

May 2020



India's Road to Electric Mobility

Analysis of State Electric Mobility Policies with a Focus
on Public Transport: 2020

The Strategy Boutique



The Strategy
Boutique
Honest Consulting

Table of Contents

<i>1. Executive Summary.....</i>	<i>3</i>
<i>2. Understanding the Need</i>	<i>5</i>
<i>3. Analysis Methodology.....</i>	<i>7</i>
<i>4. State Wise Analysis.....</i>	<i>9</i>
<i>5. Challenges</i>	<i>26</i>
<i>6. Conclusion</i>	<i>26</i>



1. Executive Summary

Mobility lies at the center of every urban city. Cars and buses hurtle down roads; scooters and bikes attempt to find nooks and corners to fit into and people move from one corner of a city to the other, without giving it much thought. When this ability to move comes under stress, it is equivalent to a fundamental rite of life being threatened. Currently, this rite of getting around is under threat as urbanized cities across the globe are burdened with unhealthy smog, traffic jams and the consequent noise pollution resulting from unsustainable mobility models. Ever growing conventional motorization has beleaguered the environment and created a need for global capitals to adopt sustainable mobility solutions.

Environmental and energy security apprehensions clubbed with rapid technological advantages has triggered a paradigm shift from conventional vehicles to electric powered ones. The sector is at the cusp of transformation and India, although a late starter, is on its path to becoming a global hub for electric mobility.

This report aims to analyze India's policy initiatives to adopt electric powered technology for mobility, with a focus on the shift to electric public transport. The electric mobility sector can be classified in the concurrent list and thus, both, state governments and the center draft and pass policies and initiatives regarding the subject to enable this transformation.

The federal structure of India's polity enables state governments to develop tailored policies for their states, incorporating regional requirements, aims and resources.

This is reflective in the diverse frameworks adopted by the 11 state governments which currently have an electric mobility centric policy or draft in place. This report analyses the policies of five of these states – Andhra Pradesh, Delhi, Maharashtra, Uttar Pradesh and Tamil Nadu, picked on the basis of contribution to national GDP, rate of urbanization, number of metropolitan cities and ability to harness renewable energy. Ambitious policy designs and efficient implementation mechanisms were also factored in to analyze policies reflecting the best practices in this space.

Most states have focused on boosting the supply end of the value chain and building electric vehicle manufacturing hubs and developing a robust infrastructure network. However, concrete measures to promote research and development in the sector is limited. There is also a lack of synchronization between renewable energy policies and electric vehicle policies. The environmental benefits of adopting electric vehicles will be fully realized only once the electricity fueling the vehicles is sourced from clean sources. This requires complementary policies to promote and incentivize generation and usage of renewable energy to charge electric vehicles.

Further, the report assesses the financial and environmental impact of switching to a pure electric bus fleet.

An aerial photograph of a winding asphalt road through a dense green forest. The road curves from the top left towards the bottom right. Several cars are visible on the road. The entire image is overlaid with a semi-transparent blue filter. A horizontal white line is positioned across the middle of the image, separating the title from the section number.

Understanding the Need for Sustainable Mobility

Section 2



2. Understanding the Need for Sustainable Mobility

India, being the second most populous country in the world, faces an alarming threat from the conventional mobility pattern to its environment. With nearly 34.03% of the Indian populace residing in urban areas, there has been a mounting pressure on the transportation systems of cities. This number was at 27% two decades back. The advent of industrialization and commercialization has exponentially increased the rate of urbanization in the country. And, with a higher urbanization rate comes a higher rate of motorization.

The current urban infrastructure cannot cope up with the rising number of vehicles, with automobile sales in the country expected to quadruple in the next 15 years. Congestion on India roads is already close to intolerable, and the country is home to 21 out of the world's 30 most polluted cities. Addressing this mobility challenge is of utmost importance to build sustainable cities.

One of the prominent solutions here lies in boosting public transport, powered by electric engines.

Public transport in India, be it on road or rail, has been a primary mode of transportation throughout the country. By moving more people with fewer vehicles, public transport has the potential to exponentially reduce emissions. More so if they are powered by electric engines.

Each state's public transport is run by State Run Transport Units (or Corporations in some cases). These SRTUs operate the bus fleet in their respective states and, most of them are currently in heavy losses along with being highly fuel inefficient.

2.1 India's National Policy Framework

The Government of India aims to transform the country into a leading hub for electric mobility. In 2013 the Centre (Ministry of Heavy Industries & Public Enterprises) launched a seven-year long vision for the electric mobility ecosystem – the National Electric Mobility Mission Plan 2020 (NEMMP). With an aim to achieve national energy security and build a green future by boosting the electric vehicle sector, the state set out to achieve sales of 6-7 million hybrid and electric vehicles year on year, from 2020. Under the umbrella of the NEMMP, Faster Adoption and Manufacturing of (Hybrid) and Electric Vehicles (FAME) was launched to promote the electric vehicle manufacturing sector.

State governments followed suit and till date, about 11 states have passed or drafted electric vehicle policies, specific to their state, to accelerate the growth in the sector and promote the industry, which is in a nascent stage currently.

The Indian electric vehicle market hitherto has been dominated by two wheelers. In the financial year 2019-20, electric two wheelers accounted for 97.5% of all electric vehicles sold. By way of national and state policy frameworks, the country aims to change this trend and boost the number of electric cars and buses being used.



Analysis Methodology

Section 3



3. Analysis Methodology

In this report, the policies of 5 states have been analyzed, namely Andhra Pradesh, Delhi, Maharashtra, Tamil Nadu and Uttar Pradesh. These 5 states have been picked out of the 11 states with an existing electric vehicle policy or policy draft. This has been done on the basis of their contribution to the national GDP, population, urbanization rate, number of metropolitan cities and their ability to harness renewable energy.

Electric buses have a significant impact on the financial and environmental front. The buses have low emissions and running costs, when compared to diesel and CNG buses and hence are considered the future of public passenger transport.

The policies have also been analyzed at a qualitative level and the financial and environmental impact of switching to a purely electric powered fleet has been estimated for each state using models developed by TSB.

3.1 Financial Impact Analysis

Majority of the State-Run Transport Units are incurring heavy losses currently. The losses are attributed to subsidized fares, high running costs and fuel inefficiency. According to TSB analysis, switching to an electric fleet will significantly cut down on the costs of these public units. This is predominantly due to the low operational and maintenance costs related to electric powered buses and their longer life.

Using publicly available government data, TSB's model estimates cost savings per bus, every year on switching from a diesel bus to an electric one and from a CNG bus to an electric one. The model assumes that

fares are not hiked in the future and are maintained at their current subsidized level. It also assumes that passenger kilometers travelled by the bus will remain constant and the revenue side will not be impacted.

There are two components to the expenditure in both the cases, a fixed cost (or capital expenditure) and a variable cost (or operational & maintenance cost). The variable cost is dependent on the rate of fuel in every state and the number of kilometers travelled by a bus daily in that state. This data has been collated from government sources.

Further, the 2019 GST slash from 12% to 5% on electric vehicles has been factored into the capital expenditure of electric vehicles, assuming state authorities purchase the electric buses instead of hiring them. Additionally, CNG, diesel and electricity prices have also been projected to reach an accurate estimate.

3.2 Environmental Impact Analysis

The long-term savings of an electric fleet are not just those from a financial perspective, but also those derived from the environmental impact of electric powered mobility. Pure electric buses have zero tailpipe emissions. However, if the electricity used to run the bus is generated from non-renewable sources of energy, then those emissions need to be accounted for. This is termed as lifecycle emissions.

