. There are seven major charging connectors in the global market including Type-1, Type-2, GB/T, CHAdeMO, CCS-1, CCS-2 and NACS. Table 3 in the annexure highlights the main features of each connector.

India has adopted the Bharat AC-001 standard specified by the Bureau of Indian Standards (BIS), based on the Type-1 connector for Level 1 AC charging and Type 2 connector for Level 2 charging. For regular DC Charging, it has adopted Bharat DC-001 which is based on the Chinese GB/T standard, while CHAdeMO and CCS-2 connectors serve high-voltage DC applications. The adoption of different connectors aims to address the unique energy requirements of different vehicle segments. For example, DC fast charging connectors are incompatible with most electric two-wheelers in India, while not all electric four-wheelers support DC fast charging. This has restricted interoperability. To address some of these concerns, the BIS approved an indigenously developed connector, based on the European CCS for two- and three-wheelers. Automotive manufacturers in India already use CCS connectors and often prefer them over alternatives like CHAdeMO and GB/T because of their dual AC+DC functionality.

Payment is another key parameter in the functioning of an EV charging infrastructure. Unlike petrol pumps, most charging points operate without regular human intervention, creating the need for digitally enabled payments. Users can pre-pay for charging services using mobile applications provided by charge point operators like Tata, Exicom and Magenta. Alternatively, they can pay later using Unified Payment Interface (UPI), debit/credit cards, radio frequency identification (RFID) and digital wallet-based payment methods. Charging EVs through stations owned by different operators often requires downloading unique mobile applications and creating separate user accounts for each application. To unify the variation of payment interface for EV charging, a consortium of EV charging infrastructure players created the Unified Energy Interface – a payment mechanism based on the Beckn protocol, that imagines an open and decentralised network for energy.[24] However, the UEI ecosystem is still in its formative stage. In September 2023, the National Payments Corporation of India (NPCI)[i] unveiled a new payment system based on the National Electronic Toll Collection (NETC) framework, allowing EV users across the country to charge their vehicles using FASTag.[ii 25]

Opportunity

India endorses various charging standards for different vehicle categories, it does not currently enforce any standardised charging technology for EVs. Manufacturers including Ather, Ola, and Ultraviolette Automotive have developed their own charging standards. For example, Ola's exclusive Hyperchargers are tailored for charging Ola Electric scooters. Ather Energy uses an open-source charging standard which can be used by other vehicles. Ultraviolette's e-scooters are compatible solely with charging connectors adhering to the IEC 62196-6 international standard.[26]

While the new BIS-approved standards unify AC and DC charging through a combined standard, all EV manufacturers may not prefer standardisation and interoperability in charging. This is because OEMs may pursue innovation in charging technology to gain a competitive edge in the industry and enhance the performance of their own product.

Additionally, while EV charging stations offer a varied mix of payment options, the quality of services can be made more dependable by improving maintenance, thus reducing the possibility of breakdowns.[27] Also, most charge point operators provide mobile applications that only display their own charging stations. This points to an opportunity to enhance the discoverability of charging stations.

NITI Aayog is working on a unified app that displays charging stations from all operators, and allows booking of slots in advance and making payments. But industry participants are worried about the risk of such an application making their apps redundant.[28]

Analysis and recommendations

Best practices

Charging Connectors: GB/T is the national connector standard in China. This has allowed the country to address concerns around range anxiety. The country is soon expected to introduce ChaoJi-1 – the next-generation improved version of the GB/T in the market.[29] In contrast, the US does not have a national standard. Tesla is influencing other automakers like General Motors, Ford, Mercedes Benz and Volvo to adopt Tesla's NACS (North American Charging Standard) as the national standard. However, proponents of Common Charging Standard (CCS) argue that standards should be made by a common body, not one manufacturer.

In Europe, CCS stands out as the primary charging connector standard, mandated by the European Union (EU) for EV charging networks. Interestingly, unlike in the US, Tesla adopts CCS for both its vehicles and charging points in the EU Market. Meanwhile, Japan relies on CHAdeMO as its national charging standard. However, despite its inception in 2010, CHAdeMO is gradually being phased out in several markets, including North America and Europe, due to the emergence of more competitive alternatives. This points to a friction between innovation and standardisation of charging connectors globally. Therefore, countries must be prepared for periodic upgradation of charging standards, as more advanced connectors become available.

