



POLICY BRIEF

ZERO EMISSION VEHICLE (ZEV) MANDATE POLICY

Scaling up electric
vehicle markets





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1. Why zero emission vehicle mandate?

Why is it necessary to implement zero emission vehicle (ZEV) mandate policy as one of the key policy accelerators to attain an ambitious scale of electric vehicle markets in India. This policy question has become compelling as the global experiences have borne out its importance in fast pacing investments and markets for electric vehicles.

To put it simply, a ZEV mandate requires manufacturers to produce and sell a minimum specified number of ZEVs as a share of their overall annual sales in the market. This works like a supply mandate for the vehicle industry to produce and sell electric vehicles (EVs) that can be ramped up over time. This strategy is needed over and above the current practice of providing purchase incentives for the consumers to catalyse the market. Both demand and supply side mandates together can help to attain scale in a time bound manner.

It is from this perspective that the Centre for Science and Environment (CSE) has outlined this policy brief to identify the potential scope of the ZEV mandate, need for supportive mechanisms, and the regulatory framework to enable its implementation.

As this is a very new area of regulatory action that directly impacts the vehicle industry, CSE had earlier carried out a stakeholder consultation to reach out to the vehicle industry, consumers, charging infrastructure providers and the expert bodies to get an insight and perspectives of the stakeholders especially the vehicle manufacturers with regard to the potential application of a ZEV mandate. While this has brought out a tacit support for the strategy, it has also highlighted the need for supportive mechanisms and regulatory enablers.

Currently, India's national strategy for promoting vehicle electrification hinges on two approaches -- the demand incentive scheme called Faster Adoption and Manufacturing of Electric Vehicles (FAME) to build consumer demand that also supports charging infrastructure and also the Production-Linked Incentive (PLI) schemes that provide incentives for manufacturing for Advanced Chemistry Cell batteries to accelerate localisation. There is an expectation that these support schemes can help to achieve at least 30-35 per cent electrification of the new fleet by 2030.

However, the reality today is that despite these strategies in place the actual fleet electrification achieved so far is only 5.34 per cent. There is still a long way to go. Even this level of electrification is not uniform across vehicle segments. While smaller vehicle segments including two and three wheelers, have witnessed relatively higher share of electrification the four wheelers have seen the minimum change.

Yet, as the International Energy Agency in its 2023 report on Transitioning India's Road Transport Sector, has pointed out the share of electric vehicles need to be at least 50 per cent in the coming decade to be on track with the 2070 net zero goal.¹

In addition to the national strategy, nearly all state governments have come up with their respective state electric vehicle policies that include a range of targets for electrification, demand incentives, and support for charging and local EV manufacturing. But progress on the ground is slow.

Therefore, going forward several factors will have to be understood and addressed to ensure that all the policy accelerators have been adopted and designed adequately.

There are several barriers that are slowing down progress. Some of these are as follows.

Lack of long term policy visibility of the national EV regulations and the regulatory targets have bred uncertainty. There is no regulatory roadmap for the vehicle industry for achieving long term targets for fleet electrification. The current FAME II scheme is coming to an end in 2024 and the discussion on FAME III has just started. Only a few states have provided for targets either in terms of percentage share of new sales or absolute numbers to roll by a certain date but these are not binding and the enabling mechanisms are also not clear.

Vehicle industry is still unsure and does not have firm corporate policy to participate in transformative pathways. Participation of the industry and its commitment to a roadmap and earmarking of investments are necessary for an effective scaling up. In fact, the Society for Indian Automobile Manufacturers (SIAM) has put out their voluntary target of 40 per cent electrification of new vehicle sales by 2030 and all new vehicle sales by 2047. But this has not propelled ambitious corporate policies and investment commitments among all the conventional OEMs equally to build much larger market share in a time bound manner. There is still considerable wait and watch approach. This gets further stymied due to regulatory uncertainties.

There is no direct policy mandate for the vehicle industry to commit to binding targets to build supply and diversify EV product portfolio. Even though the current national and state level policies have incorporated a range of measures including demand incentives, support for charging infrastructure, and funding strategies in varying scope and scale, there is no regulatory mandate for the vehicle industry to undertake phased introduction of electric vehicles.

Global experience bear out that this is a critical intervention point that makes a difference. There seems to be an over reliance on only demand incentives but that is not adding up to be a strong market catalyst to mobilise investments at a scale. Globally, more direct policy instruments have been adopted that directly sets terms of growth in the industry. These include ZEV production and sales mandate, vehicle quote, carbon dioxide (CO₂) or fuel economy standards that require electrification, and trading of carbon credits among others. Lack of industry directed strategies is a big gap in the current policy strategy on electrification in India.

There is also no clarity about the roadmap for phase down of internal combustion engine powered vehicles. Only recently, the Committee on Estimates 2022-23 of the Ministry of Heavy Industries in its twenty sixth report to the seventeenth Lok Sabha has recommended a ban on the use of diesel run four wheelers by 2027 in cities with a population of more than 1 million, and transition to electric and gas-fuelled vehicles. But this has not come with a regulatory roadmap, strategy or milestones. But the global market is expected to change dramatically. Several European countries have set targets to phase out ICE vehicles. The European Union is targeting 100 per cent zero-emission vehicle sales for cars and vans by 2035. Buses are also on the anvil and a similar target is being advocated for trucks by 2047. Indian industry cannot remain insular to this trend and needs to support a more ambitious target for electrification proactively.

India's regulatory pathways need to align with its ambitious global commitments to accelerate zero emissions transition. India has signed on to the Declaration on 100 per cent transition to zero emissions by 2030-2040 which has been signed on by 28 national governments including India. India has made a specific mention that two-wheelers and three-wheelers account for more than 70 per cent of global sales and more than 80 per cent in India. All governments should support the transition of these light vehicles to zero emission vehicles. India is also part of ZEV Transition Council that represents 17 largest vehicle markets.

There are also other policy levers like the corporate average fuel economy standard that have been implemented for passenger cars that have the potential to create

more aggressive requirements for EVs but they need to be adequately stringent. This is a missed opportunity. The current standards of 113 gmCO₂/km for passenger cars is not strong enough to push EV adoption to achieve an ambitious fleet-wide target for electrification. According to the International Energy Agency (IEA) 2023 report on Transitioning India's Road Transport Sector Realising climate and air quality benefits,² significant energy and CO₂ savings are possible if India were to achieve a 55 per cent reduction in corporate average fuel economy by 2035 compared to the current levels. But currently, most vehicle manufacturers can meet the standards easily with incremental changes in the internal combustion engines. Also the fuel efficiency of the diesel truck fleet needs to improve by more than 35 per cent in the coming decades.

Thus, in the absence of adequate policy accelerators, it is becoming challenging to overcome the initial market barriers stemming from the high upfront costs, range anxiety, inadequate charging network, inadequate funding and financing, etc. Only a scalable market with a more robust supply and value chain can help to address these barriers.

From this perspective, CSE has reviewed the pre-requisites for adoption of ZEV production mandate policy at the national level and sales mandate at the state level with supportive regulatory and market mechanisms that can mobilise industrial investments and participation. It has identified the key elements of this strategy based on the global good practices and reviewed the adequacy of the current legislations on environment protection, motor vehicles and energy conservation to understand the adequacy of the legal handle for adoption and implementation of this strategy.

Summary highlights and way forward

As noted, the missing piece in the current vehicle fleet electrification programme in India is the inadequate strategy to set industry-wide mandate targets for production of zero emissions vehicles along with supportive mechanisms and related policy milestones. This is needed to bring more certainty in investments, firmer corporate policies, product development and diversification, lowering of costs and price pressures, and make market work for widespread adoption and transition.

The ZEV production mandate will not only improve product availability at more affordable price but also help to fast pace electrification of personal vehicle segments of two-wheelers and cars. The OEMs will have to compete for that market to ensure wider access and availability for early transition.

The importance of industry oriented strategies in the form of zero emissions mandate (ZEV mandate) seeking annual increase in committed share of electrification of the new vehicle production and gradual but targeted phase out of ICE vehicles is important.

This also requires supportive measures to make fuel economy requirements more stringent to require sizable scaling up of zero emissions vehicle sales of each firm to achieve the corporate average fleet wide fuel economy/energy consumption targets. This needs to be enabled not only with regulatory measures but also market based carbon credit trading systems to create incentives and disincentives linked to carbon savings as part of this decarbonisation strategy.

As noted earlier, CSE's stakeholder consultation in 2022 especially targeting the OEMs in all vehicle segments has brought out that the vehicle industry is not averse to the idea of committing to a production based or supply side mandate. But the voluntary suggestions from the OEMs show wide variation in their opinion on the level of targets –two and three wheeler OEMs are more willing to accept higher annual targets and increase over time, while four wheeler OEMs prefer lower bound targets. But there is sufficient indication from this consultation that the government can adopt this approach and initiate a programme on ZEV mandate.

However, this possibility of production based ZEV mandate has raised concerns around legal framework and adequacy of legal back up for such a strategy. Are the national and state governments sufficiently empowered to implement the ZEV mandate seeking compulsory transition of a share of annual production to move to zero emissions vehicles at the national level and move towards sales mandate at the state level.

A rapid review of the key environmental legislations including the Environment Protection Act 1986 (EP Act 1986) and the Air (Prevention and Control of Pollution) Act in 1981 (the Air Act 1981) as well as transport linked Central Motor Vehicle Act 1988 and energy saving linked Energy Conservation Act 2021 suggest that there are ample provisions and powers that can be leveraged to enable adoption of such measures.³

If there is policy intent then environmental laws have overriding power that can supersede other laws related to the vehicle and energy related legislations. Under the EP Act 1986 and the Air Act 1981, the Union government can issue detailed instructions to the concerned ministries that are binding. Also, the Central Motor Vehicle Act 1988 that deals with vehicle registration and certification etc, has

provisions for restrictive policies on vehicles. The amended Energy Conservation Act also provides for carbon trading mechanisms for the vehicle sector and stringent penalties that can be a great enabler. Expanded and substantive interpretation of these provisions can support implementation of a ZEV mandate.

Similarly, at the state level, the Air Act 1981 can be leveraged to declare critically polluted areas for more aggressive and stringent action requiring faster adoption of zero emissions vehicles. Delhi and the National Capital Region (NCR) have already seen adoption of such an approach. Over the last two decades, a series of directives from the Supreme Court have mandated adoption of compressed natural gas (CNG) and other clean fuels for public transport, paratransit and local commercial vehicles. This transition has been fully achieved. Now the Air Commission for Delhi and NCR is also issuing directives to mandate only CNG or electric vehicles for autos and buses deriving power from the Act under which the Commission has been constituted.

Similarly, state governments can issue executive orders as has been done to issue state EV policies to phase in sales mandates for different vehicle categories. In fact, the Delhi government has issued an approved fuel list under the Air Act 1981 permitting use of only clean fuels in all sectors. It is now working on aggregator policy to mandate 100 per cent electrification of these fleets by 2026.

However, this review has also made it clear that the available power and authority conferred by the key environmental legislations are not utilised to drive action on vehicular pollution. In fact, EP Act 1986 was used only once to notify vehicle emissions standards in 1996—thus overriding the Central Motor Vehicle Act, 1988 (CMVR, 1988). The powers of the Air Act 1981 to regulate vehicular pollution has not been utilised at all. This entire function is expected to happen under CMVR that does not have the objective of air quality improvement or environmental protection and is less powerful than EP Act 1986 and the Air Act 1981. The action therefore remains siloed to the narrowly defined business rules of the ministries.

While legal handles can be further refined and reformed, building policy intent and industry participation in the pathways will be crucial to leverage the legal powers that already exist.