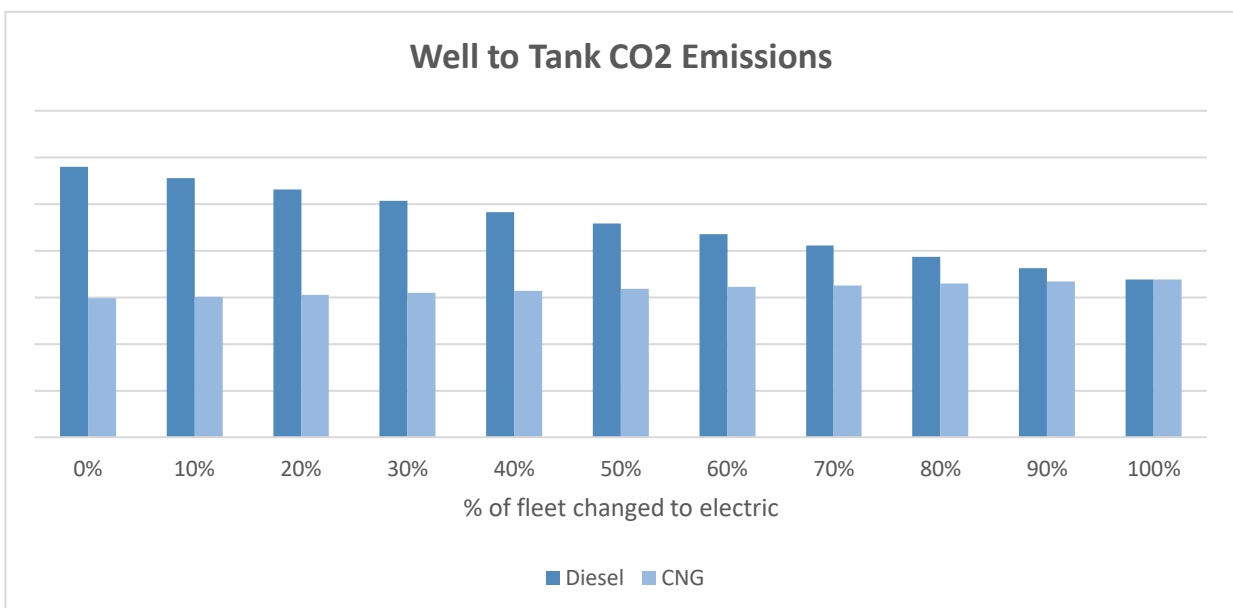
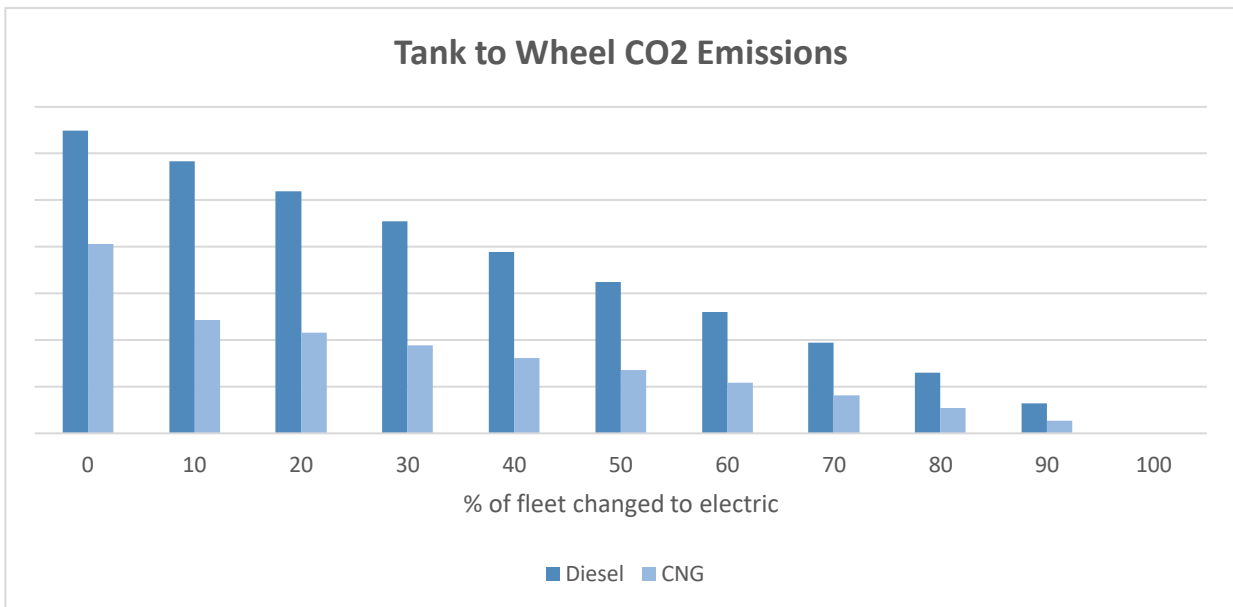
Emissions are broadly clubbed into Well to Tank (WTT) and Tank to Well (TTW).



As the name suggests, WTT emissions are those generated during the process of creating the fuel in question right up to the point when the vehicle's tank is filled with the fuel. And, TTW emissions, simply put, are tailpipe emissions, which in the case of pure electric vehicles are nil.

Diesel and CNG engines generate both, Well to Tank and Tank to Wheel emissions. The charts below show the drop-in emissions, as a fleet is gradually transformed into a purely electric powered one from 0% electric powered to 100% electric powered.

The underlying assumption here is that electricity used to charge electric buses is sourced from non-renewable sources of energy. Hence, the emissions actually rise for Well to Tank emissions when comparing CNG buses to EV ones. The TTW emissions fall to zero in the case of a 100% electric fleet. In the case for diesel the emissions drop since the fuel releases significantly more carbon dioxide as compared to alternate fuels.





State Wise Analysis

Section 4

4.1 Andhra Pradesh

At current prices, Andhra Pradesh's Gross State Domestic Product (GSDP) is estimated at ₹ 10.81 lakh crore in 2019-20. Between 2011-12 and 2019-20, the average annual GSDP growth rate was 19.05%.

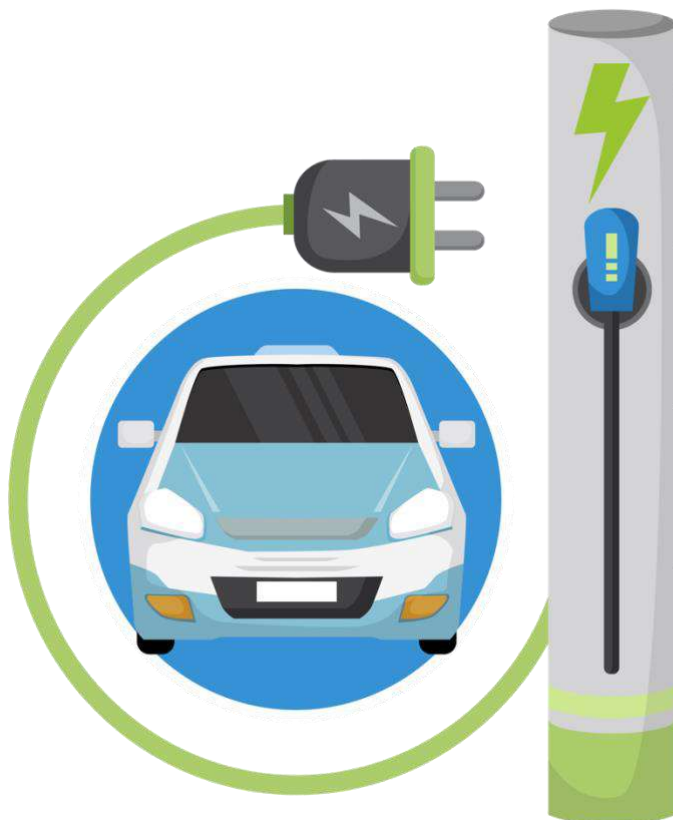
The state has attracted Foreign Direct Investment (FDI) equity inflows worth US\$ 18.98 billion during the period April 2000 to September 2019, according to data released by Department for Promotion of Industry and Internal Trade (DPIIT).

