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Roadmap for Private Sector Participation in Electric Mobility in Kolkata City

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1. Introduction

India is targeting to achieve USD 5 trillion economy in the next five years which will require significant contribution in the GDP from the manufacturing, agriculture, healthcare, services sectors etc. With the economic slowdown due to COVID-19 global pandemic, these sectors need to bounce back to their pre-pandemic growth rate in order to achieve the USD 5 trillion GDP target in the next seven to eight years. This will witness a major transformation in the energy usage pattern as compared to current situation leading to increased dependency on crude oil imports to cater to the increased demand for energy.

With transport sector being one of the biggest consumers of oil and oil products, reduced consumption of crude oil will not only decrease GHG emission and reduce import dependency but will also have substantial positive impact on the sustainable development and energy security scenario of the country. Therefore, transportation sector needs to undergo a significant transformation from oil-based system to a more environment friendly electricity-based system and should involve the entire transportation system including the last mile connectivity in far remote areas. India as a party to the Paris Agreement have well acknowledged the contribution of transport sector and included adoption of Electric Vehicle as a prioritized action item in the country's NDC.

1.1 E-Mobility Initiatives in India

India started its journey towards electrification of transportation in 2013 with the launch of National Electric Mobility Mission Plan (NEMMP) 2020 by Government of India (GoI) which envisages introduction of about 6-7 million electric/hybrid vehicles in India by the year 2020. Several ministries and departments including the Ministry of Road Transport and Highways, Department of Heavy Industry, Ministry of Finance, Ministry of Housing and Urban Affairs, Ministry of Power, Ministry of New and Renewable Energy, NITI Aayog etc. have come up with various guidelines and roadmaps to accelerate the growth of electric mobility in the country. As a part of NEMMP, Faster Adoption and Manufacturing of Electric Vehicles (FAME) India scheme was introduced in 2015, with the objective to promote the use of EV and EV manufacturing eco-system. The first phase of FAME scheme has been extended in 2019 as FAME II for the next three years with a total outlay of INR 100 billion in order to support the development of both EV and EV charging infrastructure by providing support in terms of incentives to EV buyers, state transport utilities and select agencies for setting up public charging stations.

86 percent of FAME II fund has been allocated for demand side incentives by supporting 7000 electric buses; 500,000 electric three wheelers; 55,000 electric four wheelers including strong hybrid (passenger cars); and 1 million electric two wheelers

According to Ministry of Heavy Industries and Public Enterprises (MHIPE) about 285,000 buyers of electric and hybrid vehicles have been benefitted from the subsidies provided under the FAME I scheme and under FAME II till now 26,967 electric vehicles have been sold - 1284 four wheelers; 6221 three wheelers; and 19463 two wheelers.

In addition to electric two, three and four wheelers, Department of Heavy Industries (DHI) also allocated grant for 5595 buses to 64 cities for intracity and intercity operations. Metropolitan cities like Delhi, Mumbai, Hyderabad, Bangalore and Ahmedabad have been allocated 300 buses each. For intercity operations 400 buses have been sanctioned to eight state transport undertakings with 50 buses each and Delhi Metro Rail Corporation has received 100 buses for ensuring last mile connectivity in Delhi NCR.

According to Rocky Mountain Institute, If FAME II and other measures are successful, India could realize EV sales penetration of 30% of private cars, 70% of commercial cars, 40% of buses and 80% of two and three-wheelers by 2030

To support the operation of these electric vehicles, Govt. of India also took initiative to create a network of charging stations and DHI allotted 2636 charging stations (1633 fast charging stations and 1003 slow charging stations) in 62 cities across 24 States/UTs under FAME II (number of charging stations allotted to some of the states is listed below).

Sl. No.	State	Number of charging stations
1	Maharashtra	317
2	Andhra Pradesh	266
3	Tamil Nadu	256
4	Gujarat	228
5	Uttar Pradesh	207
6	West Bengal	141
Table 1: Allocation of charging stations to cities under FAME II		
Source: DHI		

Apart from central government, 14 state governments like Delhi, Karnataka, Maharashtra, Uttar Pradesh, Andhra Pradesh, Kerala, Telangana, Tamil Nadu, Bihar Uttarakhand etc. have come out with their respective state policies focusing on manufacturing and deployment electric vehicle and charging infrastructure in the state. Some of the key aspects of these state policies cater to various benefits such as:

States	Andhra Pradesh	Delhi	Karnataka	Kerala	Maharashtra	Tamil Nadu	Telangana	Uttar Pradesh
Investment Targets	₹ 30,000 Cr ($ 4300 Mn)	-	₹ 31,000 Cr ($ 4400 Mn)	-	₹ 25,000 Cr ($3600 Mn)	₹50,000 Cr ($7000 Mn)	₹ 30,000 Cr ($ 4300 Mn)	₹ 40,000 Cr ($ 2900 Mn)
Employment Targets	10,00,000	-	55,000	-	1,00,000	1,50,000	50,000	50,000
Vehicle Penetration Targets	1,000,000 EVs on the road by 2024	25% of all new vehicle registrations by 2024	Produce and ply 40 EV bus, 100 four wheeler and 500 three wheeler	Target 2022: 1 million EVs on road.	5,00,000 EV's on road till 2023	To add 1000 e-buses every year	100% migration to EV by 2030	Target 2030: 1 million EVs in all categories and 70% of public transport to be electric
Subsidies	10% capital subsidy	Registration and road tax waiver	25% capital subsidy	Road tax exemption for first three years	15% subsidy to first 100,000 EV registered	Capital subsidy of 15% for 10 years	capital subsidy of up to 25%, capped at 5 lakh	capital subsidy of up to 25% for first 100 stations

States	Gujarat	Goa	Uttarakhand	Bihar	Madhya Pradesh	Punjab	Chandigarh
Investment Targets	₹10,000 Cr ($1330.1 Mn)	-	-	₹2500 Cr ($332.92 Mn)	-	-	-
Employment Targets	-	10,000	-	10,000	-	-	-
Vehicle Penetration Targets	Setup charging infrastructure every 75km on highways	30% of vehicle registered annually would be electric by 2025	Initial target of 500 e-buses	INR 10,000 for E-Rickshaws using Li-ion batteries.	25% of all new public transport registration would be electric by 2026.	30% private cars, 70% commercial cars, 40% of buses and 80% of 2W and 3W to be electric by 2030	1000 public chargers and only EV registration in the city after 2030
Subsidies	25% of capital cost (max. Rs. 10 lakhs)	-	Motor tax exemption for first 100,000 customers for 5 years	Exemption of road tax and registration fee for EV's	Road tax exemption and free parking for first 5 years for all type of vehicle	Exemption of road tax and registration charges for all type of vehicle	30% subsidy on installation of home chargers

Figure 1: State wise targets and Incentives

On the charging infrastructure side, Ministry of Power, Govt. of India, also came up with guidelines on implementation of Public Charging Station which mentions the following charger specification to be implemented:

Charger Type	S. No	Charger Connectors	Rated Output Voltage (V)	No. of Connector Guns (CG)	Charging Vehicle Type (W – wheeler)
Fast	1	Combined Charging System (CCS) (min 50 kW)	200-750, or higher	1 CG	4W
	2	CHArge de MOve (CHAdeMO) (min 50 kW)	200-500, or higher	1 CG	4W
	3	Type-2 AC (min 22 kW)	380-415	1 CG	4W, 3W, 2W
Slow/Moderate	4	Bharat DC-001 (15 kW)	48	1 CG	4W, 3W, 2W
	5	Bharat DC-001 (15 kW)	72 or higher	1 CG	4W
	6	Bharat AC-001 (10 kW)	230	3 CG, 3.3 kW each	4W, 3W, 2W

Table 2: Ministry of Power Guidelines on EV Charging Infrastructure

Source: MoP

With these policies in place and central govt. initiatives, the investment opportunity for the private sector has increased many folds in the EV and charging infrastructure space and various corporates and start-ups have started entering in to this space with varied capabilities like charging station implementation and operation, shared mobility, battery swapping etc.

This report will evaluate the private sector participation potential in electric three-wheeler and electric four-wheeler segment in the city of Kolkata and will provide recommendation in terms of business models, policy measures, and electricity tariff design etc. to accelerate the same.

2. E-mobility in Kolkata

Kolkata is the first city in India which introduced the electric tram service in 1902 which is still running on 550V DC traction system stretching 146 km in the city core. According to the World Health Organization, Kolkata is the 20th most populated city in the world, and lists third among the Indian cities. With expansion of the city over the years, the share of public transportation has also

experienced both growth and diversification with a greater number of buses, 3 wheelers and cars and dwindling number of trams. Air quality of the city is deteriorating as a result of constantly increasing number of vehicles which further slows down the entire traffic and further leading to increase in air pollution. According to a study by the Centre for Science and Environment in 2018, Kolkata ranked seven out of top 10 megacities in terms of total particulate emission load from urban commuting.