Executive response and action are often slow due to the complex challenges associated with mobilisation of all stakeholders, building consensus for support of new generation policies and their implementation. Institutions are also plagued by poor understanding of the design of the new generation measures. Technical

and legal solutions may exist but building adequate support to propel change is critical.

Yet given the scale of change needed within the next 5 to 10 years, these measures with clear pathways and milestones are important for the longer term policy visibility.

Need early action on the following

Set nation-wide regulatory target and timeline for targeted fleet electrification: Issue the timeline for expected size of the EV fleet and their share in different vehicle segments that can influence the corporate policies, investments and roadmaps in India.

Need timeline for phase down of new sales of ICE Vehicles: Even though the conversation has been initiated by the Parliamentary Committee of the Heavy Industry Ministry to phase out diesel run cars, a comprehensive strategy and target are needed as is being done globally.

Adopt national level ZEV production mandate for the vehicle industry along with phase in plan and stratified targets: ZEV mandate along with annual production and sales targets for different vehicle segments need to be implemented in phased manner from 2025 to 2030 and beyond.

Adopt credit trading mechanisms to support implementation of ZEV mandate: Need market based mechanism to support ZEV sales targets for each OEM selling in the country. This can provide an incentive to manufacturers to earn ZEV and emission credits, earn revenue stream from banking and trading of over-compliance credits. Energy Conservation Act provides the legal backing for this and the Bureau of Energy Efficiency (BEE) is developing a carbon credit system for the compliance mechanism. The National Automotive Policy, 2018 has recommended banking and trading of CO2 credits by vehicle manufacturers.

Need proper rules for credit transfer and accounting for effective impact. All firms must update overall sales value in its ZEV target accounting after a transaction and before engaging in a new transaction. These ZEV target transactions may be held on a government monitored online trading portal. There may be prospective estimations and retrospective accounting. There must be progressive increase in ZEV target for the OEMs. The CO2 credits awarded to a manufacturer for exceeding compliance requirements should be valid for two to three years. Offers

flexibility to manufacturers and avoid penalties for non-compliance. These and more will require effective detailing.

No accounting of ‘CO2 emissions avoided’: The government must strictly disallow accounting of ‘CO2 emissions saved’ or ‘CO2 emissions avoided’. This metric is based on a hypothesis of CO2 emissions in the scenario of the continuation of old policies. This is a flawed idea and would lead to accounting of undue credit in the new ecosystem. The bases need to be revised as we set out to reinvent the future.

Need ZEV market development and transition plan: The Union government may take up the responsibility of developing a comprehensive ZEV market development and transition plan in collaboration with all the stakeholders and concerned ministries.

Significantly tighten the fuel economy regulations to require more fleet-wide adoption of zero emissions vehicles: Revise and tighten the corporate average fuel consumption norms for cars and redesign super credits to create more incentives for increasing zero emission vehicle share of the OEMs. Similarly tighten the norms for heavy duty vehicles and ensure adoption of such norms for two and three wheeler segments.

Need state level sales mandate: The role of state level EV policies in creating local mandate for EV registration with ramped up targets over time for all vehicle segments is significant. The executive orders issuing EV policies in states need to provide for sales mandates and announce the timeline for implementation in advance to provide early signals and visibility to the market. Already, state governments are beginning to announce plans to opt for only electric models in three wheeler and bus segments. But firmer pathways are needed for targeted sales and registration across vehicle segments.

Need supportive strategies in states to ensure faster adoption in personal vehicle segments of cars and two-wheelers: The past experience related to CNG transition as well as the new announcement for electrification of three wheelers and buses in the states show that the nascent state mandates are more confined to public transport, paratransit and local commercial vehicles. Personal vehicle segments—cars and two-wheelers - are not in the orbit as there is considerable sensitivity around disproportionate impacts on different income groups etc and public backlash. Therefore, this will require a more nuanced approach in terms of early announcement of phase down plan for ICE vehicles overtime, expected target

for electrification in the longer time horizon, roadmap for restrictive policies on movement of ICE vehicles and older vehicles and their road usage; design motor vehicle taxes according to emissions level and age to increase the cost of owning polluting vehicles, and design EV incentives more explicitly for rapid adoption.

These measures combined with zero emission mandate policy for the vehicle industry can lead to more aggressive adoption of electric cars and two wheelers.

Prioritise sales mandate for two and three wheelers for early action: Assess the strategy for notifying phase out of registration of new ICE models of two and three wheelers. These vehicles with improved price parity, lowering of total cost of ownership, better access to diverse models, easier charging among others are more amenable candidates for sales mandate and early transformation. These dominate the vehicle fleet and cause enormous toxic exposures. Zero emissions mandate can contribute towards significant emissions reduction.

Require transparency and communication: The government must ensure that all ministries, departments and stakeholders maintain adequate transparency and clear communication among themselves and with the public at large.

Need industry participation to detail out strategy and industrial development policy: Industry participation and support is critical to this strategy. Build knowledge on how industry can benefit from these strategies. Also for robust product development need technology improvement plans to inform battery and cell development to address speed, energy density, power density, electric drive system to lower costs, target for electricity consumption (kwh/km etc). This requires development of technical standards, R&D of core technology, building on industrial value chain, battery reuse and recycling strategies, subsidy and tax for pilot projects to push innovation, Corporate policies adopting voluntary carbon neutral and net zero targets, strategies to reduce to reduce supply risks and price volatility and focus on material security for batteries.

Continue to reform and strengthen ZEV schemes with multiple measures including demand incentive, charging infrastructure, battery ecosystem etc.

Need strong public participation and awareness building strategies to counter disinformation on the new generation technology and build consumer confidence.

2. How can ZEV mandate help?

Production or supply mandate for vehicle industry requires vehicle manufacturers to produce and sell a minimum specified number of ZEVs as a share of their overall sales in the market. This is supported by enabling market mechanisms like carbon credit mechanism, stringent emissions requirements and zero emission targets. There is no one way of doing this. Global learning has brought out the importance of this strategy and the advantages associated with this. Some of these are as follows.

If the vehicle industry is committed to producing a specified share of their production as EVs, the original equipment manufacturers (OEMs) will be required to compete with each other for the sale in order to be compliant with the sales requirement.

A sales requirement is expected to enhance competition among OEMs for sales and put downward price pressure on electric vehicles. It can prevent skewed pricing. On the other hand, purchase requirements and incentives force consumers to compete for a limited number of products in the market and puts upward price pressure on a limited supply.⁴

Global reviews have indicated that a ZEV mandate can induce higher ZEV sales than a financial purchase incentives-only policy, with much lower government expenditure. A mandate can be a revenue neutral strategy for the government that helps to leverage the market competition to promote ZEVs. This also has the potential to free up government capital for EV promotion and charging infrastructure. This can increase employment and investments.

ZEV mandate can help the initial supply chain, spur innovation, diversify production portfolio to have more models in the market to attract consumers. Competition will induce more aggressive marketing. This can help to bring more certainty in the market and stimulate investments, build consumer confidence and build the EV market. As is evident, product diversity in different segments is very limited. Even though the smaller vehicle segments like two and three wheelers have attracted several start-ups, the conventional OEMs are largely conservative and waiting at the fence.

The ZEV mandate can be further supported by credit markets to make market work for the transition.

3. Is Indian industry willing to consider ZEV mandate?

The ZEV mandate policy requires industry participation. But it is not clear how the Indian vehicle industry is likely to respond to such a proposal. In view of this CSE carried out a perception survey of the stakeholders in 2022 along with the Citi Forum to reach out to the key drivers of the EV ecosystem that included vehicle industry (conventional OEMs and start-ups), consumers and experts. The OEM surveys was conducted to understand their views on the EV targets, their plans for growth, and their perspective on ZEV mandate adoption.⁵

Reiterating some of the summary highlights of these findings can provide insights into what is needed to implement the ZEV mandate.

Vehicle manufacturers are positive about the EV growth but their responses vary depending on the vehicle segments:

- A majority of two- and three-wheeler OEMs expect 40 per cent growth per annum over the next five years. The OEMs who produce only e-two wheelers expect even higher growth. They attribute this to improved price parity and lower total cost of ownership. They are more open to the idea of a ZEV mandate.
- Car manufacturers expect not more than 5 per cent per annum growth over the next five years. Less than 10 per cent believe that close to 10 per cent EV penetration is possible. They do not expect price parity in the short run. Low consumer demand is attributed to high upfront cost, inadequate public charging, low battery range, low level of innovation, and limited number of models.
- E-bus OEMs see a likely growth of up to 20-30 per cent over the next five years — but they will require continued support and inclusion of private bus operators as their consumer base. Bus OEMs are directly linking this growth to subsidy and readiness of state transport undertakings for this transition.

OEMs have identified factors responsible for low penetration of EVs: Nearly everyone has identified high upfront cost as the biggest barrier, followed by public hesitation for adoption, lack of diverse model options, range anxiety, lack of charging infrastructure, early stage of EV technology development, and charging time. (see Table 1: *Identification of key barriers by the OEMs*).

Table 1: Identification of key barriers by the OEMs

Barriers identified	Percentage response
High upfront costs	100
Public hesitancy in adoption	86
Lack of diverse options	57
Range anxiety	43
Lack of public charging infrastructure	43
Early-stage EV technology	35
Lack of robust policies/ incentives	30
Charging time	29

Source: CSE 2023, Towards a zero emission mandate policy — Analysis of stakeholder perceptions

This shows that supply mandates can help to overcome several of these concerns, especially related to reducing upfront costs, enabling more product diversity and promoting appropriate infrastructure to address public hesitation and build consumer confidence. In fact, around 61 per cent of OEMs were interested in creating a charging station network to help build the market.

Among the OEMs about 86 per cent have attributed the problem of slow progress to inadequate demand for EVs. About 43 per cent hold inadequate access to production material and finance to be a constraint. Most OEMs have cited demand vs supply issues and inadequate finance as their main concern in the production of EVs.

There is variation in perception across vehicle segments. Among the two- and three wheeler manufacturers the majority feel battery performance expectations and charging infrastructure are the key challenges for mass penetration.

On the other hand, among the four wheeler OEMs, high upfront cost, lack of public acceptance, inadequate public charging infrastructure are the major dampeners. Bus OEMs attribute the challenge to high upfront cost, low battery range and high charging time.

The OEMs who produce only EVs consider lack of robust government policy and high upfront cost responsible for low penetration. They feel that all factors can be addressed if strong government support is ensured.

Buses have additional problems as state transport corporations feel that functional requirements of buses in terms of distances, route characteristics etc

are different in cities; therefore, the product range has to be diversified to meet these requirements. Moreover, there are other concerns as well, such as battery replacement in buses, high costs, lack of trained people, and uncertain battery efficiency. Most manufacturers have shown an interest in a business model that provides a complete package of products and services that includes vehicle, charging infrastructure and service costs. They are looking at the vehicles as a service.

OEMs identify factors that can influence scale of EV sales in the long run:

Among the key factors that are likely to affect the sale curve of EVs in the long run, nearly all OEMs have prioritised purchase price parity, followed by Total Cost of Ownership (TCO) parity, differential fuel prices, and extensive charging network. Pollution and environmental awareness comes at the bottom.

The purchase price parity for individual vehicle mode is likely to be achieved as the volume of sales pick up within a period of ten years. This will require stronger demand supported by government incentive schemes with expanded coverage. It has also been pointed out by the OEMs that implementation of supply focused policy packages need incentives and mechanisms to support EV production. Therefore, consider implementation of an exclusive policy package to target EV supply chain and associated ecosystem. (see Graph 1: *Projected trend in price differential between electric vehicles and internal combustion engines*).