As of February 2020, the state had 20 operational Special Economic Zones (SEZs), 32 SEZs with formal approvals, four SEZs with in-principle approval and 27 notified SEZs. These SEZs were spread across diversified sectors which include textiles & apparel, food processing, footwear & leather products, multi-product, pharma, IT SEZs, etc.

With abundance of renewable sources of electricity and the eminent need of cleaner air, road and water, the government of Andhra Pradesh announced the Electric Mobility Policy 2018-23.

4.1.2 Electric Mobility Policy (2018)

Announcing the policy, the government claims the new policy will attract a combined investment of over ₹30,000 crore and create about 60,000 jobs. To encourage indigenous manufacturing of EVs, the state government has allocated a Research and Development grant of ₹500 crore.



POLICY HIGHLIGHTS

MANUFACTURING

- The GoAP will allocate 500 to 1,000 acres of land for developing EV Parks with plug and play internal infrastructure, common facilities and necessary external infrastructure.
- The parks will attract manufacturers across the EV ecosystem.
- An incubation center for handholding startups will also be planned in the EV Park.

CHARGING INFRASTRUCTURE

- Providing accessible public charging/battery swapping facilities in all public parking spaces.
- APSRTC depots, bus terminals and bus stops will have charging stations.
- Charging infrastructure will be installed at least every 50 km on highways, other major roads etc.

ENVIRONMENT PROTECTION

- Battery recycling plants will be incentivized to mine for compounds from used batteries.

RESEARCH & DEVELOPMENT

- A research grant of INR 500 Cr will fund the most innovative solutions in the mobility space.
- Center for Advancement of Smart Mobility (CASM) will be setup in 100 acres of land along with a test track for all new electric vehicles and autonomous vehicles
- In coordination with National automotive testing and R&D Infrastructure (NATRIP), GoAP shall strive to set-up quality testing center for EVs.

DEMAND CREATION

- Registration of EVs will be done online immediately.
- Electric Autos will be given permits on priority.
- In order to avoid congestion in cities, EVs will be mandated in cities while phasing out polluting vehicles in parallel.



Andhra Pradesh has set an ambitious target to be the best Indian state in EV by 2029 and a leading global investment destination by 2050. The state aims to have **1,000,000 EVs on the road by 2024.**

Furthermore, all government vehicles, including the ones under Government Corporations, boards, and government ambulances, will be converted to electric vehicles by 2024. The government also aims to have 1,00,000 slow and fast EV charging stations installed throughout the state by 2024.

4.1.3 Passenger Public Transport in Andhra Pradesh

With over 11,600 buses, Andhra Pradesh State Road Transport Corporation (APSRTC) clocks in a loss of approximately INR 1000 daily per bus.

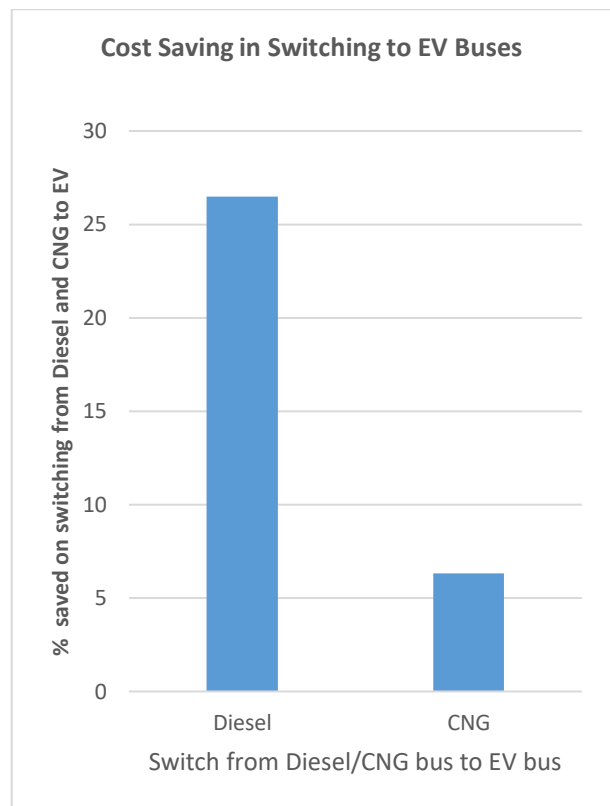
In order to achieve the target, set by Electric Mobility Policy 2018-23., the state government aims to convert the entire fleet of Andhra Pradesh State Road Transport Corporation (APSRTC) into electric (BEVs/FCEVs) by 2029, which stands at over 11,000 buses at the moment and the first phase of 100% conversion of bus fleet in top 4 cities by 2024.

4.1.4 Impact of the Policy Intervention

Financial Impact

Despite having a higher capital expenditure, electric powered buses have a significantly lower operational and maintenance cost. They also have a longer life. The table below estimates the total cost of operating a CNG and EV bus in Andhra Pradesh.

Cost per Yearly (₹)	Diesel	CNG	EV
Fixed Cost	10,24,000	9,22,000	18,37,000
Variable Cost	27,00,000	20,00,000	9,00,000
Total Cost	37,24,000	29,22,000	27,37,000



The conversion of the fleet as suggested in the policy would allow saving 6% and 27% in costs for CNG and diesel buses in Andhra Pradesh respectively.

Impact on Employment

Having one of the most aggressive EV implementation policy, Andhra Pradesh is bound to gain hugely from the conversion of all vehicles into electric ones.



This would not only attract billions in FDI but also allow for employment generation and increasing standards of living.

4.1.5 Key Takeaways

Andhra Pradesh's policy focuses on the production side of things and the infrastructure value chain. The key takeaways from the initiatives are:

- The state aims to not just boost manufacturing infrastructure but, also build a society which is aware and centred around sustainability. This is being done through initiatives such as test rides to popularize electric cars and celebrating “green days” in the capital
- Promotes innovation and research by way of grants and venture funds to research organisations, incubators and start-ups
- The initiatives will lead to a large influx of FDI to the state and give a significantly boost to employment opportunities. Both combined will improve the standards of living for the state's residents.

4.2 Delhi

The nation's capital, a hub of trade and finance, Delhi is one of the fastest growing states of the country. At current prices, the Gross State Domestic product (GSDP) of Delhi increased at a CAGR (in ₹) of 12.41 per cent between 2011-12 and 2018-19 to reach ₹ 7.80 trillion. The per capita GSDP (in ₹) increased a CAGR of 10.30 per cent between 2011-12 and 2018-19 to ₹ 402,173.