In order to address this spurge in both the carriage and the content and the resultant environmental concerns, West Bengal Transport Corporation (WBTC) in-charge of the State Government owned Bus Services, Tram Services and Ferry Services in Kolkata City, has undertaken an ambitious initiative to deploy clean public transportation system in Kolkata. As a part this initiative, WBTC had procured 80 electric buses (40 nos. 9 metre and 40 nos. 12 metre) under the FAME I scheme of the Government of India and is currently operating these buses in 12 different routes which are mainly slow moving or congested routes and features connectivity to different railway stations, airport and business centres across the city.

Route of Electric Buses	*Number of buses operating*	*Route of Electric Buses*	*Number of buses operating*
Howrah- Kamalgazi	8	Joka- Newtown	7
Howrah – Shapoorji	8	Tollygunge - Janakalyan	6
Tollygunge-Ecospace	6	Nabanna- Rathtala	5
Rajchandrapur-Karunamoyee	8	Tollygunge- Karunamoyee	8
Tollygunge-Airport	7	B.Garden – Sulekha	6
Rathtala - Sulekha	6	Digha- Contai/ Egra	5
Table 3: Electric Bus Routes in Kolkata			
Source: WBTC			

In order to support the operation of these buses, WBTC also procured 80 charging stations which have been installed in 10 bus depots and 9 bus termini maintained by WBTC. Out of these 80 charging stations, 66 charging stations comprising of 56 slow charging stations of 60 kW each and 10 fast charging stations of 120 kW (double gun of 60 kW) each have been installed in 10 depots to facilitate both overnight charging and opportunity charging in between trips respectively whereas one fast charging station of 120 kW (double gun of 60 kW) is placed in every terminus with two termini having two fast charging stations to facilitate opportunity charging in between the trips for the electric buses. The civil and electrical infrastructure in these depots and termini has also been upgraded accordingly in terms of construction of shed, installation of transformers, cables for power supply etc. to ensure safe and secure parking for these buses and to meet the power supply requirement of the charging stations respectively.

Depot	*Number of buses*	*Depot*	*Number of buses*
Nonapukur	8	**Belghoria**	8
Lake	8	**New Town**	10
Thakurpukur	8	**Howrah West**	7
Gariahat	8	**Kasba**	10
Salt Lake	8	**Digha**	5
Table 4: Number of Electric Bus in each Bus Depots			
Source: WBTC			

Bus depot	*Number of chargers installed & rating*	*Bus termini*	*Number of chargers installed & rating*
Nonapukur	1x120 kW & 7x 60 kW	**Santragachi**	1x120 kW
Lake	1x120 kW & 6x 60 kW	**Nabanna**	1x120 kW
Thakurpukur	1x120 kW & 6x 60 kW	**Howrah Station**	2x120 kW
Gariahat	1x120 kW & 6x 60 kW	**Karunamayee**	1x120 kW
Salt Lake	1x120 kW & 6x 60 kW	**New Town Bus stand**	1x120 kW

Belghoria	1x120 kW & 6x 60 kW	**Airport**	1x120 kW
New Town	1x120 kW & 6x 60 kW	**Garia**	1x120 kW
Howrah West	1x120 kW & 6x 60 kW	**Tollygunge**	2x120 kW
Kasba	1x120 kW & 6x 60 kW	**Rajabazar**	1x60 kW
		Proposed: Baruipur, Esplanade, & Joka	
Digha	1x120 kW & 1x 60 kW		

Table 5: Number of Charging Stations in each Bus Depots and Terminus

Source: WBTC

With this initiative, Kolkata has become the first city in India to successfully operate 80 nos. electric buses and also received C40 Cities Bloomberg Philanthropies Award in the 'Green Mobility' category in 2019. However in Kolkata as of 2020, 7500 private buses are operating in 230 routes and are operated by 6000 operator mostly small organizations or individuals who struggle to survive in the business despite several challenges. These category require financial support for investment in fleet conversion to electric buses. Unlike WBTC, the private bus operators do not have depots for parking the buses at night and are parked randomly at various places or streets. Hence setting up of dedicated charging stations for private buses is a major challenge.

Our interactions with various stakeholders have brought out strong reservations in any kind of investments by private bus operators as the business is not viable in the present context owing to multiplicity of problems faced by bus operators in terms of less revenue, high operating cost etc. e.g. as discussed with representative from Joint Council of Bus Syndicate, daily operating cost for a private diesel bus is INR 6000 whereas the daily revenue generation is INR 6500 to INR 7000.