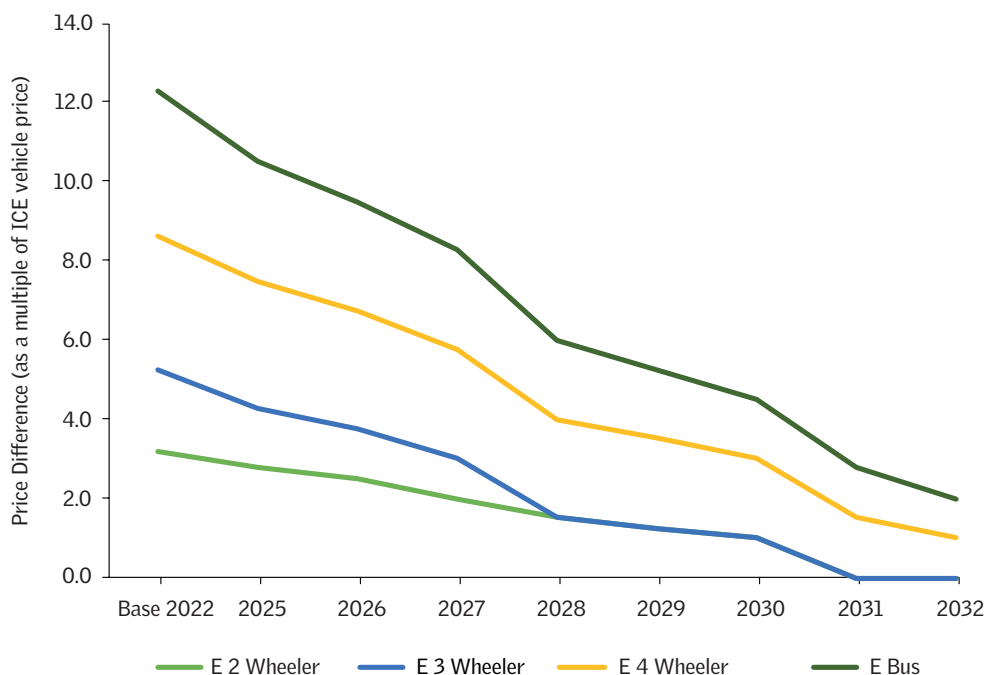
There is support for ZEV mandate policy but the preference is for a lower bound ZEV mandate implemented in a phased manner from 2025 to 2030:

The reason for optimism is that OEMs have not disagreed with the idea of ZEV mandate. While there is support for this strategy, the OEMs of different segments have responded differently.

Two-three wheeler manufacturers are more supportive of the ZEV mandate, while four-wheeler and bus manufacturers are more conditional in their support. They would prefer to begin at the level they are selling today, and ramp it up as the market picks up. Therefore, the preferred mandate differs for different segments beginning at 2 per cent for two-wheelers, 5 per cent for three-wheelers, and 1 per cent for cars and buses. In 2030, this is expected to end at 25 per cent for two-wheelers, 50 per cent for three-wheelers, 5 per cent for cars and 15 per cent for buses.⁶

- OEMs agreed that a ZEV mandate would be an effective measure to drive innovation and growth in the EV industry.

Graph 1: Projected trend in price differential between electric vehicles and internal combustion engines



Source: CSE 2023, Towards a zero emission mandate policy — Analysis of stakeholder perceptions

- Majority of the OEMs—especially four wheeler OEMs believe that a zero-emission vehicle mandate of more than 10 per cent would be a deterrent to the industry.⁷

Industry has suggested possible targets for the ZEV mandate: The industry has shown preference for a lower bound ZEV mandate for production that can be implemented in a phased manner from 2025 to 2030. Based on their forecast of the EV penetration by 2030 and their suggestions on possible targets for production, it is possible to construct a year-wise plan for the phase-wise ZEV targets for implementation. (Table 2: *Possible target for ZEV production vehicle segment-wise (between 2025 and 2030)*).

The ZEV mandate requires additional and supportive measures – All OEMs are unanimous about the need for tax incentives, production linked incentives, subsidised funding support for expansion of manufacturing, consumer financing and continuity in FAME subsidy. Vehicle manufacturers look for continued support to counter key barriers to EV penetration.

Table 2: Possible target for ZEV production, vehicle segment-wise (between 2025 and 2030)

Year	Two-wheeler (%)	Three wheeler (%)	Car (%)	Bus (%)
2025	2	5	1	1
2026	5	10	1	2
2027	10	20	2	5
2028	15	30	3	5
2029	20	40	4	10
2030	25	50	5	15

Source: CSE 2023, Towards a zero emission mandate policy — Analysis of stakeholder perceptions

Need market based mechanism like credit trading mechanism to support implementation: As evident from the global experience, a credit trading mechanism can incentivise the manufacturers to build EVs, win ZEV and emission credits, get a fresh revenue stream from banking and trading of over-compliance credits.

The basic principle is that the OEMs can earn credits from the reduction of carbon dioxide (CO₂) emissions through technology improvement and electrification. The CO₂ credits are awarded to a manufacturer for exceeding compliance requirements. Those who overachieve their target can trade their CO₂ credits with the laggards to help them meet the target. This allows flexibility to the manufacturers and avoids penalties for non-compliance. If India adopts this mechanism the credits should be valid for two to three years.

In India the Bureau of Energy Efficiency (BEE) is already exploring the option of developing a carbon credit system for the compliance mechanism of fuel economy regulations for vehicles. In fact, the National Automotive Policy, 2018 has recommended banking and trading of CO₂ credits by vehicle manufacturers.

The CO₂ credits or debits per manufacturer will be available to facilitate trade of credits between manufacturers. Designing the credit programme will be critical for effective implementation. This will however require a robust and transparent data sharing system for tracking the market and ensuring effective trading systems.

Need industrial policy for long term planning of EV production and markets: Large scale electrification of vehicles is a massive industrialization agenda. Building of manufacturing base can enable technology improvement plans that include setting of a roadmap for battery development to address speed, energy density, power density, electric drive system to lower costs, target for electricity

consumption (kwh/km etc) among others. An industrial development strategy can help to establish ZEV supply chain and promote research and development (R&D) of core technology, and industrial value chain.

This will require a range of preparedness and pathways to address future technology roadmap for charging technology, development of technical standards, improvement in cell chemistry and substitution of materials, corporate policies for adopting voluntary carbon neutral and net zero targets, subsidy and tax for pilot projects to push innovation, and battery reuse and recycling strategies. A sustained industrial strategy can help to reduce supply risks and price volatility.

Growing interest among OEMs in creating a charging station network to build markets: Notably, about 61 per cent of the OEMs across all segments showed interest in setting up a charging station network. In fact, those who produce only EVs in the two and three wheeler segments 90 per cent would want to provide charging as a service. Otherwise, among conventional OEMs it is about 70 per cent. Even in the car and bus segments the interest level is as high as 60-70 per cent.

4. Regulatory framework for ZEV mandate

Is there adequate legal back up at the national and state level to implement production or supply mandates for electric vehicles. So far, clean air action has driven sales mandates in targeted cities to some extent. The most notable is the 1998 Supreme Court directive to mandate only compressed natural gas (CNG) powered buses, autos, taxis and local commercial vehicles in Delhi and NCR. High courts have also supported such measures in other cities. Judicial interventions have drawn upon the fundamental right to life as enshrined in the Constitution of India.

The critical question that is being asked is about the power and authority of the executive to take similar action with respect to EVs. Do current legislations related to environment and vehicles provide adequate legal basis for such action at the national and state level. This has made this rapid review of the legal framework important.

Legal framework at the national level

A rapid review of the national legislations indicate that the existing legal provisions under the relevant legislations related to environment protection, motor vehicles regulations, and energy conservation can provide the legal back up for such an action. But it is necessary to understand their interlinkages and their expanded and substantive interpretation.

Some of the key legislations relevant to this context include:

The Environment (Protection) Act, 1986 (EP Act 1986): The EP Act, 1986 was enacted under Article 253 of the Indian Constitution which provides for the enactment of legislation for giving effect to international agreements and treaties and is subject of Union Legislation. Article 253 gives overriding power to Parliament to make laws for the purpose of implementing the treaty obligations of India. This overrides and prevails over any inconsistent State enactment. This is administered by the Ministry of Environment and Forests and Climate Change (MoEFCC). The directives under this Act are binding.

For instance, the Section 3 of this Act empowers the central government to take measures as it deems necessary or expedient to protect and improve the quality

of the environment, and to prevent, control, and abate environmental pollution. Central government needs to plan and execute nationwide programs to lay down standards for the quality of different aspects of the environment, standards for emission or discharge of pollutants and to restrict the operation of certain industries, processes, or operations in specific areas.⁸ Also the Section 5 of this Act empowers the central government to issue directions to any officer or any authority who will be bound to comply with such directions. This gives overriding powers over all else. To encourage local or provincial effort for several legislative measures the Union has laid down the policy and guidelines that promote further efforts by the States.⁹

The Air (Prevention and Control of Pollution) Act 1981 (The Air Act 1981):

This has also been passed by Parliament under Article 253 which enables Parliament to make laws for the purpose of implementing any treaty, agreement etc. This is administered by the MoEFCC. This can prohibit the use of polluting fuels and substances and regulate appliances that cause air pollution. This combines command and control methods, voluntary regulations, fiscal measures, awareness and involvement of the public. Under the Section 19 of this act the state government can declare any area as air pollution control area where it can prohibit the use of any fuel, other than an approved fuel. The Clause (d) of section 2 of this act empowers the state pollution control boards to declare an “approved fuel” list for use in automobiles, industries and other applications. Clause (g) of section 17 of this act empowers the state boards to lay down standards for emission of air pollutants from industrial plants and automobiles or for the discharge of any air pollutant from any other source except ship and aircraft. This is done in consultation with the Central Board.¹⁰

Motor Vehicle Act, 1988: This Act is administered by the Ministry of Road Transport and Highways. Section 110 of The Motor Vehicles Act, 1988 empowers the Central Government to formulate standards for emission of air pollutants, among others. Electric vehicle regulations have been prepared under this rule.¹¹ Motor vehicles are under List 3 of the schedule, related to the concurrent powers of legislation under the Constitution.

The objective of this Act is to *‘take into account changes in the road transport technology, pattern of passenger and freight movements, development of road network in the country, and particularly the improved techniques in the motor vehicle management.’* It is further required to *‘take care of the need for encouraging adoption of higher technology in automotive sector.’* (The Motor Vehicles Act 1988 pp. 9–10).

The Motor Vehicle Act is the Parliamentary enactment on motor vehicles and is in the concurrent list of the Constitution that means states are also empowered under this Act. Normally, if there is any inconsistency or conflict between laws in the Union and State lists, then one has to be void. But in the Concurrent List if any provision of a law made by the Legislature of a State is repugnant to any provision of a law made by Parliament then the law made by Parliament will prevail and the law made by the Legislature of the State will be void. Only if the law made by the State Legislature is reserved for the consideration of the President and gets the assent, then it will prevail in the State. But the Parliament can still enact at any time any law or amend or repeal the law made by the Legislature of the State.¹²

Energy Conservation Act 2001 and its amendment in 2022: This Act is administered by the Ministry of Power. This empowers the central government to enforce efficient use of energy and its conservation. The central government may specify the norms for processes and energy consumption standards for any equipment, appliance, vehicle, vessel, industrial unit, building or establishment which consumes, generates, transmits or supplies energy; prohibit manufacture or import of any equipment or appliance or vehicle or vessel unless it conforms to energy consumption standards.¹³

The amendment in 2022 has expanded the scope to include vehicles (as defined under the Motor Vehicles Act, 1988), and vessels (ships and boats). This specifies the minimum share of consumption of non-fossil sources by designated consumers as energy or feedstock. Before the Amendment, the energy consumption standards could be specified for equipment and appliances that consumed, generated, transmitted, or supplied energy. The amended Act has expanded the scope of Section 14 (Power of Central Government to enforce efficient use of energy and its conservation) to include 'vehicles' (as defined under Section 2 (28) of the Motor Vehicles Act, 1988).