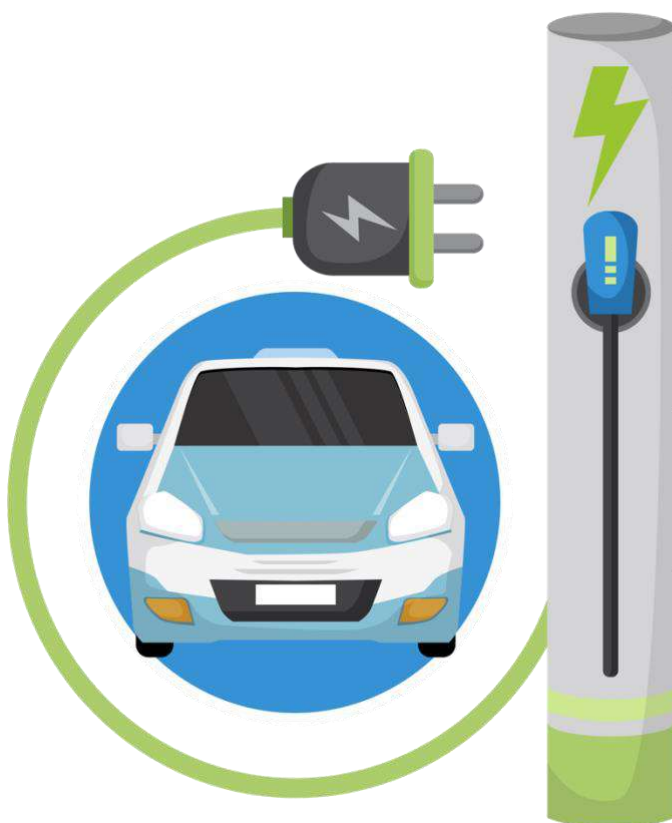
As per the new Industrial Policy for Delhi 2010-21, the Government is keen on developing and promoting the hi-tech, sophisticated, knowledge-based IT and ITeS industries in the state. For this, the Government has planned to set up 'Centre of Excellence' to promote innovation and entrepreneurship in the sectors.

Being one of the busiest places in the world, and rather infamous for the constant air pollution, Delhi Metro is the seventh busiest metro rail network in the world with 178.9 million people having used the service in 2017.

4.2.1 Delhi Electric Vehicle Policy (2018 Draft)

Under the new electric vehicle policy draft - Delhi Electric Vehicle Policy 2018, the Delhi Government aims to tackle the rising air pollution problem. As per the policy, electric vehicles inducted in the next 5 years are estimated to avoid approximately 4.8 million tonnes of CO₂ (carbon dioxide) emissions. They will also help avoid about 159 tonnes of PM 2.5 (fine particulate matter) tailpipe emissions.

POLICY HIGHLIGHTS



MANUFACTURING

- The GNCTD is committed to providing stable incentives with a view to encouraging long term investments by manufacturers, dealers and charging facility providers.

CHARGING INFRASTRUCTURE

- Providing accessible public charging/battery swapping facilities within 3 km travel from anywhere in Delhi is a key objective of this policy
- 100% of net SGST will be provided as reimbursement to EOs for purchase of Advanced Batteries to be used at swapping stations.

ENVIRONMENT PROTECTION

- Batteries that have reached their end of life will need to be either reused or recycled.
- EV batteries that cannot be re-used, either because of poor condition of the battery or lack of demand for reuse, will be sent to recycling facilities. At these recycling facilities, high value battery materials (e.g., Nickel and Cobalt) will be recovered and then sold to battery manufacturers for re-use.

RESEARCH & DEVELOPMENT

- In partnership with auto OEMs, EOs and BSOs, vocational courses will be designed to train EV mechanics and charging station staff.
- The GNCTD will conduct regular recruitment 'fairs' at the WCSCs for private sector recruiters who would like to hire trained personnel.

DEMAND CREATION

- Road tax and registration fees to be waived for all Battery Electric Vehicles during the period of this policy.
- Interest subvention of 5% on loans and/or hire purchase scheme for the purchase of an e-auto.
- Purchase incentive of ₹10,000 per kWh of battery capacity for first 1000 cars subject to a cap of Rs 1,50,000 per vehicle



The policy aims to drive the rapid adoption of Battery Electric Vehicles (BEVs) such that they contribute to 25% of all new vehicle registrations by 2024.

The Delhi EV Policy Draft is estimated to avoid approximately ₹ 6,000 crores in oil and liquid natural gas imports and 4.8 million tonnes of CO₂ (carbon dioxide) emissions. The state policy is targeted to achieve an increase in the number of registered EVs to 5,00,000 by 2023.

Within a year, the Delhi government is targeting the induction of 35,000 electric vehicles (2/3/4 wheelers and buses), 1000 electric vehicles for last mile deliveries and 250 public charging/swapping stations to come up. Additionally, in the next 5 years, the Delhi government is targeting to put 5 lakh new EVs register in Delhi due to this policy.

4.2.2 Passenger Public Transport in Delhi

Founded in 1948, the Delhi Transport Corporation (DTC) is one of the oldest running SRTUs in India. With a combined fleet strength of 6000 buses, DTC along with DMRC (Delhi Metro Rail Corporation) provides a rather robust public transportation system. Another unique feature that the DTC has is the completely CNG powered fleet. This initiative was taken by the government to help fight air pollution in the capital of the nation.

With the highly subsidised tickets, the financials of the Corporation don't look good. With each bus running into ₹16,000 worth of daily losses, the corporation has been under mounting financial pressure.

Substantial additions of buses to the public transport fleet are expected in the period 2019-2023. The Government NCT of Delhi

(GNCTD) committed to pure electric buses being at least 50% of all new state-carriage buses procured for the city fleet including for last mile connectivity, starting with the induction of 1000 pure electric buses in 2019. This will help achieve a target of making 50% of the public transport bus fleet zero emission by 2023. In addition, GNCTD has offered reasonable incentives to operators of private stage carriage vehicles of all sizes to ensure that battery electric vehicles make up least 50% of the entire public transport system in Delhi by 2023.

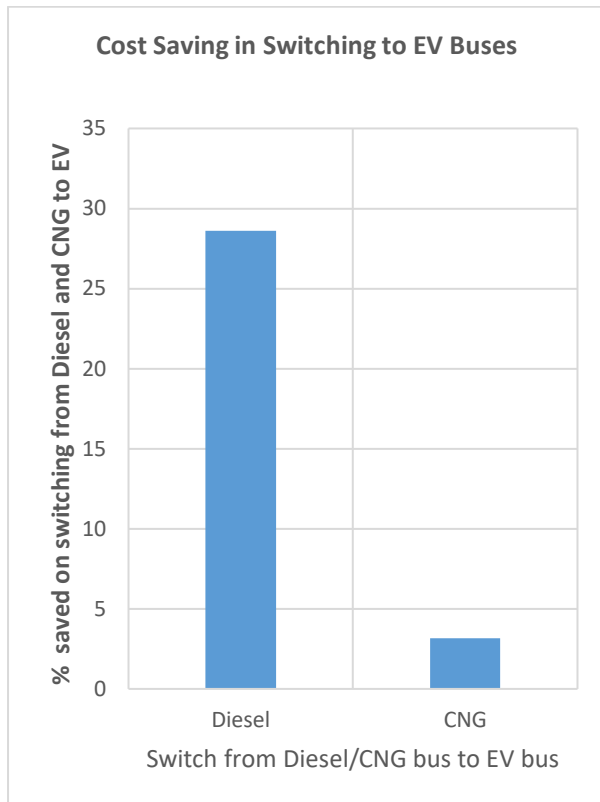
4.2.3 Impact of the Policy Intervention

In the national capital, the environmental benefits from an electric fleet are of significant importance considering the alarmingly high pollution levels in Delhi. Besides this, the Delhi Transport Corporation has been running in heavy losses and switching to an electric fleet will reduce running costs for the corporation.

Financial Impact

Despite having a higher capital expenditure, electric powered buses have a significantly lower operational and maintenance cost. They also have a longer life. The table below estimates the total cost of operating a Diesel, CNG and EV bus in Delhi per year.

Cost per Year(₹)	Diesel Bus	CNG Bus	Electric Bus
Fixed Cost	10,24,000	9,22,000	18,37,000
Variable Cost	26,00,000	17,50,000	7,50,000
Total Cost	36,24,000	26,72,000	25,87,000



Switching from a CNG bus to an EV one will result in a cost saving of 4% and from a diesel one to an EV one will save 29% of the costs.