Besides public buses, there are large number of private buses running in the city – schools, hospitals, corporates, police, postal services, tour operators etc. run their buses for daily operation and this segment could be taken up in the first phase for electrification. Like taxi fleet operators, charging facilities for these buses may be setup by the respective agencies. These buses may be allowed to be charged from WBTC's charging facilities at various bus depots and termini.

In the second phase, (say from 2025), permits for all new buses in the city should be issued only for electric buses. This will gradually increase private participation; and existing diesel buses may be phased out by 2035.

In addition to buses, private participation is also negligible in the three and four wheeler segment apart from electric rickshaws which are plying in various small towns and cities for providing last mile connectivity. Under FAME II, 462 nos. electric vehicles were sold in the state of West Bengal including 6 nos. electric four wheelers, 1 no. electric three-wheeler (L5M), 387 nos. electric rickshaws and 68 electric two wheelers. Electrification of these vehicle segments such as three wheelers and cab aggregators offer immense investment potential for private parties.

2.1 Electric Three Wheelers (e-autos and e-rickshaws)

Urban transportation system in India comprises of diverse mode of transportation including metro rail, buses, commercial taxis, auto rickshaws, private cars etc.; and auto rickshaws serves as both the part of main mode of transport in cities like Delhi, Bangalore as well as the last mile connectivity option in cities like Kolkata, Mumbai etc. Apart from this, its easy accessibility to commuters and its use as a para transit mode in cities made it an integral part of urban mobility.

City	*Population million (2011)*	*Auto's mode share among motorized transport*
Mumbai	13.8	20%
Pune	3.5	11%
Bengaluru	5.4	13%

Table 6: Auto Rickshaw Mode Share in Cities

Source: WRI (2012)

Electrification of auto rickshaws will play a major role in transforming city's mobility scenario by providing a clean and green mobility solution for meeting the last mile connectivity requirement. According to a study by TERI, ***an average conventional LPG auto emits approximately 0.005 tonne of Particulate Matter-10 (PM10) in a year and about 3.72 tonne of carbon dioxide in a year*** whereas electric auto rickshaws produce zero tailpipe emission and no noise pollution while meeting the expected mobility requirement of the cities.

Moreover, in India's strive towards electric mobility, e-rickshaw is the segment which has gained maximum momentum with more than 2 million e-rickshaws currently running across the country. Considering the extent of adaptability in many parts of India, in 2015 Govt. of India has amended the Motor Vehicle Act, 1988 and allowed exemption of license for e-rickshaws having seating capacity of 5 persons and motor power rating of up to 4000 watt (4kW) which made it easier for the segment to grow. Recently, Ministry of Road, Transport and Highways (MoRTH) directed Transport Commissioners of all the states and Union Territories to allow sale and registration of EVs (electric two and three wheelers) without batteries as de-linking of battery cost from the vehicle will reduce the upfront capital cost of three wheelers by 30% to 40%.

Figure 2: e-rickshaw Specifications

Source: Ola Mobility Institute

In addition to these central government initiatives, several state governments have provided incentives to electric three wheelers some of which are mentioned below:

EV Policies	Incentives for electric three wheelers
Maharashtra	• Subsidy up to INR 12,000 for electric three wheelers • End user subsidy for 5 years for first 20,000 electric three wheelers • 25% capital subsidy on charging stations
Karnataka	• Encourage retrofitting of existing auto rickshaws and transition of entire fleet to electric three wheelers by 2030 • 25% capital subsidy on battery swapping stations and fast charging stations

Telangana	• Time bound mandate for all auto rickshaws within GHMC to switch to EV • Permission for ARAI certified e-rickshaws in fringe areas at the periphery of GHMC limits in predefined zones and routes • Extension of retro fitment rule to cover electric kits for auto rickshaws
Delhi	• Open permit for e-autos • Purchase Incentive of INR 30,000 per e-auto • Interest subvention of 5% on loans and/or hire purchase scheme for the purchase of an e-auto

Table 7: Incentives for electric three wheelers

On the charging infrastructure side, e-autos can be charged with portable chargers or fixed on-board chargers provided by their manufacturers or can be charged at public charging stations depending on their battery types and chargers available at the charging stations. Fleet operators normally use portable chargers. In addition, battery swapping stations can also be implemented to facilitate swapping of the discharged battery with charged battery to ensure continued operation of the e-autos and e-rickshaws.