This needs to be read with the Rule 115-G of the Central Motor Vehicle Rules, 1989, on and from April 1, 2017, that requires average fuel consumption standards notified under the Energy Conservation Act, 2001, for all manufacturers or importer of motor vehicles or cars (classified as M1 in Motor Vehicle Rule), which are type approved under Rule 126, with at least four wheels and gross vehicle weight not exceeding 3,500 kilograms.

The Amendment Act has introduced a penalty for vehicles. If the vehicle manufacturers violate the fuel consumption norms, will be liable to pay a penalty of up to Rs 10 lakh for each failure and additionally pay a penalty of twenty-five

thousand per vehicle for non-compliance of norms up to 0.2 litres per 100 kms and fifty thousand rupees per vehicle for non-compliance of norms above 0.2 litres per 100 kms.

The amended Energy Conservation Act and carbon credit trading: The Amendment Act empowers the central government to specify a carbon credit trading scheme. This however has not been defined under the principal Act or the amendment Act. This is related to tradable permits that limit the emission for the entities or designated consumers. The central government or any authorised agency may issue carbon credit certificates to registered entities compliant with the carbon credit trading scheme. The entities can purchase a carbon credit certificate on a voluntary basis. However, the Carbon Credit Trading Scheme has not yet been notified. The earlier version of trading scheme under the Energy Conservation Act include the Perform Achieve Trade (“PAT”), a market-based compliance mechanism for selected industries in which energy savings of industries is converted into a tradable Energy Saving Certificates (“ESCerts”). Also Renewable Energy Certificate under the Electricity Act, 2003, is yet another trading scheme operational in the energy sector.¹⁴

5: How can the existing legislative framework work for ZEV mandate?

The existing central legislations have adequate power to support action on vehicles for clean air and energy conservation: These legislations that support decarbonisation to mitigate climate change. However, it needs to be assessed if the available enabling powers under environmental legislations are effectively utilised to address emissions from vehicles.

Environmental laws despite the superseding powers have not been adequately leveraged to take action on vehicles: Even though the Environment Protection Act 1986 has overriding power and can be leveraged to take action on vehicles this power has not been adequately used. Same is the case with the Air Act 1981 that has provisions for regulating vehicular emissions. But this has not been utilized.

However, there is still some precedent of setting emissions standards for vehicles and fuel quality under the Environment Protection Act, 1986 in the past. During the late nineties several emissions standards for petrol and diesel vehicles were enacted under this Act. These include *Vehicular Exhaust Emission Standards (effective for 1990–1996) Standards for emission of smoke, vapour etc. from motor vehicles (EPA Notification [GSR 55(E), 5 February 1990]; Diesel Fuel: Specifications for Emission Related Parameters, (EPA Notification [GSR No. 176(E), 2 April 1996]; Motor Gasoline: Specifications for Emission Related Parameters, Source: EPA Notification [GSR No. 176(E), 2 April 1996]* were enacted under the EP Act.

It is notable that this was done by the Central Pollution Control Board even though legislative procedure under the Central Motor Vehicle Act and Central Motor Vehicle Rules (that directly govern the vehicles) were also at work. In fact, some earlier standards had started to get notified under this Motor Vehicle Act. These include *Petrol Driven Vehicles: Mass Emission Standards effective from 1 April 1996 to 2000 (G.S.R. 609[E], 15 September 1993, Ministry of Surface Transport under Motor Vehicles Rules, 1989); Mass Emission Standards for Petrol Driven Vehicles (for vehicles fitted with Catalytic Converter) effective for 1998 to 2000, Source: Central Motor Vehicle Rules, 1989 GSR 461(E), 21 January 1990 etc.* Yet, in the late nineties subsequent emissions standards were notified under the EP Act 1986.

Therefore, precedence shows that the overriding authority of the EP Act 1986 has been exercised to notify standards for vehicles. This Act has superior authority to override the Central Motor Vehicles Act. But this practice has not been sustained. The subsequent emissions standards were notified under the Central Motor Vehicle Act by the MoRTH.

On the other hand, provisions of the Air Act 1981 that has empowered the MoEFCC to regulate and legislate on vehicular emissions, has not been utilised at all for vehicular pollution control. Section 17 lays down the “Functions of the Board” to lay down the standards for the emissions of the air pollutants into the atmosphere from industrial and automobiles. This is to be done in consultation the Central Board. Clause (g) of sub section (1) of Section 17 refers to standards to be set for automobiles and industrial units. And this can be done ‘notwithstanding the Central Motor Vehicle Act’. Despite these explicitly stated powers under the Air Act, 1981, the MoEFCC does not regulate vehicular pollution.

Similarly, Section 20 of the Air Act, 1981, has provisions of power to give instruction for ensuring standards for emissions from automobiles. It states *‘with a view to ensuring that the standards for emission of air pollutants from automobiles . . . are complied with, the State Government shall, in consultation with the State Board, give such instructions . . . to the concerned authority in charge of registration of motor vehicles under the Motor Vehicles Act, 1939 (Act 4 of 1939)’*

However, these provisions and powers have not been exercised to notify norms for vehicular emissions.

Jurisdictional challenge

If the environmental laws have overriding powers can those be leveraged to design more ambitious mandates and targets for the zero emission transition of vehicles? This investigation throws up that the convention of applying the legal provisions is very siloed and jurisdiction of ministries are not breached.

Even though the EP Act 1986 and the Air Act 1981 have overriding powers and permit the Union via MoEFCC to act on vehicular pollution, it does not do so. Technically and legally it is possible to regulate emissions or cap emissions from vehicles under Section 17 and Section 20 of the Air Act 1981 and override the Central Motor Vehicle Act. But this is not done.

The idea is not that the Union would enforce the standard directly. The instruction would have to be given to the Ministry of Petroleum and Natural Gas, Ministry of

Road Transport and Highways and State Pollution Control Boards. Everything depends on the nature of direction being given under the Air Act (broadly or minutely defined). Depending on the nature of direction, no transport authority can refuse to obey these instructions that are constitutional and statutory. But this authority will have to be exercised.

An earlier review by CSE had shown that the issue is also how to draft instructions under these Acts. If loosely drafted—as no more than an objective—it would be left to the Ministry of Road Transport and Highways and other agencies to devise their own methods of acting out these objectives. If these instructions contain details—including how they are to be enforced—the answer would be in the letter and spirit of instruction.

Nothing in the Central Motor Vehicles Act prevents the Environment Protection Act and Air Act from creating an oversight body or from giving detailed instructions to any authority or agency. In such cases no state can protest.

It may also be noted that the Motor Vehicle Act is not supportive of the objectives of improving air quality to protect public health and environment. As vehicular emissions have strong bearing on air quality, its regulation needs to be aligned with environmental laws and made consistent with the objective of air quality regulations.

The Energy Conservation Act can be an enabler: Under this Act the norms for energy consumption standards for vehicles are specified. These norms are also notified under the Central Motor Vehicle Act. In fact, corporate average fuel consumption standards have already been notified for cars and heavy duty vehicles. There are also strong provisions for penalties for non-compliance. If the norms can be tightened with super credits designed to incentivise electric vehicles electrification can be more transformational.

5. Role of state level policies

While the national level ZEV mandate for committed EV production is critical to stimulate investments and expansion of the production base for market expansion, state level sales mandate can also help to scale up markets quickly.

State governments have taken varying approaches to promoting electrification of vehicle fleets. States can decide the scope and adoption of a combination of instruments and approaches according to local priorities and imperatives. Variety of targets have been set for the programmes across states. Different approaches have been adopted for incentive structures for demand creation and funding strategy. Fiscal and non-fiscal instruments vary across states. They have also adopted different approaches to charging infrastructure design. Some states have integrated industrial plans for investment and jobs. There is also focus on the battery ecosystem, and recycling.

While there is a conversation around the need for integrated approach to harmonise the market for scale and level playing field, the potential and power of the state level action is well recognised. Most of the EV policies of the state governments have measures that while helping to build demand for EVs can also act as an incentive for the industry to scale up the supply. (see Table 3: Key elements of the state electric vehicle policy that support demand and manufacturing of electric vehicles and Table 4: State level targets for zero emissions vehicles).

The measures already embedded in several state EV policies that can help to create state level sales mandates for industry include EV targets for vehicle fleets (either in percentage share of total registration or in absolute numbers), support for charging infrastructure, and support for manufacturing for localization and investments. There are financial incentives for manufacturing, support for product marketing, support for research and development including demonstration of EV technology, proposed collaboration with research hubs etc. All these together can help to build the manufacturing base in states and increase supply and local sales. (see Annexure: State level support for EV manufacturing).

Table 3: Key elements of the state electric vehicle policy that support demand and manufacturing of electric vehicles

		Tier 1	Tier 2w	Tier 3	Tier 4
Supply Side					
1	Policy Targets	Y/N	Fleet based target	Charging network target	Manufacturing / localisation target and investment target
2	Benefits to Manufacturer	Y/N	Mandate for OEMs to produce and sell EVs	Financial incentives for manufacturers	Support for product marketing for manufacturers
3	Research and Development	Y/N	Support for development and demonstration of EV tech	Support for technical events, collaborations with universities, research hubs etc	
Demand Side					
	Vehicle specific Incentives				
4	Direct Incentive to consumer	Y/N	Purchase incentives	Tax exemptions / discounts + tolls, parking fee etc	Vehicle replacement / scrappage subsidies + retrofitting
5	Non Fiscal and Indirect Incentive to consumer	Y/N	Indirect Subsidies - interest free loans, congestion pricing for ICE	Non-fiscal incentives - designated parking, preferential lane access, exempt from PUC, low emission zones	Disincentivise ICE - carbon/fuel tax, higher registration/road tax for ICE, parking surcharges
	Charging Infrastructure specific Incentives				
6	Individual (Private/ Corporate/Retail) subsidy	Y/N	Purchase subsidy (home / workplace charger)	Revised tariff (for residential and commercial use) for EV charging	Grid modernisation and smart meters to track EV charging
7	Incentives for DISCOMS and EOs	Y/N	Financial incentives for DISCOMS	Deploy public land for installing infrastructure	
Market Enablers					
8	Regulatory and Legislative Parameters	Y/N	Amend Building codes and zoning laws/landuse policies to integrate e-mobility	Standardise chargers and interoperability	Streamlining permitting and reviewing / inspection process
9	Battery Recycling and reuse	Y/N	Incentivize end-of-life recycling	Commercialize battery second-life (along with OEMs and battery manufacturers)	
10	Awareness and training	Y/N	Mass communication	Targeted / Personal communication	Education and skill training