While the aim of the EV policy is the reduction of overall levels of pollution in the city, the changing of the fleet into an electric one would also help in reducing the losses. Even though the Delhi fleet is CNG, the diesel fleet comparison has also been given.

Environmental Impact

With the reduction of pollutants in the air and increase in EV adoption, this policy when passes, will be a step towards the future and bring Delhi closer to other modern cities across the globes in terms of indicators other than GDP figures and literacy rates.

4.2.3 Key Takeaways

The draft policy mainly focuses on issues in the environmental front. This is justified considering the extremely poor air quality in the capital.

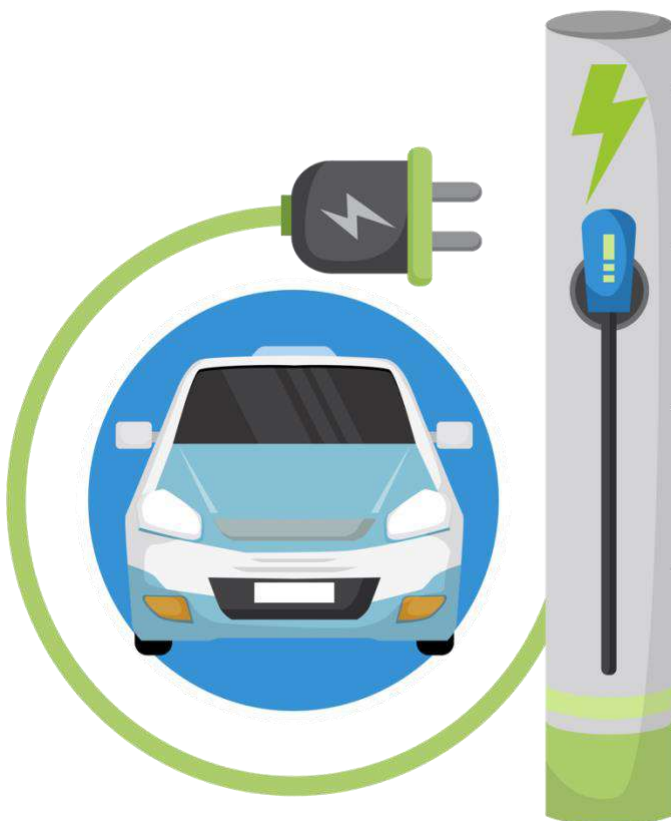
The key takeaways from Delhi’s initiatives to promote the electric mobility ecosystem are:

- The draft policy will bring about material improvement in Delhi’s air quality by reducing emissions
- The 50% targeted switch to electric powered buses will significantly reduce the financial distress the Delhi Transport Corporation is in currently
- There will be a support extended to creation of jobs in driving, selling, financing, servicing and charging electric vehicles

4.3 Maharashtra

Along with being the state with the largest chunk of the Indian GDP - ₹32.24 lakh crore, Maharashtra also houses the financial capital of the country, Mumbai. The state's infrastructure sector has grown significantly over the last decade, with a substantial rise in the number of industrial clusters and public-private partnership (PPP) projects. It is also the largest automobile hub in India and accounts for approximately 35.1% of the country's output of automobiles, by value. With a few major cities facing major congestion problems, the state has been looking to develop a sustainable transport system through electric mobility solutions.

According to MOSPI, the state accounts for 10.39% of the potential renewable energy capacity of India. With over 9000MW of installed capacity of renewable energy resources, a strong precedent for the usage of EVs as a standard in the automobile industry is set.



4.3.1 Maharashtra State Electric Vehicle Policy (2018)

With the mission of placing Maharashtra as a globally competitive state for electric vehicle and component manufacturing, and to maximize adoption of electric vehicles, the government launched the Maharashtra State's Electric Vehicle Policy, 2018.

The state aims to develop Maharashtra as the leader in electric vehicle manufacturing and create new employment opportunities in the sector. It also aims to promote export of electric vehicle components, battery and charging equipment and boost the research & development, innovation and skill development in the sector.

The overarching goal of the framework is to build a sustainable transport system and develop a greener Maharashtra.

POLICY HIGHLIGHTS

MANUFACTURING

- Package Scheme Incentives for MSME and large units will be applicable throughout the state for EV and EV related manufacturers.
- The package of incentives to pioneer units, mega units & ultra-mega units manufacturing electric vehicles shall be as per the 'Template of Incentives'

CHARGING INFRASTRUCTURE

- The electricity used for EV charging would be charged at residential prices all across the state.
- Provision of charging mechanism in commercial buildings such as malls, cinema complexes, hotels, apartments etc.
- Fast tracking of charging station applications, approval within 15 days.
- Capital subsidy of 25% or INR 10 lac per charging station.

ENVIRONMENT PROTECTION

- EV batteries will not include lead-acid batteries.
- Better utilization of cleaner energy and creating demand for additional installation of infrastructure.

RESEARCH & DEVELOPMENT

- Proposal to be prepared for the establishment of center of excellence and research and development centers.
- The Maharashtra State Board of Technical Education (MSBTE), Maharashtra State Skill Development Society (MSSDS) and other agencies will institute training-based certification and placement programmes.

DEMAND CREATION

- First 1000 EV buses would be eligible for user subsidy over policy period of 5 years.
- First 1,00,000 EVs would be able to benefit from end user subsidy over policy period of 5 years.
- Exemption from road tax and registration fee for all EVs.
- 15% subsidy (upto ₹5000, ₹12,000 and ₹1 lac for 2,3,4 wheelers) per vehicle. transferred within 3 months.



With its Maharashtra State’s Electric Vehicle Policy, 2018, the government targets to generate an investment of ₹25,000 crores in electric vehicles, electric vehicle manufacturing and component manufacturing, battery manufacturing and assembly enterprises and charging infrastructure equipment manufacturing in the state. Additionally, it envisions to create 1,00,000 jobs.

The state policy is targeted to achieve an increase in the number of registered EVs to 5,00,000 by 2023.

4.3.2 Passenger Public Transport in Maharashtra

The Maharashtra State Road Transportation Corporation (MSRTC) has a fleet size of 18,449 buses and has an estimated daily ridership of 67,00,000 passengers. Keeping in trend with the other SRTUs, on average each bus makes a loss of ₹ 600 daily. The figure for Pune is even higher, pegged at ₹ 2,200 while the figure for Mumbai is ₹ 1,100.

Initially Government of Maharashtra aims to promote EV in public transport in six cities i.e. - Mumbai, Pune, Aurangabad, Thane, Nagpur and Nashik.

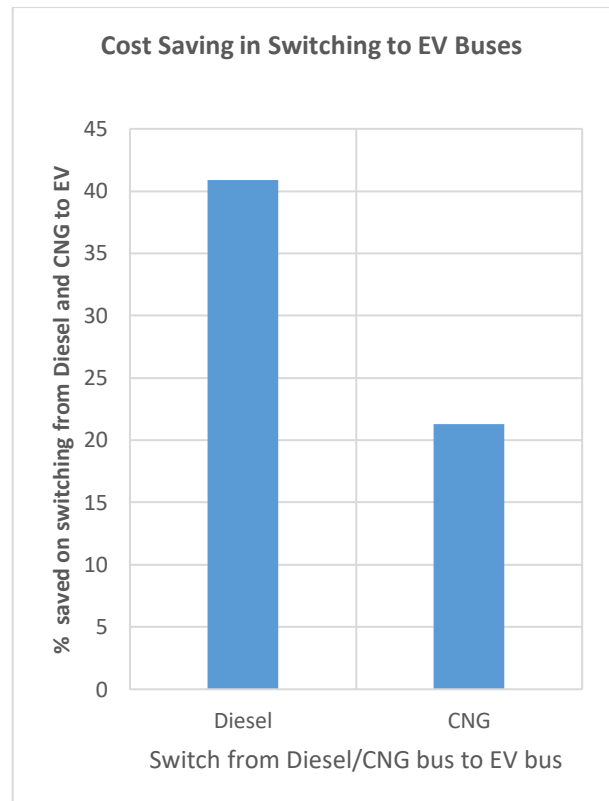
To incentivise and boost green buses, the first 1,000 EV private/public passenger bus buyer whose vehicles are registered in the state will be eligible for user subsidy over policy period of 5 years. Additionally, a provision of 10% subsidy for passenger buses registered in the state to private/public bus transport buyer, on base price (maximum limit of ₹ 20 lacs per vehicle) has been created.