Payments: Accessing DC fast-charging stations for EVs typically involves using an access card or mobile app in the US, while some stations have credit card readers as well. In addition, several charging networks

offer subscription plans to streamline the charging process and provide cost-saving offers.[30] EV charging stations in China are adapting to the prevalent payment methods in the country, such as Alipay and WeChat Pay, to supplement China's broader push towards cashless transactions and QR code payments.[31]

Recommendations

- MHI could consider introducing guidelines for standardised and inter-operable chargers, while also leaving room for some variability, perhaps through two to three standardised options instead of only one. Additionally, the standardisation could be reviewed in two to three years to ensure the desired beneficial impact and minimal detrimental impact.
- MHI could facilitate and coordinate ongoing efforts by NITI Aayog and other entities towards a master app for unified payments and discoverability of charging stations.

Defining a best-in-class scrapping policy

Background

India's national vehicle scrapping policy does not distinguish between ICE vehicles and EVs, despite their distinctive product architectures. Released in March 2021, the Ministry of Road Transport and Highways (MoRTH) introduced the Voluntary Vehicle Fleet Modernisation Programme (VVMP), aimed at creating an eco-system for phasing out end-of-life vehicles (ELVs), agnostic to their fuel type. The policy mandates all 15-year-old commercial vehicles and 20-year-old passenger vehicles to undergo a mandatory fitness and emission test through Automated Testing Stations (ATS). Upon passing the test, the Regional Transport Office (RTO) approves a fitness certificate for qualified vehicles. Table 2 in the annexure captures the salient features of the VVMP.

To enable nationwide ELV management, the policy encourages state governments to expand the network of ATSs and Registered Vehicle Scrapping Facilities (RVSFs) by promoting private investments. India has 24 ATSs and 47 operational RVSFs[32] against the required 400 ATSs and 1,000 RVSFs to meet the objectives of the scrapping policy.[33]

There is no specific directive on vehicle scrappage for EVs. However, India's Extended Producers Responsibility (EPR) regulations define various aspects of ELV management which includes EVs. This includes automotive battery waste, electronic waste and tyre waste. As per a draft released by the Central Pollution Control Board (CPCB), manufacturers need to fulfil EPR obligations for newly introduced vehicles, achieve recycling targets, and establish eco-friendly vehicle scrapping facilities.[34] Battery waste management requires producers to collect, recycle, and refurbish battery waste while prohibiting incineration or landfill disposal.[35]

Opportunities

An EV-inclusive state-of-the-art vehicle scrapping policy will benefit India. The county has an opportunity to be an early mover in defining an innovative EV scrapping policy globally, focused on e-waste management and battery recycling. As EVs in the country age, automotive e-waste management will be an important policy issue. Moreover, mineral recovery from battery recycling can meet a share of the demand for lithium, cobalt, nickel and manganese – minerals critical to aid India's battery cell manufacturing capabilities.

The MHI could lead the way in addressing the barriers that currently hinder the country-wide adoption of VVMP, as EVs enter the market. These include (i) the need for more vehicle testing facilities, (ii) the need to increase vehicle scrapping facilities, and (iii) the need to more evenly distribute these facilities across the country. Only six percent of the required number of ATSs and 4.7 percent of the required number of RVSFs are operational in India, with the disparity in their regional distribution. For example, states including Uttar Pradesh and Haryana have a combined 22 operational scrapping facilities, while other large states like Maharashtra, Rajasthan, Andhra Pradesh and Karnataka have eight operational facilities combined.[36]

Additionally, since the choice of providing scrapping incentives to new vehicle buyers rests with OEMs, there is no mechanism under VVMP to enforce it. States such as Delhi, Maharashtra, Odisha, Chandigarh and Chhattisgarh provide scrappage incentives under their respective EV policies. However, these states have a total of only five registered scrapping facilities, reflecting the gap between policy intent and available resources.

Testing and scrapping facilities could be upgraded to better serve EVs, whose powertrain differs compared to ICE vehicles. For example, parameters for vehicle testing in ICE vehicles are primarily linked to emissions and safety. EVs on the other hand are free from tailpipe emissions. However, they face other challenges, mostly associated with the safety of lithium-ion batteries. This includes thermal runway, short circuit, and swelling of the battery pack – risks that increase as the battery ages.

The scrapping policy could take these differences into account and specify a timeline for EV testing and scrappage based on these conditions. It could also include safety guidelines for the recycling of lithium-ion batteries to recover valuable rare earth metals like lithium, cobalt, nickel and manganese. MHI could also consider means to formalise the EV recycling industry since most recycling in India currently takes place in informal settings.

Analysis and recommendations

Best practices

Countries including China, Japan, Korea and the European Union have dedicated ELV legislative frameworks, while in the US, ELV recycling falls under its environmental protection laws. These frameworks were designed in the early to mid-2000s to cater to ICE Vehicles. In the case of EVs, lithium-ion battery technology takes the spotlight, where countries are trying to make recycling lithium-ion batteries economically attractive.