Streamlining permitting and reviewing / inspection process

Source: CSE compilation

Table 4: State level targets for zero emissions vehicles

State	Year of Policy Release	Mandate
Delhi	2020	<ul style="list-style-type: none"> • BEVs to contribute 25% of all vehicle's registration by 2024 • 1000 pure electric buses by 2020 • Delivery service providers to convert 100% of their fleet operators to electric by 2025
Karnataka	2017	<ul style="list-style-type: none"> • Auto Rickshaws, Cab Aggregators, Corporate Fleets and School Buses/Vans to achieve 100% electric mobility by 2030 • 1000 electric buses by 2022 • EV 3-wheelers and 4-wheelers mini goods vehicles to achieve 100% electric mobility by 2030
Maharashtra	2021	<ul style="list-style-type: none"> • BEVs to contribute to 10% of new vehicle registrations by 2025 • 10% electric 2-wheelers by 2025 • 20% electric 3-wheelers by 2025 • 5% electric 4-wheelers by 2025 • 15% electric buses by 2025 (25% for Urban Agglomerations) • 25% electric fleet operators by 2025
Assam	2021	<ul style="list-style-type: none"> • BEVs to contribute 25% of all vehicle's registration by 2026 • 100% electric buses by 2030 • 100% of government vehicles to be converted to electric vehicles by 2030
Telangana	2020	Nil
Tamil Nadu	2019	Nil
Kerala	2019	<ul style="list-style-type: none"> • 10,00,000 electric vehicles on road by 2022 • Pilot fleet of 200,000 2-wheelers, 50,000 3-wheelers, 1000 good carriers, 3000 buses and 100 ferry boats by 2020 • 100% electric buses by 2025
Andhra Pradesh	2018	<ul style="list-style-type: none"> • 10 lakhs total EVs by 2024 • 100% electric buses by 2029 • 100% electric fleet in electric mobility cities by 2024
Gujarat	2021	<ul style="list-style-type: none"> • 1,10,000 electric 2-wheelers by 2025 • 70,000 electric 3-wheelers by 2025 • 20,000 electric 4-wheelers by 2025
Madhya Pradesh	2019	<ul style="list-style-type: none"> • 100% electric commercial and logistics fleet by 2028 • 100% electric buses by 2028 • 100% government vehicles by 2028
Manipur	2021	15% electric vehicles by 2025
Odisha	2021	BEVs to contribute to 20% of total vehicle registrations by 2025
Uttar Pradesh	2019	<ul style="list-style-type: none"> • 10 lakhs EVs by 2024 • 1000 electric buses by 2030
Uttarakhand	2018	500 electric buses by 2023
West Bengal	2021	<ul style="list-style-type: none"> • 10 lakhs EVs by 2026 • Public and semi-public charging stations: 1 lakh by 2026 • EV to public charging point ratio - 8:1

Source: CSE compilation

6. Needed: State level sales mandate

State level sales mandates in key state markets can be an effective catalyst. There are a few precedents of this nature in Indian cities. Delhi has implemented a Supreme Court mandated compulsory replacement of diesel powered buses, autos, taxis and local commercial fleet with vehicles running on compressed natural gas to control vehicular pollution in the city. More recently, the Air Commission for Delhi and the National Capital Region has directed that all future expansion of the auto and bus fleet needs to be on CNG or electric buses. Similar decisions have been taken in other cities like Kolkata, Mumbai etc with respect to buses.

Cities like Delhi where electrification of vehicles has progressed more are beginning to take decisions to set electrification targets for e-buses, three-wheelers, and fleet aggregators. According to the Delhi EV Cell, all future three wheeler registration needs to be electric. Delhi draft aggregator policy has also given a target of 100 per cent electrification by 2026.

How this can be taken forward to define state level zero emissions sales mandate with roadmap and firm milestones, and a dedicated funding strategy at the state level.

State governments can also develop market based instruments and fiscal policies to accelerate zero emission transition. It is encouraging to see that Maharashtra has included Maharashtra ZEV Credit Programme in their EV policy — it plans to further explore the feasibility of a ZEV requirement and credit program for the state. Technical details are yet to be worked out.

Currently, most of the state EV policies in states have been issued by different departments as executive orders. For example, several state government policies have been issued as follow:

- **Delhi:** The Council of Ministers, Govt. of NCT, Delhi, approved the Delhi Electric Vehicles Policy vide a Cabinet Decision
- **Odisha:** The government of Odisha announced its EV policy via a Resolution of Commerce and Transport Department.

- **Punjab:** The government notified Punjab Electric Vehicle Policy (2022) as an executive order.
- **Karnataka:** Karnataka Electric Vehicle and Energy Storage Policy 2017 was announced via a government order
- **Tamil Nadu:** The government announced their policy via an Executive order
- **Rajasthan:** The State Government notified Rajasthan Electric Vehicle Policy on 31st August 2022 in the Rajasthan Gazette.
- **Andhra Pradesh:** Industries & Commerce Department—“Electric Mobility Policy 2018-23”—Issued as an order.

Additionally, in Delhi-NCR, the Air Commission for Delhi-NCR and beyond in exercise of the powers conferred upon it under *Section 12 of the Commission for Air Quality Management in National Capital Region and Adjoining Areas Act 2021*, has directed the state government of Haryana, Uttar Pradesh and Rajasthan to ensure new registration of only CNG/ electric autos in the NCR w.e.f. 01.01.2023 and plan complete phase out diesel auto rickshaws from the districts of Gurugram, Faridabad, Gautam Budh Nagar and Ghaziabad t by 31.12.2024 and the other districts Sonapat, Rohtak, Jhajhar and Baghpat in NCR by 31.12.2025 and the rest by 01.01.2027.¹⁵ Similar strategies are also being said about the future bus fleet.

This kind of approach amounts to a sales/registration mandate at the state level that can be taken forward to speed up electrification.

Mandates for personal vehicles—cars and two-wheelers, can be more challenging: The limited approach taken so far to regulate vehicle replacement with cleaner vehicles, and fleet renewal have targeted commercial and public transport vehicles. These programmes have not touched personal vehicle segments. Only the National Green Tribunal (NGT) ordered mandating phase out of 10 year old diesel vehicles and 15 year old petrol vehicles including personal vehicles.

Sales mandate for personal vehicles can be challenging given the public and political backlash and wide and disproportionate impacts on different income groups.

Globally, this is being addressed by setting future timeline for stopping registration of internal combustion engines (ICE); designing fiscal incentives for fleet renewal

to encourage consumers to replace older vehicles with EVs; introducing low/ultra-low emissions zones to incentivise EVs and disincentive older ICE vehicles; vehicle quota system and sales caps as in Chinese cities among others.

In this connection, ZEV supply mandate can be more effective as this would mandate manufactures to produce a share of their annual production and sales as EVs.

It is also being said that a sales mandate can work more effectively for the two-wheeler segments if combined with incentives initially and then leveraging the lowering of TCO. Several Chinese cities have banned registration of ICE two-wheelers that has stimulated the market for e-two-wheelers. But in Indian cities that might require an announcement of an advance timeline for the market and the consumers to be prepared.

Indian cities will also require a combination of these strategies along with ZEV sales mandate designed for different vehicle segments. Firmer roadmap for time bound sales mandate for public transport buses, paratransit and commercial vehicles is needed. In personal vehicle segments a range of incentives and disincentives for personal vehicles, advance announcement of timeline for ICE phase down would need to support sales mandate.

There are small instances of movement restrictions on personal vehicles in targeted areas where pedestrianisation zones are being promoted in Delhi. For instance, in the case of pedestrianisation of project of Shahjahanabad, in Chandni Chowk the Transport Department, Govt of NCT of Delhi has issued a notification (dated 14th June 2021) under the section 115 read with clause (41) of section 2 of the MV Act, 1988 to prohibit plying of motor vehicles on main Chandni chowk road in the interest of public safety and convenience of general public of Delhi.¹⁶ Scope of this action needs to be expanded to develop low emissions zones incentivising EVs, public transport and accessibility.

Technically, executive orders to enforce sales mandates are possible. However, what slows down the executive process or builds policy inertia is the need for mobilisation of stakeholders to agree to deliberate on the strategy, building consensus and garnering support for such decisions. This can also face political resistance. This requires policy leaders and champions and intense outreach. This also brings out that legal empowerment is a necessary but not a sufficient condition. This is the reason why directives from the courts are often seen as a more effective way to support such strategies and ensure compliance more effectively.

7. Global learning on ZEV mandate

The regulatory action to enforce ZEV mandate had started way back in 1990 when the California Air Resources Board (CARB) had adopted low emission vehicle regulation that required 10 per cent of the vehicle sales to be zero emissions by 2003. Those were very early stages and could not be implemented in the face of strong opposition from the industry.

The process gathered momentum and in 2012 low emission vehicles regulations were amended to address the model years 2015-2025. The CARB started by announcing a target of 5 million ZEVs by 2030 vide an executive order. This was followed by another executive order in September 2020 stating that 100 percent of in-state sales of new passenger cars and trucks need to be zero-emission by 2035 and 100 percent of medium- and heavy-duty vehicles to be zero-emission by 2045.

In August 2022, more stringent low-emission and zero-emission vehicle standards for model years 2026-2035 were announced. This requires 100 percent of new car sales in California to be zero-emission vehicles (ZEVs) by 2035. The annual targets are planned as 35 percent ZEV sales by 2026, 68 percent by 2030, and 100 percent by 2035. (see Table 5: *Successive stages of regulations to phase in zero emissions mandate in California*).

From a legal and regulatory perspective, California enjoys an extra lever. It is allowed to take more stringent action to reduce air pollution under the Section 177 of the Clean Air Act to combat local pollution. Additionally, the Assembly Bill 32, also known as the Global Warming Solutions Act of 2006, has established a comprehensive program of regulatory and market mechanisms to reduce greenhouse gases.¹⁷

More progressive action in California has emboldened 17 other states in the US to adopt California's low-emission and zero-emission vehicle regulations. As a result, this could impact more than 35 per cent of the national new light-duty vehicle sales. These states also meet the more advanced automotive emissions standards of California.

The action in California is backed by a series of executive orders from CARB. The significance of the Executive Order- N-79-20 of September 2020 is that

Table 5: Successive stages of regulations to phase in zero emissions mandate in California

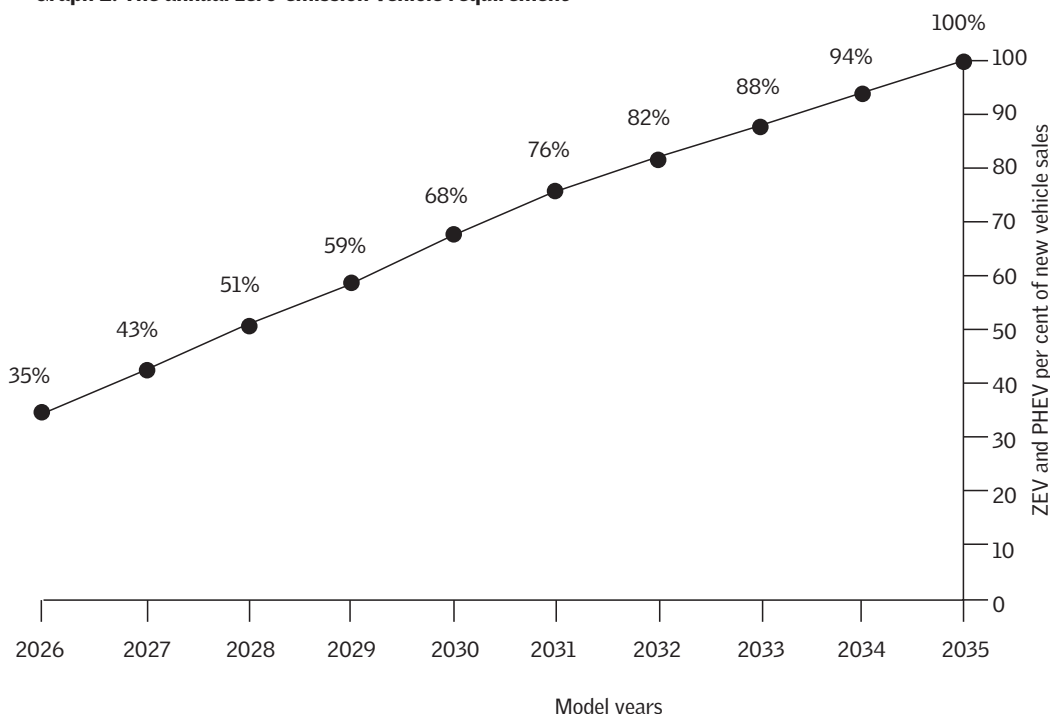
Stages of ZEV policies	Year	Evolving mandate
ZEV Program	1990	When CARB first adopted the Low Emission Vehicle regulation in 1990, it was noted that 10 percent of new vehicle sales would need to be zero-emission in order to meet tailpipe standards. The Board required that in 1998, 2 percent of the vehicles that large auto manufacturers produced for sale in California had to be ZEVs, increasing to 5 percent in 2001 and 10 percent in 2003.
Advanced Clean Cars I	2012	First adopted by CARB in 2012, including LEV III Criteria, LEV III GHG, and ZEV regulation amendments to address model years 2015-2025.
Executive Order B-48-18	January 2018	California announced a target of 5 million Zero Emission Vehicles (ZEVs) by 2030.
Executive Order-N-79-20	September 2020	100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035. It shall be a further goal of the State that 100 percent of medium- and heavy-duty vehicles in the State be zero-emission by 2045 for all operations where feasible and by 2035 for drayage trucks. It shall be further a goal of the State to transition to 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible.
Clean Miles Standard	2021	On May 20, 2021, the Air Resources Board adopted a regulation to require electrification of ride-hailing companies starting in 2023 with annual targets requiring zero grams of CO2 greenhouse gas emissions and 90 percent of passenger miles travelled to be fully electric by 2030
Advanced Clean Cars II	August 2022	Imposed the next level of low-emission and zero-emission vehicle standards for model years 2026-2035 that contribute to meeting federal ambient air quality ozone standards and California's carbon neutrality targets.