4.3.3 Impact of the Policy Intervention

Financial Impact

Despite having a higher capital expenditure, electric powered buses have a significantly lower operational and maintenance cost. They also have a longer life. The table below estimates the total cost of operating a Diesel, CNG and EV bus in Maharashtra.

Cost per Year(₹)	Diesel	CNG	EV
Fixed Cost	10,24,000	9,22,000	18,37,000
Variable Cost	42,00,000	30,00,000	12,50,000
Total Cost	52,24,000	39,22,000	30,87,000





Switching from a CNG bus to an EV one will result in a cost saving of 21.3% and from a diesel one to an EV one will save 40% of the costs. As the table and the accompanying graph above suggest, the conversion of the fleet into EVs would not only help bring down the losses significantly but also help the state to push its own EV policy.

Impact on Employment

In addition to creating 1,00,000 new jobs, the Maharashtra EV policy targets to pulling in several thousand crores in investments and emerging as a new EV hub of the country. With the huge clean energy potential, the state will also benefit from cleaner air along with pushing additional installation and harnessing of cleaner energy.

4.3.4 Key Takeaways

Maharashtra's initiatives to develop a sustainable transport system are focused on the electric vehicle value chain and infrastructure chain. The key takeaways from the initiatives are:

- The policy offers multiple incentives to create demand for electric vehicles
- There is an emphasis on promoting research and development in the state by way of setting up centres and encouraging skill development in this sector
- Considering the state's capacity to generate renewable energy, electric vehicles in Maharashtra will have a significant positive impact on the state's environmental condition

4.4 Uttar Pradesh

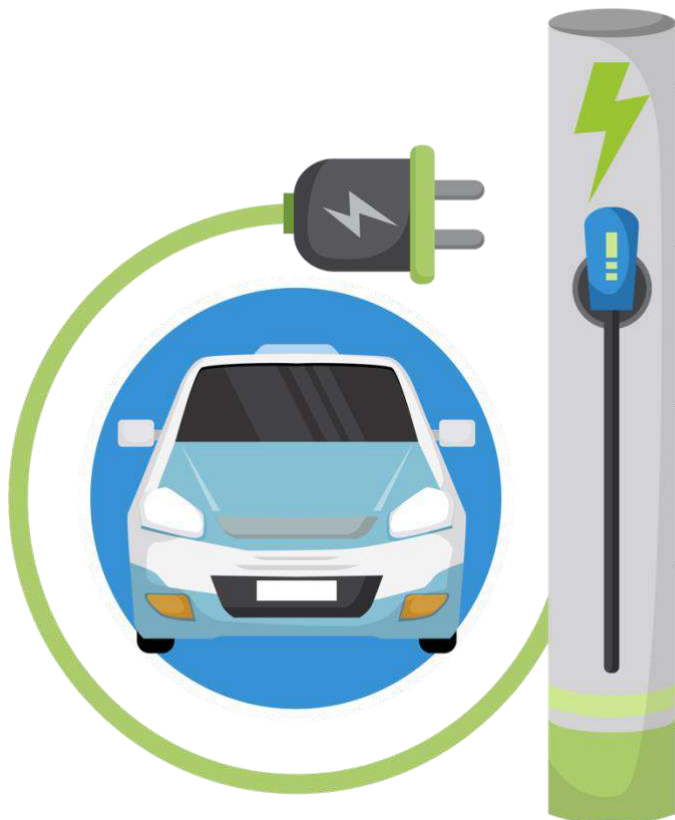
Uttar Pradesh, India's most populated state, houses over 20 crore people and at the same time also houses 11 out of the 14 most polluted cities in the country. The constantly rising pollution levels have been a cause for major concern for the state which has multiple industrial centers. In an attempt to build a greener UP, the government launched a comprehensive policy to push electric mobility in the state - Electric Vehicle Manufacturing and Mobility Policy (EVMMP). UP is also one of the country's biggest automobile consumer market with over 10% of the nation's registered vehicles being used in UP. By way of EVMMP the state aims to transform this automobile space and become the country's leading electric vehicle manufacturing hub and build a sustainable future.

4.4.1 Electric Vehicle Manufacturing and Mobility Policy (2019)

With a target of attracting investments of INR 40,000 crore over the next five years across the electric mobility space, EVMMP tries to incentivise all stakeholders in the electric mobility value chain.

The policy has deployed targeted financial incentives to boost manufacturing, research & development and demand creation.

Various incentives are provided under the EVMMP such as capital interest subsidy, infrastructure interest subsidy, technology transfer subsidy, exemption from stamp duty and SGST reimbursement. To boost demand, the state will also provide 100% exemption from vehicle registration and 100% exemption from road tax for two wheeler EVs.



POLICY HIGHLIGHTS

MANUFACTURING

- **EV Manufacturing Park:** Annual interest subsidy of up to 50% to buy land, 100% exemption of the stamp duty to the developer and 50% to the buyer
- **Large & Anchor EVMUs/EBUs:** SGST reimbursement ranging from 60% to 90%, depending on the size of the industry, 5% p.a. capital interest subsidy, 5% p.a. infrastructure interest subsidy, 100% exemption on electricity duty for new industrial units

CHARGING INFRASTRUCTURE

- Capital subsidy of 25% on fixed capital investment for first 1,000 stations
- Capital interest subsidy of 50% for setting up hydrogen enabled refueling infrastructure
- Special power tariff for EV charging

ENVIRONMENT PROTECTION

- Capital interest subsidy of 50% to large & anchor EVMUs and EBUs for setting up waste treatment plant
- Capital interest subsidy of 50% to large & anchor EBUs for setting up battery recycling infrastructure

RESEARCH & DEVELOPMENT

- Incentives as per UP startup policy for incubation centers facilitating EV mobility
- Encouragement of universities with excellence in automobile manufacturing to promote EV research & development
- Reimbursement of 75% of cost of patent registration and 50% of all charges paid for obtaining quality certification
- Setting up of quality testing facilities for manufacturers in the sector

DEMAND CREATION

- Exemption of 100% from vehicle registration fees
- Exemption of 100% from road tax for two-wheeler EVs
- Exemption of 75% from road tax for other EVs, for the first 100,000 buyers



The policy has identified ten cities as *EV Model Cities* including, Noida, Ghaziabad, Meerut, Mathura, Agra Kanpur, Lucknow, Allahabad, Gorakhpur and Varanasi for all new mobility initiatives in the first phase till 2020. These cities were chosen on the basis of their contribution to the state GDP and their industrial nature.

Keeping environment protection in mind, a capital interest subsidy has also been provided for large and anchor EVMUs for setting up waste treatment plants. UP also targets becoming a research and development hub for electric vehicles with a focus on next generation battery chemistry, fuel cell systems, powertrains, automotive electronics and electrical road systems. In addition, quality testing facilities will be set up across the state and will be accessible to manufacturers and service providers.