Specification	*Portable charger (Programmable)*	*Fixed charger*
Input / Output	AC/DC	AC/DC
Input Voltage (V)	230/415	230/415
Output Voltage (V)	40-72	42-58
Maximum Output Current (A)	50	187
Output Power (kW)	1 to 3.3	6 to 9

Table 8: Specification of chargers for electric three wheelers

Source: AEEE

2.1.1 Electric Three Wheelers (e-autos and e-rickshaws) in Kolkata

In Kolkata, the auto rickshaws are considered as the most preferred option of intermediate public transport and last mile connectivity. As of 2018, there were approx. 44,000[1] registered auto rickshaws operating in the city of Kolkata in 125 permitted routes and these auto rickshaws operate in a fixed route transporting passenger from one place to another on a fixed fare basis. Considering the emission factor of approx. 3.72 tonnes of carbon dioxide in a year for LPG base auto rickshaws, the conversion of these 44,000 auto rickshaws to e-autos will save 1,63,680 tonnes of carbon dioxide every year. Besides, there are more than 1,00,000 e-rickshaws (lead acid battery) that are operating in the urban and sub-urban areas of Kolkata City for providing last mile connectivity to the daily commuters.

Routes having most no. of auto rickshaws	*Number of Auto Rickshaws*
Golpark – Gariahat	525
Ganesh talkies to Phoolbagan	420
Ultadanga Station to Jora Bagan Power House	390
Lohapool to Dharmatala	375
Dharmatala - Orient Row	355
Kimber Street (Park Circus) to Topsia	335
Sealdah Court Complex to CIT Building	315

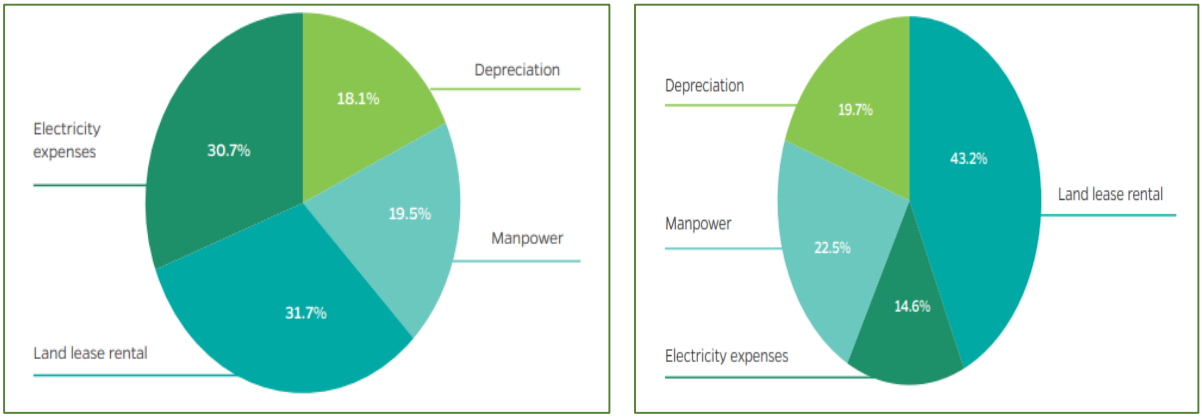
Table 9: Auto rickshaw Routes in Kolkata

Source: ISGF (2017)

Apart from the benefits of reduced carbon dioxide emission, e-autos are also cost effective due to its low operation and maintenance cost as compared to ICE based auto rickshaws. According to the Nagpur pilot project by OLA Mobility Institute, cost of operation of e-rickshaw is coming out to be INR

[1] https://www.statista.com/statistics/1075163/india-registered-auto-rickshaws-in-kolkata/#:~:text=Number%20of%20registered%20auto%20rickshaws%20Kolkata%20India%202016%2D2018&text=In%202018%2C%20the%20number%20of,Kolkata%20was%20around%2044%20thousand.

3.73/km and the key components contributing to the cost are land cost for charging stations and cost of electricity which can be addressed by effective policy measures including reduced tariff for electricity, capital subsidy on charging stations and introduction of battery swapping which requires less space and offers lesser wait time as compared to charging stations.