this provides a clear timeline for automakers to scale up and market new zero-emission vehicles, as well as provides further impetus for charging and refuelling infrastructure, electric utilities, and supports consumer demand. This has helped to emit market signals to investors and mobilize private capital. The annual zero emissions vehicle requirements until 2035 are significant (see Graph 2: *The annual zero-emission vehicle requirement*).

Applicability of ZEV mandate to manufacturers in California: ***Manufacturers are classified based on their volume status for each compliance year. Volume status for the compliance year is calculated as the annual average of the manufacturer's sales in California in the previous three years.***

- Small-volume manufacturers (volume status < 4,500) are exempt from the mandate.

Graph 2: The annual zero-emission vehicle requirement



Source: <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii>

- Intermediate-volume manufacturers (volume status > 4,501–20,000 units) are subject to the mandate.
- Large-volume manufacturers (volume status > 20,000 units) are subject to the mandate, with a minimum requirement of pure ZEVs.

ZEV credit requirements

The critical lesson from California is the designing of supportive market based mechanisms to enable implementation of the ZEV mandate. California has implemented the minimum ZEV credit percentage requirement for each manufacturer as the percentage of the passenger cars and light-duty trucks, produced by the manufacturer and delivered for sale in California.(see Table 6: Credit percentage requirements). Credits are awarded based on ZEV sales. Large-volume manufacturers need a certain percentage of their ZEV credit requirements through pure ZEVs, or Fuel cell electric vehicles (FCEVs). Intermediate-volume manufacturers to meet the entire ZEV credit requirement through transitional ZEVs—Plug-in hybrid electric vehicles (PHEVs).

Table 6: Credit percentage requirements

Model Year	Credit Percentage Requirement (in percent)
2018	4.5
2019	7.0
2020	9.5
2021	12.0
2022	14.5
2023	17.0
2024	19.5
2025	22.0

Source: Govt.westlaw¹⁸

The available information shows that there are several pathways to meet credit requirements in a compliance year. Manufacturers may bank excess ZEV credits for future use or trade them. Industry may purchase ZEV credits from other automakers as an alternative to earning them. Manufacturers may offset some of their ZEV credit requirements by over complying with their corporate average GHG targets. The ZEV targets are linked with GHG regulations. GHG over-compliance can offset ZEV credit requirements, but excess ZEV credits cannot offset GHG targets.

How does the California ZEV credits system work? Available information shows that the California ZEV programme assigns each automaker ‘ZEV credits’. Automakers are required to maintain ZEV credits equal to a set percentage of non-electric vehicle production. Each manufacturer has a target percentage for a model year. Each car produced earns a number of credits based on the type of ZEV and its battery range.

The credit requirement for 2025 is 22 per cent and is likely to require less than 8 per cent of sales to be ZEVs. Credits could also be won from Transitional Zero Emission Vehicles (TZEVs) or plug-in hybrid vehicles, but the mandate has restrictions on the amount of credits that can be won, with a cap of 6 per cent. The total production volume of ZEVs for a model year is calculated using a three-year average. For example, the total production volume for 2020 was based on the average for years 2017, 2018 and 2019. This volume was then used to calculate ZEV volume target based on the credit percentage mandate. The ZEV programme also offers a ‘travel provision’ that allows automakers to earn credits in the other states with ZEV mandates for vehicles sold in California.

Trading credits- It is evident that the manufacturers can bank excess credits for a model year to meet requirements in the subsequent year. Similarly, credits can be transferred and traded within or between states under the ‘travel’ and ‘pooling’ provision. The travel provision, which allowed credits earned in one state to be counted as earned in all ZEV states, is no longer in effect. The pooling provision allows automakers to over-comply in one eastern ZEV state and transfer the extra credits to another eastern ZEV state. Unlike the travel provision, pooling avoids the double-counting issue, and still requires that an actual vehicle is produced and sold before credit is rewarded and transferred. However, transferring or trading between region pools incurs a premium of 30 per cent of their credit value. In comparison, transactions within a region pool are free.

Credit over-compliance- According to the Final Regulation Order, Title 13, California Code of Regulations, 2022. “The over compliance mechanism makes a manufacturer eligible for GHG over compliance credits provided they have no outstanding debits from previous years (till 2017) under both the GHG and ZEV programs. To avail this scheme, the manufacturer had to state their commitment for over compliance with the GHG program by at least 2 gCO₂/mile for the entire period starting 2018 through 2021”.

Penalty: There is also a penal provision for its implementation. Non-compliance leads to financial penalties. Any manufacturer that fails to produce and deliver for sale in California the required number of ZEVs and submit an appropriate amount of credits and does not make up ZEV deficits within the specified time allowed by law shall be subject to the Health and Safety Code section 43211 civil penalty applicable to a manufacturer that sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board (USD 5,000 for each vehicle sold beyond credit requirement violation).

A manufacturer failing to comply with the ZEV regulation credit requirements for a model year must make up for the deficit by the next model year. Intermediate manufacturers can request for up to three consecutive model years to make up for the deficit, although they will have to back it up by submitting a plan on how to make up for the deficit during this period. Manufacturers failing to make up for the required credit deficit during the time allowed to attract a civil penalty of up to USD 5,000 for each non-compliant vehicle.

Supportive strategies — Clean Miles Standard: On May 20, 2021, the Air Resources Board adopted a regulation to require electrification of ride-hailing companies starting in 2023 with annual targets requiring zero grams of CO₂

greenhouse gas emissions and 90 percent of passenger miles travelled to be fully electric by 2030.¹⁹ The Clean Miles Standard Program, - developed by the CARB and implemented by the California Public Utilities Commission (CPUC) seeks to reduce greenhouse gas (GHG) emissions from passenger ride-hailing services operated by transportation network companies (TNCs) such as Uber and Lyft. The regulation establishes vehicle electrification and GHG emission reduction targets that TNCs are required to meet. The regulation applies to passenger ride-hailing services operated by TNCs with more than 5 million annual vehicle miles travelled. A substantial portion of vehicles operating on the platform need to be electric.²⁰

California ZEV Market Development Strategy: Increasing and accelerating the shift to a zero-emission transportation system requires an organized, collaborative, and cross-cutting approach. Through this document, the Zero Emission Vehicle (ZEV) Market Development Strategy, the Governor's Office of Business and Economic Development (GO-Biz) and our partners seek to accelerate large scale, affordable, and equitable ZEV market development.

The Strategy is centred around the four market pillars: vehicles, infrastructure, end users, and workforce. The pillars must all be fully supported and are built upon a foundation of five core principles: equity in every decision, embracing all zero-emission pathways, collective problem-solving, public actions drive greater private investment, and designing for system resilience and adaptability. The market pillars and underlying core principles inform the Strategy's roadmap for who is focused on what — the roles and responsibilities of each public and private market player. The Strategy will be updated at least every three years and each state agency will submit a brief action plan annually, starting March 1, 2021, setting the agency's priorities according to their objectives.

The ZEV Market Development Strategy (ZEV Strategy) report organizes and connects multiple documents and efforts to help align individual and collective efforts within the state government, working with stakeholders, to build the ZEV market. The core components include:

ZEV Market Development Strategy Website is a living site that hosts all ZEV Strategy related documents. The site will evolve through time, share the latest information, and house the ZEV Metrics Portal (connecting to existing and new agency efforts). Updated regularly.

ZEV Market Development Strategy Document is an overarching document that

establishes a framework for collective action based on a foundation of five core principles. The plan is organized around the four core pillars of the ZEV Market: Vehicles, Infrastructure, End Users and Workforce. Updated every three years, or sooner if needed.

Agency ZEV Action Plans focus on executing the agency objectives outlined in the ZEV Market Development Strategy, with special attention given to equity and collaboration. Updated Annually.

Impact of California action: ZEV mandate supported by other regulations have catalysed the California market. California’s market share is more than 4 times than American average. California has more ZEV models than the rest of US. California. In April 2023, California exceeded 1.5 million ZEV sales two years ahead of schedule.

As much as 21.1 per cent of all new cars sold in FY23 in California were ZEVs, according to the California Energy Commission. Also 40 per cent of ZEVs sold in the U.S. are sold in California, according to the Office of Governor, California website.²¹

European Union (EU)

Leveraging CO2 emissions standards to drive electrification: The approach in Europe has been different from that in California though aggressive strategies and ambitious targets have been adopted to drive the market. The EU has leveraged the CO2 emissions standards to drive electrification. The corporate fleet-wide

Table 7: The CO2 standards for different vehicle segments in Europe—current and proposed

	2020/21	2025 onwards	2030 onwards	2035 onwards
Cars	95 g CO2/km [NEDC]*	-15% vs. 2021	-55% vs. 2021*	
Vans	147 g CO2/km [NEDC]	-15% vs. 2021	-50% vs. 2021*	-100% vs. 2021*
Heavy-duty vehicle	Not applicable	-15% vs. reference period	-30% vs. reference period	-100% vs. 2021*
*Proposal of the EU Commission *New European Driving Cycle				

Source: Europa²²

average standard of 95 g CO₂/km require more hard sell of electric vehicles to have a larger share of zero emissions vehicles while improving the fuel efficiency of the vehicles powered by the internal combustion engines.

According to the 2016 ICCT report on CO₂ standards for new cars and light-commercial vehicles in the European Union, “by 2021, average laboratory CO₂ emissions from new cars in the EU as measured on the New European Driving Cycle (NEDC) must fall to 95 g/km.” According to the same ICCT report, “beginning in 2017, a new test procedure, the Worldwide Harmonized Light Vehicles Test Procedure (WLTP) was introduced to replace the NEDC (New European Driving Cycle). The 2021 CO₂ target of 95 g/km as measured on the NEDC is equivalent to approximately 109 g/km under the WLTP.⁶ The transition to the WLTP should reduce the gap between official and real-world CO₂ emission levels to about 23%, so that the average real-world CO₂ emissions of new cars by 2021 will be around 134 g/km.”