4.4.2 Passenger Public Transport in UP

The state's passenger public transport is managed by the Uttar Pradesh State Run Transportation Corporation (UPSRTC). There is a fleet size of over 11,833 buses carrying over 5481 lakh passengers annually. While the state corporation is one of the few profit-making transport units across the country, making a profit of ₹12 daily per bus, the profit is marginal. It is also one of the worst unit's when it comes to fuel efficiency.

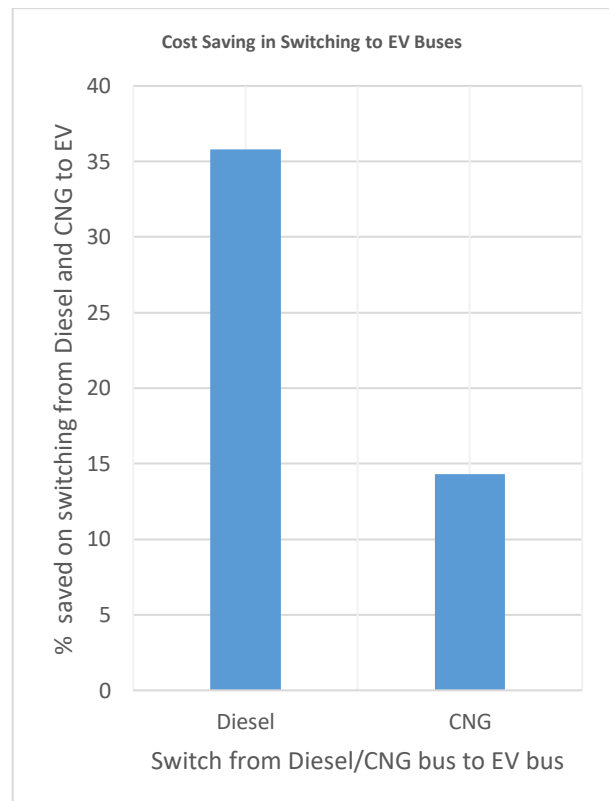
The UPEVMMP aims to launch 1,000 electric buses (that is 8.4% of the whole fleet) and achieve 70% electric powered public transportation on green routes in the identifies 10 cities, both by 2030. The financial and environmental impact of this will be immense.

4.4.3 Impact of the Policy Intervention

Financial Impact

Despite having a higher capital expenditure, electric powered buses have a significantly lower operational and maintenance cost. They also have a longer life. The table below estimates the total cost of operating a Diesel, CNG and EV bus in Uttar Pradesh.

Cost per Year(₹)	Diesel	CNG	EV
Fixed Cost	10,24,000	9,22,000	18,37,000
Variable Cost	44,00,000	31,40,000	16,45,000
Total Cost	54,24,000	40,62,000	34,82,000





Switching from a CNG bus to an EV one will result in a cost saving of 14.3% and from a diesel one to an EV one will save 35.8% of the costs. Changing 8.4% of UP's fleet to electric buses will significantly boost the SRTC's profitability.

4.4.4 Key Takeaways

Uttar Pradesh's policy focuses heavily on developing the state into the leading electric vehicle manufacturing hub of the country. The set targets might be termed ambitious but the schemes supporting them have the capacity to turn the vision into reality.

The key takeaways from the policy initiatives are:

- The framework offers a plethora of incentives to boost manufacturing, infrastructure and demand creation
- Environment protection measures during the process of electric vehicle manufacturing has also been kept as a priority
- Financially, considering that the state is on its way to adopting an EV bus fleet, it can save close to ₹19.5 lakh annually per bus (on switching from a diesel bus to an EV bus)
- The targeted investment has the potential to create skilled employment for about 50,000 people

4.5 Tamil Nadu

Tamil Nadu, the second largest state economy in the country which contributes to 8.4% of India's GDP, is an economic powerhouse of the nation with a very strong and diverse industrial base.

Sustained economic development and an expanding road network has led to rapid increase in the number of motorized vehicles in Tamil Nadu. In addition to being highly efficient in reducing local air pollution, electric vehicles also lead to a reduction in overall pollution when energy is generated from clean or renewable sources. Given that pure electric vehicles have 0 tank to wheel emissions, the cleaner the source of electricity, the cleaner is the vehicle. This is particularly relevant for Tamil Nadu, which is the leader in renewable energy with an installed capacity of 12,180 Megawatt.

Possessing the highest vehicle population in the country and the highest rate of urbanisation in the country, with close to 50% of the population residing in urban areas, the state's motor mobility is under mounting pressure. Rising air pollution accompanied with a spike in motor accidents has raised alarms and pushed the state to actively counter the mobility challenge. Consequently, the Government of Tamil Nadu has launched multiple initiatives to reduce air pollution and congestion on roads. Schemes under the umbrella of Vision 2023 being some of the most ambitious ones.

4.5.1 Vision 2023 (2019 Draft)

Drafted in September 2019, Vision 2023 Tamil Nadu envisages the state to be a prosperous and progressive state. In order to build a greener Tamil Nadu, the formulation of a dedicated Electric Vehicles Policy was imperative.

POLICY HIGHLIGHTS

MANUFACTURING

- **Special package of incentives for units with either more than INR50 crore investment or 50 jobs –**
 1. Reimbursement of SGST
 2. Capital Subsidy
 3. Tax Exemption
 4. Special economic zones

CHARGING INFRASTRUCTURE

- Capital subsidy for private operators setting up charge stations
- Provision of charging mechanism in commercial buildings such as malls, cinema complexes, hotels, apartments etc.
- Charging station at 25 KM distance, on both sides. On NHAI and state highways.

ENVIRONMENT PROTECTION

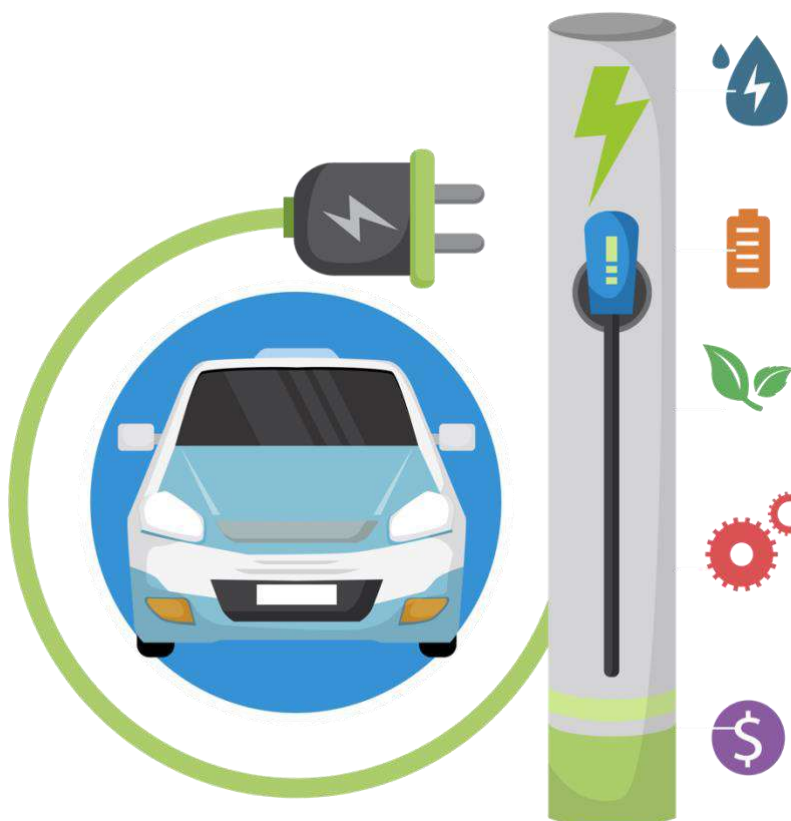
- Supply of Renewable Energy will be ensured on preferential basis at for EV charging stations with zero connection cost.
- Recycle and reuse used batteries and dispose the rejected batteries in an environment friendly manner to avoid pollution.