China dominates the global EV battery recycling market, with over three times as much existing and planned lithium-ion battery recycling capacity as the U.S in 2021.[37] With an ageing EV fleet, the country is developing avenues for EV recycling by forging industry alliances, encouraging standardisation of battery design, and increasing research support for recyclers. America's Inflation Reduction Act grants substantial tax credits for recycled battery materials like lithium, cobalt, and nickel. This legislation considers EV battery materials recycled within the country as American, irrespective of their source. Similarly, the EU enacted the End-of-Life Vehicles Directive, compelling automakers to reclaim end-of-life batteries from vehicle owners.

In India, Punjab promotes automakers to implement buyback schemes for used battery packs under the Punjab Electric Vehicle Policy 2022.[38] The state is also establishing an e-marketplace to encourage the resale of used batteries, along with offering incentives to promote resale. On the other hand, Telangana's electric vehicle policy focuses on reusing lithium-ion batteries in stationary energy storage applications and promotes collaborations between battery and vehicle manufacturers, recyclers, and energy storage operators. Additionally, it provides incentives to recycling businesses for processing used batteries.[39]

Global and national trends suggest ample interest among governments to support the end-of-life management of EV batteries through incentives. India has an opportunity to create a national framework for defining the end-of-life for EVs, and optimising the testing and scrapping facilities for electric mobility.

Recommendations

- MoRTH could promote private investments in the upgradation of vehicle testing and scrapping facilities to the high safety standard requirements for EV recycling. Towards this, MoRTH could remodel VVMP towards recycling of EV batteries, focussing on two main elements: (i) setting guidelines for the mitigation of safety risks in lithium-ion batteries including thermal runway and short circuit fires, (ii) recovery of high-value rare earth metals like lithium, nickel, cobalt and manganese from batteries. MoRTH could also incentivise recyclers through research support on battery safety to promote safer recycling practices and promotion avenues for the resale of extracted metals.

- State governments could do more to scale up their vehicle testing and scrapping facilities, even though VVMP already encourages public-private partnerships to achieve this objective. This is imperative in states like Delhi, Maharashtra, Odisha, Chandigarh and Chhattisgarh, which promise dedicated scrapping incentives in their respective EV policies but lack infrastructure to support them.

- MoRTH could consider defining a timeline for mandatory testing of EVs, marking a distinction concerning ICE vehicles, on which the current testing timelines are based. It could encourage states to waive off the fitness test cost for EV owners, which is currently ₹1000 for light motor vehicles (LMVs). MoRTH could also supplement this benefit by subsidising the fitness certificate fee, which costs ₹7500 for LMVs, once the vehicle is declared fit to ply on roads.

Rationalisation of GST across the EV ecosystem

Background

The Indian government has introduced various tax measures for fostering the adoption of environmentally friendly transportation. These include reducing the GST from 12 percent to five percent,[40] as well as a reduction in the GST imposed on fuel cell vehicles from 28 percent to 12 percent.[41] In 2018, the GST rate on lithium-ion batteries was also brought down from 28 percent to 18 percent.[42]

The EV ecosystem comprises various components, each subject to different GST rates. To illustrate, EVs along with chargers and charging stations are charged with five percent GST. While, charging as a service, and other critical components such as lithium-ion batteries and electric motors have an 18 percent GST rate. There also exists a variation in the GST-imposed batteries used in fixed battery vehicles at five percent as opposed to the batteries placed in swappable battery vehicles at 18 percent.

Table 4: GST on EV ecosystem

Components	GST rate (in percent)
Electric Vehicle[43]	5
Chargers/ Charging Stations[44]	5
Charging as a service[45]	18
Lithium-ion battery[46]	18
Electric motors[47]	18
DC/DC Converter[48]	9

Source: Various authors

The GST Council makes recommendations on amending rates. These rates are determined considering revenue needs, protection to socio-economically backward groups and reducing the taxation burden on firms and consumers.[49] The Union Government and state governments must also amend their respective legislations to bring any of the council's recommendations into effect.

Opportunities

The rationalisation of GST across the EV ecosystem would bring two main benefits to India's ambitions in the EV space: (i) it would attract global value chains, by avoiding inverted tariff and GST structures, and (ii) it would also facilitate more rapid growth of charging as a service across the country.