On the other hand the two EU Regulations that govern the fleet targets for passenger cars and vans and heavy-duty vehicles share the following features:

- **Tank-to-wheel approach (“tailpipe” emissions):** Therefore, only the vehicle tailpipe emissions are relevant in the current context, regardless of the origin and CO₂ intensity of the fuel used.
- **Single annual EU-wide fleet target for each OEM:** For each OEM, a single EU-wide fleet target applies for each of the segments (cars, vans, and heavy-duty vehicles). Fleet targets are set annually and comprise all new vehicles registered in the same year.
- **Targets are tightened over time:** The basic idea is that all OEMs should lower the Europe-wide average CO₂ emissions of their new vehicles each year below an increasingly stringent fleet limit value:

Fleet of heavy-duty vehicles will be regulated from 2025 onwards, with the initial CO₂ target emission-reduction levels to be set relative to a reference period (July 1, 2019—June 30, 2020). On 17 September 2020, the EC presented its plan to accelerate emissions reductions significantly in the next decade. This will most likely imply even stricter fleet targets.

Penalty: There are specific mechanisms for enforcement. There are significant penalties for underperformance – Automotive manufacturer (OEMs) must pay a

penalty per vehicle if their average emissions exceed the fleet target:

- For **cars and vans**, OEMs must pay a ‘penalty’ of 95 EUR/g CO₂/km times the number of new vehicles.
- For **heavy-duty vehicles**, failure to comply with emission targets will result in a penalty of Euro 4,250 per g CO₂/tkm in 2025 and Euro 6,800 per g CO₂/tkm in 2030.²³

Pooling: Manufacturers can group together and act jointly to meet their emissions target. In forming such a pool, manufacturers must respect the rules of competition law. Pooling between car and van manufacturers is not possible.

Super-credits system to incentivise electrification: In the years from 2020 to 2024, a super-credits system applies for passenger cars with emissions of less than 50 g CO₂/km (NEDC) in the European Union. As per the information available in Transport Policy.net, “ZLEVs are passenger cars with emissions of less than 50 gCO₂/km (NEDC). They mainly include BEVs. These vehicles are counted multiple times for the calculation of the average specific emissions of a manufacturer:

- as 2 vehicles in 2020
- as 1.67 vehicles in 2021
- as 1.33 vehicles in 2022.”

A cap on the super-credits was set at 7.5 g/km per car manufacturer over the three years.

ZLEV crediting system: The EU super credits system was in force from 2020 to 2022. From 2025, a different ZLEV crediting system will apply both for car and van manufacturers. Following the amendments introduced in 2023, this system will apply until the end of 2029. No super-credits system was in place for vans. From 2025, a different ZLEV crediting system will apply both for car and van manufacturers. Following the amendments introduced in 2023, this system will apply until the end of 2029. It allows for the relaxation of a manufacturer’s specific emission target, if its share of new ZLEVs (vehicles with emissions between 0 and 50 g CO₂/km (WLTP)) registered in a given year exceeds the following benchmarks (as amended by Regulation (EU) 2023/851):

- Cars: 25 per cent ZLEV
- Vans: 17 per cent ZLEV

A one percentage point exceedance of the ZLEV benchmark will increase the

manufacturer's CO₂ target (in g CO₂/km) by one percent. The target relaxation is capped at maximum 5 per cent to safeguard the environmental integrity of the Regulation.

For calculating the ZLEV share in a manufacturer's fleet, an accounting rule applies. This gives a greater weight to ZLEV with lower CO₂ emissions.²⁴ Essentially the ZLEV credits are rewarding car manufacturers with less stringent CO₂ reduction requirements for deploying electric vehicles in numbers consistent with what they have already announced they plan to do.

Exemptions: Manufacturers responsible for fewer than 1,000 cars or fewer than 1,000 vans newly registered in the EU per year are exempted from meeting a specific emissions target in the following year, unless they voluntarily apply for a derogation target.

Derogations: Manufacturers may apply for a derogation from their specific emission target at the following conditions:

- A “small-volume” manufacturer (responsible for less than 10 000 cars or less than 22 000 vans newly registered per year) can propose its own derogation target, based on the criteria set in the Regulation.
- A “niche” car manufacturer (responsible for between 10 000 and 300 000 cars newly registered per year) can apply for a derogation for the years until 2028 included. Between 2020 and 2024, the derogation target will be a 45 per cent reduction from its average emissions in 2007. In the years 2025 to 2028, the derogation target will be an additional 15 per cent lower.

Eco-innovations; To encourage eco-innovation, manufacturers may obtain emission credits for vehicles equipped with innovative technologies for which it is not possible to demonstrate the full CO₂ savings during their type approval. The manufacturer must demonstrate these savings on the basis of independently verified data. The maximum emission credits for these eco-innovations per manufacturer are 7 g CO₂/km per year (until 2024), 6 g CO₂/km from 2025 until 2029 and 4 g CO₂/km from 2030 until and including 2034. As of 2025, also the efficiency improvements for air conditioning systems will become eligible as eco-innovation technologies.

ZEVs manufacturers have the option of meeting voluntary ZEV quotas and claim compliance offsets against the post-2021 corporate average standards.

Manufacturers that exceed these voluntary targets can receive specified levels of relaxation on their standards. This replaces the super credit-based offsets available to manufacturers in the existing regulations. Vehicles with zero total emissions, or BEVs and FCEVs, get full credit; those with emissions between 0 g/km and 50 g/km count partially. Vehicles that emit 50 g/km or more are not counted. If manufacturers meet specified targets for sale fleetwide CO₂ compliance targets would be relaxed by a commensurate factor.

Manufacturers have an incentive to beat their ZEV targets by as much as 5 per cent, as the CO₂ compliance relaxation factor is capped at a maximum of 1.05. There are no penalties specified in the proposal for manufacturers that miss their ZEV targets.

United Kingdom

The Road Vehicle Carbon Dioxide Emission Performance Standards (Cars and Vans) (Miscellaneous Amendments) Regulations 2021 came into force in the UK on 26th November 2021, in exercise of the powers conferred by Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO₂ emission performance standards for new passenger cars and for new light commercial vehicles. As per this legislation document, “for a manufacturer that is placing passenger cars on the United Kingdom market for the first time in any of the calendar years 2021 to 2024, the specific emission reference target in the applicable years shall be the average of the specific emissions reference targets determined for all manufacturers in accordance with this legislation, weighted according to the number of new passenger cars that were registered for those manufacturers in the United Kingdom in 2020.”

Phase out of polluting vehicles: In November 2020, as part of the UK Prime Minister’s Ten Point Plan for a Green Industrial Revolution, the Government brought forward the date at which UK will phase out the sale of new petrol and diesel cars and vans to 2030, and brought forward the date at which all new car and van sales will be zero emission to 2035. Between 2030 and 2035, only new cars and vans with ‘significant zero emission capability’ would be permitted to be sold. The UK has already announced ambitious commitments to phase out the sale of all vehicles that produce exhaust emissions in the UK by 2040. The earlier targets were that new petrol and diesel cars and vans will be phased out from 2030; all new cars, vans and heavy goods vehicles (HGVs) < 26t must be zero emission from 2035; all new HGVs >26t must be zero emission by 2040.

Impact of the policies on the EU market: In Europe, electric car sales increased by more than 15 per cent in 2022 relative to 2021 to reach 2.7 million. Sales grew more quickly in previous years: annual growth stood at more than 65 per cent in 2021 and averaged 40% over 2017-2019. In 2022, BEV sales rose by 30 per cent relative to 2021 (compared to 65 per cent growth in 2021 relative to 2020) while PHEV sales dipped by around 3 per cent. Europe accounted for 10 per cent of global growth in new electric car sales. Despite slower growth in 2022, electric car sales are still increasing in Europe in the context of continued contraction in car markets: total car sales in Europe dipped by 3 per cent in 2022 relative to 2021.²⁵

Statistics released by the Department of Transport, UK in May 2022 showed that the UK's transport revolution is well underway with EV registration numbers in the north of England rising to 74,677 in 2021. More than a quarter of a million EVs were travelling on UK roads and sales of plug-in vehicles had reached all-time highs, with 327,000 registered in 2021 alone—a 77 per cent rise compared to 2020, said to the report.²⁶

China

In 2017, New-Energy Vehicle (NEV) mandate policy for passenger cars (PHEVs, BEVs, and FCEVs) came into force in China. This requires manufacturers to meet credit-based requirements, not direct market-share targets. The Ministry of Industry and Information Technology of China is responsible for its implementation.

The dual credit policy China promulgated in 2017, assesses carmakers according to their efforts to cut fuel consumption and to produce new energy vehicles. China's dual credit policy introduces both emission targets and credit allocation system to meet its GHG emission targets.

The key elements in this policy that create a mandate for the vehicle industry include Dual Credit Policy of 2017 that requires 8 per cent of a carmaker's vehicle deliveries for 2018, 10 per cent for 2019 and 12 per cent for 2020. Back then, a carmaker could earn up to five points for producing an electric vehicle and 2 points for producing a plug-in hybrid.

The revised targets in dual credit policy of 2017 require carmakers to garner credits accounting for 14 per cent of their total sales as NEVs in 2021, 16 per cent in 2022 and 18 per cent in 2023. They can fetch 3.4 points for an electric vehicle and 1.6 points for producing a plug-in hybrid. China raised the ratio of electric cars and plug-in hybrids in carmakers' line ups in 2020.

Mandatory NEV credit targets for manufacturers for 2019 and 2020 are linked with corporate average fuel consumption (CAFC) standards. Excess credits earned under the NEV mandate can offset deficits in CAFC compliance. Simply stated, the mandate requires that a certain percent of all vehicles sold by a manufacturer each year must be battery-powered. To avoid financial penalties, every year manufacturers must earn a stipulated number of points, which are awarded for each EV produced based on a complex formula that takes into account range, energy efficiency, performance, and more. The requirements get tougher over time, with a goal of having EVs make up 40 per cent of all car sales by 2030.

Manufacturers with annual production or import of conventional passenger vehicles totalling 30,000 or more are subject to the mandate. For the purpose of the policy the eligibility criteria for EVs are specified.

Manufacturers can use excess self-generated NEV credits or purchase NEV credits to offset a CAFC²⁷ credit deficit. GHG over-compliance cannot offset NEV credit requirements.

With regard to banking, trade and transfer of credits, manufacturers cannot bank excess credits, except from 2019 to 2020. They may trade or sell excess credits to other manufacturers. Manufacturers cannot carry back negative credits, except from 2020 to 2019. Manufacturers may trade or sell excess credits to other manufacturers. They can use excess self-generated NEV credits or purchase NEV credits to offset a CAFC credit deficit. Carmakers can amass credits by producing gasoline vehicles with less emissions than the country's standards or by producing electric cars, plug-in hybrids and fuel cell vehicles.

The companies are allowed to offset deficits in petrol vehicle credits with those accumulated by their sister companies, - those producing new energy vehicles or have bought from others.

Manufacturers with annual production or import of conventional passenger vehicles totalling 30,000 or more are subject to the mandate. Types of NEVs eligible to earn credits include:

- Battery electric vehicles (BEV) with electric range of at least 100 km, maximum vehicle speed of at least 100 km/h.
- FCEVs with electric range of at least 300 km.

-
- PHEVs with electric range of at least 50 km.

Penalty: Regulations deny type approval for new models that cannot meet their specific fuel consumption standards until both CAFC and NEV deficits are fully offset.

Impact of policies on vehicle electrification in China

In 2022, BEV sales in China increased by 60 per cent relative to 2021 to reach 4.4 million, and PHEV sales nearly tripled to 1.5 million.