RESEARCH & DEVELOPMENT

- Research programs in collaboration with EV industry with a focus on battery innovation will be introduced in Engineering Colleges / Universities.
- Establishing Centres of Excellence for conducting market focused research on Battery Technologies, Battery Management, EV Motors and Controllers.
- Government will seek industry participation and leverage with Government of India to provide grant to these centres.

DEMAND CREATION

- Exemption from vehicle registration fees as per GOI notification.
- Exemption of 100% from road tax for all EVs till 31.12.2022





It is the vision of the Government of Tamil Nadu to attract ₹50,000 crore (₹500 billion) of investment in electric vehicle manufacturing and create a comprehensive electric mobility ecosystem in the state. Investment of this magnitude is expected to create 1.5 lakh new jobs.

Keeping environment protection in mind, a capital interest subsidy has also been provided for large and anchor EVMUs for setting up waste treatment plants.

Additionally, an Electric Vehicle Venture Capital Fund will be created by the Government to offer financial support to EV start-ups to enable them to scale up their business.

4.5.2 Passenger Public Transport in Tamil Nadu

The state's passenger public transport is managed by the Tamil Nadu State Transport Corporation (TNSTC). There is a fleet size of over 21,000 buses carrying over 5481 lakh passengers annually. While TNSTC handles one of the biggest fleets in the country, it also is riddled with the issue of being a loss-making public enterprise. According to the state SRTU data, each bus makes an estimated loss of nearly ₹2500 per day.

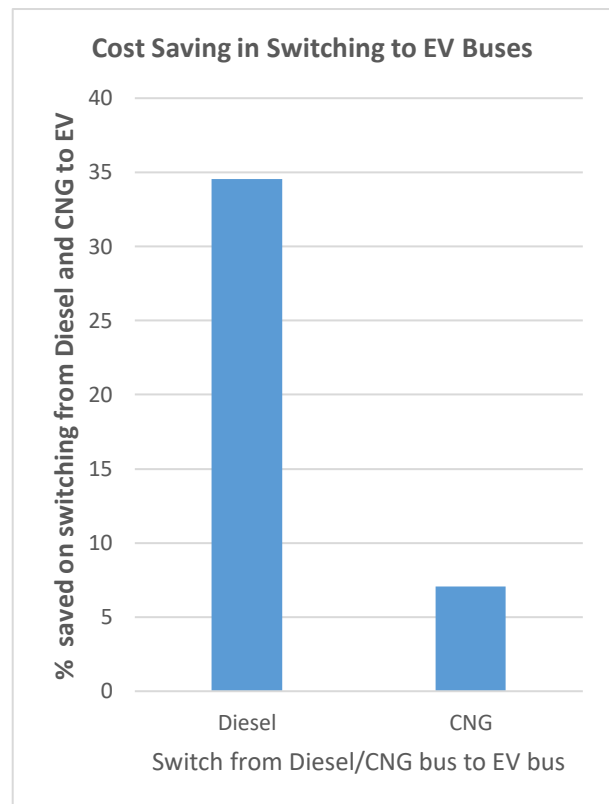
By way of Target 2030, the state corporation aims to launch 1,000 electric buses (that is about 5% of the whole fleet) annually until a completely electric fleet is achieved. The financial and environmental impact of this will be immense.

4.5.3 Impact of the Policy Intervention

Financial Impact

Despite having a higher capital expenditure, electric powered buses have a significantly lower operational and maintenance cost. They also have a longer life. The table below estimates the total cost of operating a Diesel, CNG and EV bus in Uttar Pradesh.

Cost per Year(₹)	Diesel	CNG	EV
Fixed Cost	10,24,000	9,22,000	18,37,000
Variable Cost	27,00,000	17,00,000	7,00,000
Total Cost	37,24,000	26,22,000	24,37,000





Switching from a CNG bus to an EV one will result in a cost saving of 7% and from a diesel one to an EV one will save 34% of the costs. Changing the fleet to electric buses will significantly bring down the TNSTC's losses.

Impact on Employment

As the state not only indulges in bringing in investments from vehicle manufacturers all across the globe but also revamps educational programs to cater to the R&D needs, the 'educationally intellectual standards' are bound to go up. Additionally, an estimated 150,000 jobs will be created.

4.5.4 Key Takeaways

All in all, the state aims to create and nurture a conducive environment for the electric mobility ecosystem. With an additional focus on promoting research and development in the sector, Tamil Nadu aims to support an environment of innovation. The key takeaways from the initiatives are:

- Electrification is promoted by building an enabling environment for the sector and focusing on infrastructure
- Robust infrastructure for charging is developed and boosted with a separate power tariff for electric vehicle charging



Challenges and Conclusion

Section 5 & 6



5. Challenges

While a nationwide move to electric vehicles, and specifically buses, seems like a financially and environmentally beneficial idea, it is a lofty idea at best. A phased transition is a more realistic idea. However, that too comes with its share of challenges.

Firstly, the high capital expenditure for electric buses is a major setback. It is nearly triple the cost of diesel and CNG buses. Electric buses do last for a longer time, normally for 20% more time than conventional buses but the fixed cost is a major challenge in the face of the move to electric buses. This holds true for electric cars too.

Secondly, the lack of a hyper-connected network of charging infrastructure across the country is a setback in the shift to electric powered buses. A pan-India charging network is essential for the adoption of electric fleets.

There is also a need to spread consumer awareness regarding the benefits of electric transport. Electric vehicles, especially four wheelers, are a higher financial burden on consumers. To push a switch from conventional vehicles, awareness campaigns regarding sustainability and renewable sources of fuel need to be conducted.

Lastly, to reap the environmental benefits of an electric bus, or vehicle, the electricity has to be sourced from a renewable source of energy. If it is drawn from traditional sources, the lifecycle emissions will be in the same range of those from CNG engines. To actually realise the benefits of electric powered vehicles, the move has to be supported by aggressive promotion of renewable energy. This has to be done not

just by way of stand-alone policies and, but by complementary initiatives to build a holistic framework.

6. Conclusion

This report analyses the existing policies for the promotion of electric vehicles and the financial and environmental impact of electric public transport. The magnitude of the financial and environmental benefits of electric buses make them an obvious choice to build sustainable cities.

While India envisions an electric fueled future, the road towards sustainable mobility requires getting all stakeholders on board. The change has to be driven at the central level to develop a pan India conducive ecosystem.

Currently, the policy scenario in the country is fragmented. Although 11 states have made headway towards an electric powered future, a centralized and complementary path is yet to be formed. The existing national framework acts as a guide to nurture the sector but falls short at bringing all stakeholders together in a holistic manner. There is a need for initiatives at the national front to transition the mobility system in India.

According to TSB observations across various states, working in silos will not benefit any state. States need to come together to build a knowledge pool from their experiences. Sharing best practices and shortcomings will go a long way in building an integrated national model enabling the movement towards electric powered mobility. The future is electric no doubt. However, the question remains, how efficiently will consumers embrace it?



The Strategy
Boutique
Honest Consulting

The Strategy Boutique
2nd Floor - First India Place, Sushant Lok-I, Phase 1,
Block-B, MG Road, Gurgaon – 122002, India (+91) 98 1000
1413 www.thestrategyboutique.com
consult@thestrategyboutique.com