Rationalising GST has already been considered by government bodies. For instance, rationalising GST on lithium-ion batteries was proposed as part of NITI Aayog's Draft Battery Swapping Policy, in April 2022.[50] The GST Council rejected the proposal citing the widespread use of lithium-ion batteries in cell phones, power tools, digital cameras, small and large appliances, tablets, and storage systems.[51] Given their multiple end uses, the government was hesitant about reducing the GST rate as it would adversely impact their revenue collection. Batteries are the most valuable part of an EV, representing 30–45 percent of the cost for light vehicles such as E2Ws, E3Ws and E4Ws with light battery capacity and 50 percent for heavy-duty vehicles such as buses and trucks.

The MHI could be a powerful advocate for the rationalisation objective. The key message could be that while there might be some loss of GST revenue in the short term, revenues would expand rapidly in the long term because of the exponential growth of EV sales and EV-related services.

Analysis and recommendations

Best practices

India is among a handful of countries such as Luxemburg, Ghana and China which have implemented a multi-tiered GST system. It adopted such a system to ensure revenue predictability for the exchequer and to provide low GST rates on essential items like food items.[52] However, such multi-tiered systems can create problems for supply chains which are complex owing to their multiple components. Thus, GST rates across multiple components in a supply chain need to be aligned on a single rate if the government cannot reduce the number of tiers in the GST system.

Table 5: Single-tier GST regimes

Country	Tiers in GST Structure
Canada[iii]	1 tier at 5 percent
Australia	1 tier at 10 percent
New Zealand	1 tier at 15 percent

Source: EY Worldwide VAT, GST and Sales Tax Guide 2024

Recommendations

- MHI could lead discussions to achieve targeted reductions of GST rates for lithium-ion batteries utilised in EVs. In doing so, MHI could draw on precedence from other industries. For instance, the Ministry of Petroleum and Natural Gas brought down the GST rate on ethanol used for blending with petrol while maintaining the 18 percent rate on ethanol used for other purposes. Such an approach has the potential to invigorate the EV industry while ensuring it doesn't reduce government revenue from other industries.

- The MHI could also advocate for GST rationalisation across the EV ecosystem, including components for manufacturing as well as services such as charging. Doing so could increase investments and growth in manufacturing and servicing aspects of the EV industry.

Preferred lending for EV buyers

Background

The Reserve Bank of India (RBI) conceived priority sector lending (PSL) in 1972, to broaden financial inclusion for marginalised communities by increasing credit flow to priority sectors. PSL guidelines require regulated banks to allocate a percentage of their adjusted net bank credit (ANBC) to priority areas like agriculture; micro, medium, and small enterprises (MSMEs); housing; renewable energy; education; social infrastructure; export credit; self-help groups and startups; and weaker sections of society. In 2022, NITI Aayog in its report titled Banking on Electric Vehicles in India outlined the importance of priority sector recognition for retail lending in the electric vehicles domain.[53] The government is yet to decide on this.[54]

Opportunities

Preferred lending could help to bridge the financing gap currently faced when purchasing EVs versus ICE vehicles.[55] Consumers have limited financing options for EVs, with fewer banks and NBFCs lending to them as opposed to the ICE vehicles. This is because of the real and perceived risks associated with financing EVs due to the nascency of this technology and market.[56] Some of these risks include concerns about the resale value and product quality of EVs.

The loan terms for EVs also tend to be unfavourable. An example of this is the loan-to-value (LTV) ratio concerning EVs, a metric used by lenders to compare a loan amount to the value of the asset purchased with the loan. To illustrate, if the value of a product is ₹1,00,00 and the loan taken is ₹50,000, then the LTV is 50 percent. The LTV ratio for EVs is on average 10-30 percent lower than the ICE vehicles, thus the initial down payment required for the EV is higher.[iv]

MHI could catalyse even more accelerated uptake of EVs by bridging the consumer financing gap and thereby enabling the availability of more and better financing options.

Analysis and recommendations

Best practices

Many countries have increased EV adoption through financing options. Australia has set up an asset finance programme to enhance EV adoption. This programme has already delivered results, with nearly 8.4 per cent of all new cars sold in Australia in the first six months of 2023 being electric vehicles. Relative to EV sales across 2022, this marked a 120.5 per cent increase.[57] The inclusion of EVs in the PSL guidelines can similarly boost EV adoption in India.

Table 6: Best practices to enhance financing

Country	Government entity	Mechanism for support
Australia	Clean Energy Finance Corporation	The Clean Energy Finance Corporation partners with private banks to share risks and set up green vehicle loan schemes through an Asset Finance programme
Scotland	Transport Scotland	Scotland's national transportation agency offers interest-free loans for cars, motorcycles, and scooters with longer repayment periods
United States	State of California	California State Bill 633 established a State EV authority to incentivise EV adoption by providing loan guarantees.