BEV sales in China tripled from 2020 to 2021 after moderate growth during 2018-2020. Electric car sales increased even while total car sales dipped by 3 per cent in 2022 relative to 2021.²⁸

According to the publicly available information, the new requirements can ensure that by 2025 passenger vehicles' average fuel consumption falls to 4.0 liters per 100 km and new energy vehicles account for 20 percent of total vehicles in the year. This is reported to have increased the investment in research and development, led to more new energy vehicles in the market and improved passenger vehicle fuel efficiency. Statistics show that average fuel consumption stood at 5.5 liters per 100 km in 2019, down 10 percent from 2016. New energy vehicle sales in the year totalled 1.06 million, ranking first globally for five years in a row.²⁹

8. Towards Indian ZEV mandate

Need early action on the following.

Set nation-wide regulatory target and timeline for targeted fleet electrification: Issue the timeline for expected size of the EV fleet and their share in different vehicle segments that can influence the corporate policies, investments and roadmaps in India.

Need timeline for phase down of new sales of ICE Vehicles: Even though the conversation has been initiated by the Parliamentary Committee of the Heavy Industry Ministry to phase out diesel run cars, a comprehensive strategy and target are needed as is being done globally.

Adopt national level ZEV production mandate for the vehicle industry along with phase in plan and stratified targets: ZEV mandate along with annual production and sales targets for different vehicle segments need to be implemented in phased manner from 2025 to 2030 and beyond.

Adopt credit trading mechanisms to support implementation of ZEV mandate: Need market based mechanism to support ZEV sales targets for each OEM selling in the country. This can provide an incentive to manufacturers to earn ZEV and emission credits, earn revenue stream from banking and trading of over-compliance credits. Energy Conservation Act provides the legal backing for this and the Bureau of Energy Efficiency (BEE) is developing a carbon credit system for the compliance mechanism. The National Automotive Policy, 2018 has recommended banking and trading of CO₂ credits by vehicle manufacturers.

Need proper rules for credit transfer and accounting for effective impact. All firms must update overall sales value in its ZEV target accounting after a transaction and before engaging in a new transaction. These ZEV target transactions may be held on a government monitored online trading portal. There may be prospective estimations and retrospective accounting. There must be progressive increase in ZEV target for the OEMs. The CO₂ credits awarded to a manufacturer for exceeding compliance requirements should be valid for two to three years. Offers flexibility to manufacturers and avoid penalties for non-compliance. These and more will require effective detailing.

No accounting of ‘CO2 emissions avoided’: The government must strictly disallow accounting of ‘CO2 emissions saved’ or ‘CO2 emissions avoided’. This metric is based on a hypothesis of CO2 emissions in the scenario of the continuation of old policies. This is a flawed idea and would lead to accounting of undue credit in the new ecosystem. The bases need to be revised as we set out to reinvent the future.

Need ZEV market development and transition plan: The Union government may take up the responsibility of developing a comprehensive ZEV market development and transition plan in collaboration with all the stakeholders and concerned ministries.

Significantly tighten the fuel economy regulations to require more fleet-wide adoption of zero emissions vehicles: Revise and tighten the corporate average fuel consumption norms for cars and redesign super credits to create more incentives for increasing zero emission vehicle share of the OEMs. Similarly tighten the norms for heavy duty vehicles and ensure adoption of such norms for two and three wheeler segments.

Need state level sales mandate: The role of state level EV policies in creating local mandate for EV registration with ramped up targets over time for all vehicle segments is significant. The executive orders issuing EV policies in states need to provide for sales mandates and announce the timeline for implementation in advance to provide early signals and visibility to the market. Already, state governments are beginning to announce plans to opt for only electric models in three wheeler and bus segments. But firmer pathways are needed for targeted sales and registration across vehicle segments.

Need supportive strategies in states to ensure faster adoption in personal vehicle segments of cars and two-wheelers: The past experience related to CNG transition as well as the new announcement for electrification of three wheelers and buses in the states show that the nascent state mandates are more confined to public transport, paratransit and local commercial vehicles. Personal vehicle segments—cars and two-wheelers - are not in the orbit as there is considerable sensitivity around disproportionate impacts on different income groups etc and public backlash. Therefore, this will require a more nuanced approach in terms of early announcement of phase down plan for ICE vehicles overtime, expected target for electrification in the longer time horizon, roadmap for restrictive policies on movement of ICE vehicles and older vehicles and their road usage; design motor vehicle taxes according to emissions level and age to increase the cost of owning

polluting vehicles, and design EV incentives more explicitly for rapid adoption.

These measures combined with zero emission mandate policy for the vehicle industry can lead to more aggressive adoption of electric cars and two wheelers.

Prioritise sales mandate for two and three wheelers for early action: Assess the strategy for notifying phase out of registration of new ICE models of two and three wheelers. These vehicles with improved price parity, lowering of total cost of ownership, better access to diverse models, easier charging among others are more amenable candidates for sales mandate and early transformation. These dominate the vehicle fleet and cause enormous toxic exposures. Zero emissions mandate can contribute towards significant emissions reduction.

Require transparency and communication: The government must ensure that all ministries, departments and stakeholders maintain adequate transparency and clear communication among themselves and with the public at large.

Need industry participation to detail out strategy and industrial development policy: Industry participation and support is critical to this strategy. Build knowledge on how industry can benefit from these strategies. Also for robust product development need technology improvement plans to inform battery and cell development to address speed, energy density, power density, electric drive system to lower costs, target for electricity consumption (kwh/km etc). This requires development of technical standards, R&D of core technology, building on industrial value chain, battery reuse and recycling strategies, subsidy and tax for pilot projects to push innovation, Corporate policies adopting voluntary carbon neutral and net zero targets, strategies to reduce to reduce supply risks and price volatility and focus on material security for batteries.

Continue to reform and strengthen ZEV schemes with multiple measures including demand incentive, charging infrastructure, battery ecosystem etc.

Need strong public participation and awareness building strategies to counter disinformation on the new generation technology and build consumer confidence.

Annexure

State level support for EV manufacturing: some illustrative cases

State electric vehicle policy	Capital subsidies	Tax exemptions/concessions	Other strategies
Karnataka, 2017:	Investment promotion subsidy: (a) Micro - 25% value of fixed assets (VFA)—up to INR 15 lakh; (b) Small - 20% VFA—up to Rs 40 lakh; (c) Medium—up to Rs 50 lakh; Investment subsidy (EV cell/ battery/ module manufacturing): 20% VFA - first 2 units	100 per cent exemption from electricity duty SGST reimbursement, and stamp duty exemption.	Concessional Registration Charges: Rs 1 per INR 1000 •Capital subsidy for ETP: (a) MSME - 50% - up to Rs 50 lakh (b) Large/Mega/Super mega - 50% - up to Rs 200 lakh
Telangana 2020:	20% of investment up to Rs 30 crore	Power Tariff Discount: 25 per cent for 5 years capped at 5 Cr. for Mega Enterprises Electricity Duty Exemption at 100 per cent for 5 years capped at 0.5 Cr Stamp duty exemption—100 per cent.	Interest subvention: 5.25 per cent over 5 years up to INR 5 crore Registration fees exemption: 100%
Tamil Nadu 2019:	15% capital subsidy on eligible investments over 10 years Special Package for EV battery manufacturing — 20% capital subsidy on eligible investments over 20 years (50% subsidy in case of southern districts). This special package is available for investments till 31/12/2025 Additional capital subsidy of 20% will be offered over existing capital subsidy to MSME units	100% electricity duty exemption and stamp duty waiver. 100% SGST Reimbursement. Registration fees exemption: 100%	Land subsidy available. interest subvention: 5.25% over 5 years up to Rs 5 crore

ZERO EMISSION VEHICLE (ZEV) MANDATE POLICY: SCALING UP ELECTRIC VEHICLE MARKETS

State electric vehicle policy	Capital subsidies	Tax exemptions/concessions	Other strategies
Andhra Pradesh 2018	<p>Micro industries: 25% of fixed capital investment (FCI)—up to Rs 15 lakhs</p> <ul style="list-style-type: none"> •Medium industries: 20% of FCI—up to Rs 40 lakhs •Large industries: 10% of FCI—up to 10 crores •Mega industries: 10% of FCI—up to 20 crores <p>Fixed power cost reimbursement: INR 1/ unit—for 5 years</p> <p>Subsidy: 50% of cost—up to INR 2 crore</p> <p>Electricity duty: 100%—for 5 yea</p>	<p>100% Net SGST—</p> <ul style="list-style-type: none"> (a) Micro: 5 years (b) Medium: 7 years (c) Large: 10 years; 100% stamp duty exemption. 	<p>Land for mega integrated projects: ancillary units offered land at the same rate - 50% of OEM's land</p> <p>Clean production measures:</p> <ul style="list-style-type: none"> (a) MSME - 35% subsidy on most—up to INR 35 lakh (b) Large - 10% subsidy on cost—up to INR 35 lakh <p>Sustainable green measures: 25% subsidy of FCI—up to Rs 50 crore</p> <p>Auto cluster and automotive suppliers manufacturing centres (ASMC) - 50% of FCI -up to Rs 20 crores</p> <p>Stipend: Rs 10,000/ year - first 50 employees of a single company</p> <p>Marketing: 50% cost of participation -up to Rs 5 lakh; R&D: Rs 500 crore</p> <p>Water supply: 50% of price - for 3 years; 25% cost of water treatment plant—up to Rs 2 crore</p>
Gujarat 2021	<p>Micro industries: 25% of fixed capital investment (FCI)—up to INR 15 lakhs</p> <p>Medium industries: 20% of FCI—up to Rs 40 lakhs</p> <p>Large industries: 10% of FCI—up to Rs 10 crores</p> <p>Mega industries: 10% of FCI—up to 20 crores</p>	<p>All tax measures as per the Gujarat Industrial Policy 2020³⁰</p>	<p>Land policy in line with Gujarat Industrial Policy 2020</p>
Odisha 2021	<p>Micro and small enterprise: 25% of the capital investment made in plant and machinery up to INR 1 crore.</p> <ul style="list-style-type: none"> •Micro and small enterprise (owned by SC/ST/differently abled/women): 30% of the capital investment made in plant and machinery up to Rs 1.25 crore <p>Micro and small enterprise (set up in industrially backward districts): Additional 5% capital investment subsidy</p>	<p>100% SGST Reimbursement</p>	

State electric vehicle policy	Capital subsidies	Tax exemptions/concessions	Other strategies
Assam 2021:	<p>Micro units - 20%—up to Rs15 lakhs</p> <ul style="list-style-type: none"> •Small units - 20%—up to Rs 50 lakhs •Medium units - 20%—up to Rs 1 Crores •Large units - 10%—up to Rs 10 Crores <p>SGST reimbursement: 100% capped at Rs 5 crores per year or Rs 25 crores over 7 years</p>		
Uttar Pradesh 2019		100% exemption from SGST, stamp duty, and electricity duty	<p>Land policy - For mega anchor and ultra-mega battery plant: 25% cost of land</p> <p>Technology transfer for alternate clean fuel mobility:</p> <p>Anchor EBUs: 100% cost - 5 vendor units & 75% cost - next 5 vendor units -up to INR 50 lakh</p> <p>Ultra mega battery plant: 50% cost -up to INR 10 lakh.</p>
Uttarakhand 2018		<p>100 per cent electric vehicle exemption</p> <p>Tax measures: 100 per cent exemption from electricity duty and stamp duty.</p> <p>SGST reimbursement: MSME and large - 30% - for 5 years</p> <p>Investment above Rs 50 crore - 50% - for 5 years</p>	Skill development compensation: Rs 1000/month for the first 50 trainees
Delhi, Maharashtra, Kerala, Madhya Pradesh, Manipur, and West Bengal	Nil	Nil	Nil

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