Source: EY Worldwide VAT, GST and Sales Tax Guide 2024

Recommendations

- MHI could lead the identification of the segment(s) to prioritise in the EV industry. Preferred lending need not cover all segments, ranging from electric two-wheelers and three-wheelers to commercial four-wheelers. The coverage should follow from research on the socio-economic potential of segments requiring significant financial support for inclusive growth, identifying segments capable of generating substantial livelihood opportunities, and assessing scalability to ensure market expansion.

- The MHI could also develop policy suggestions for other government stakeholders to consider. These suggestions could include placing lending limits for individuals and fleets to purchase EVs. This will ensure that loans beyond a certain threshold do not qualify as PSL. Large institutions and lower-risk borrowers will not benefit disproportionately from the inclusion of EVs in the PSL guidelines.

- MHI or other relevant stakeholders could work with the EV and banking industry to develop training programs, to equip bankers with the knowledge and skills to assess EV loan applications accurately while considering factors specific to the technology. This includes understanding the residual battery values and depreciation patterns. It could inform bankers of the asset's use case beyond EVs and may also address apprehensions on resale value in case of loan defaults.

Annexure

Table 7: Minimum domestic investment conditions under PLI AAC (₹ crore)

Cumulative new domestic investment to be achieved	Champion OEM (Except 2W & 3W)	Champion OEM 2W & 3W	Component Champion	New non-automotive investor (OEM) company or its Group company(ies)	New non-automotive investor (Component) company or its Group company(ies)
Up to or before March 31, 2023	300	150	40	300	80
Up to or before March 31, 2024	800	400	100	800	200
Up to or before March 31, 2025	1400	700	175	1400	350
Up to or before March 31, 2026	1750	875	220	1750	440
Up to or before March 31, 2027	2000	1000	250	2000	500

Source: Ministry of Heavy Industries

Table 8: Features of VVMP

Objectives	a. Emission reduction of 20-30 percent by scrapping over one crore unfit and unregistered vehicles; b. Improving road and vehicular safety; c. Boosting demand for the automotive sector, especially EVs; d. Formalising the currently informal vehicle scrappage industry; e. Boosting the availability of low-cost raw materials for the automotive, steel and electronics industries; f. Expanding the presence of ATSs and RVSFs across India by encouraging private investments.
Incentives	a. Four to six percent discount on the ex-showroom price of new vehicle[v] provided by the scrapping centre; b. Waiver on the registration fee of the new vehicle; c. Advisory to state governments to offer up to 25 percent discount on the RTO charges of personal vehicles and 15 percent on commercial vehicles; d. Advisory to vehicle manufacturers to provide up to five percent discount on the purchase of new vehicles.
Disincentives	a. Fitness test fee of ₹1000 and registration renewal fee of ₹5000; b. Cancellation of registration in case of failure in two consecutive fitness tests.

Source: Ministry of Road Transport and Highways

Table 9: Types of charging connectors[58]

S.No.	Connector		Country	Type
1	Type 1	J1772	North America, Japan	Level 1 AC (1-3 kW)Level 2 AC (3-22 kW)
		Commando (IEC60309)	India	
2	Type 2	Mennekes	India	
3	CHAdeMO	Charge De Move	Japan	Level 3 DC (10-400 kW)
4	CCS-1	Common Charging Standard - 1	Europe and the rest of the world	Level 3 DC (10-400 kW)
5	CCS-2	Common Charging Standard - 1	Europe and the rest of the world	Level 3 DC (10-400 kW)
6	GB/T	GuóBiāo/Tuījiàn	China	Level 1 AC (1-3 kW)Level 2 AC (3-22 kW)Level 3 DC (10-400 kW)
7	NACS	North American Charging Standard	North America	Level 1 AC (1-3 kW)Level 2 AC (3-22 kW)Level 3 DC (10-400 kW)

kW: Kilowatts; DC: Direct Current; AC: Alternating Current
Source: India Energy Storage Alliance

Glossary

i NCPI is the umbrella organisation that facilitates different modes of payments in India

ii FASTag is a device that employs RFID technology for making toll payments directly while the vehicle is in motion.

iii In New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario and Prince Edward Island, the GST has been blended with the provincial sales tax and is called the harmonised sales tax.

iv The LTV ratio for EVs varies based on the segment of the vehicle such as 2Ws, 3Ws and 4Ws

v Refers to the ex-showroom price of the vehicle to be scrapped when it was in a new condition.

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