Source-OLA Mobility Institute

Figure 3: Charging infrastructure cost break up before and after Maharashtra EV policy

2.2.2 Roadmap for Private Sector Participation in electric three wheelers in Kolkata

Based on our assessment, it can be inferred that e-autos and e-rickshaws offers several benefits in terms of reduced air pollution, low operation and maintenance cost, no noise pollution etc. and considering these benefits Government of West Bengal should take necessary steps to facilitate electrification of this vehicle segment on fast track. As this segment is mainly operated by private sector, conducive policy measures in terms of regulation for e-rickshaw operation, incentives, parking benefits, tax exemption, and other attractive business models could propel this transition. Offers such as e-autos getting open permit, priority entry to business areas etc. need to be introduced to attract the private sector participation. Some of the measures that could help the sector are mentioned below:

Roadmap for Private Sector Participation			
Key Areas of Intervention	**Immediate (next 2 years)**	**Near-Term (3-5 years)**	**Long Term (6-8 years)**
Proposed Deployment	e-autos to be mandatory in the routes where number of auto rickshaws are more than 300 or higher	50% of the total auto rickshaws registered in the city to be changed to e-autos	100% e-auto deployment across the city
Policy and Regulations	• Formulate guidelines for registration of e-rickshaws • Formulate EV policy • e-autos and e-rickshaws to be included under Gatidhara scheme for extending the financial benefit • Formation of an EV cell comprising of members from KMC, WBTC, CESC and WBSEDCL for fast track implementation of EV projects	• Creation of state fund by levying pollution cess, additional road tax etc. on ICE vehicles which can be used to subsidize EVs • Promote local manufacturing and/or assembly of EVs, batteries and components, and charging stations • Stop new registration and renewal of permits for internal combustion engine (ICE) based auto rickshaws	• Enable large scale local manufacturing and import of EV batteries and components

	• State government should promote retrofitment and provide subsidy on electric drive train • Single window clearance for registration and vehicle transfer process and issuance of permits for e-autos and e-rickshaws • Standard guidelines and single-window clearance for approvals from Municipal authorities and other Statutory bodies for the construction and operation of charging stations and battery swapping stations • Conduct public education and outreach to raise awareness to use e-autos and e-rickshaws	• Complete Phase out of e-rickshaws with lead acid batteries •	
Incentives	• Exemption from registration charges and road tax • Free parking for EVs • GST rate should be rationalized on EVs and EV components • Capital subsidies on batteries to reduce the upfront cost of the e-autos • Ease import duties for lithium-ion batteries, chargers	• Exempt import and custom duty on EVs and EV components • Scrapping incentive to auto rickshaw owners which is redeemable only if e-autos are purchased • Reduced GST on charging stations and battery swapping stations • Reduced property tax for EV and battery manufacturers	• Incentives for engaging in demand response activities through vehicle grid integration activities
Business Model	• Creation of dedicated EV zones near corporate hubs and business centres • Declaration of few congested routes as green routes with EV only mandate • Concessional locations for battery swapping stations at bare minimum lease rental • Charging stations or battery swapping stations to be installed at places like hotels, super markets, parking areas, government buildings etc. nearby to the start and the end point of the route in which e-autos are operating	• Commercial ownership of e-autos to be allowed • Reimbursement of 100% of net SGST, accrued to the State, should be provided to BSOs for purchase of advanced batteries to be used at swapping stations	• Consider secondary use of retired batteries for stationary and grid applications
Electricity Tariff Design	• WBERC to notify separate tariff for EV charging and should not exceed average cost of supply	• WBERC to notify separate tariff for battery leasing agencies, including enabling Vehicle Grid Integration services	• Enable electricity market redesign to use Battery Leasing Agency's charging

	• Demand charge to be exempted from electricity tariff for EV charging for first 5-7 years • e-rickshaws can be charged at home in the night which may be permitted by the electric utility under special category (EV) or commercial consumer category	• Integration of renewables introduction of Time of Use tariff for EVs to address load variability	infrastructure as grid resources

Table 10: Roadmap for Private Sector Participation

2.2 Electric Four Wheelers (Shared Mobility)

India's shared mobility market has undergone significant transformation with the introduction of app based services like OLA and UBER and has also increased the usage of passenger cars as one of the major mode of public transport in the metropolitan cities like Delhi, Mumbai, Kolkata, Bangalore etc. In addition, various app based delivery services like Grofers, BigBasket are using four wheeler goods carrier for delivering goods to their customer. Therefore transition to electric vehicle for these commercial fleet will have significant impact on the electric vehicle uptake and consumer awareness. Moreover, the shared mobility services owing to their higher daily distance coverage will contribute significantly to the fuel savings and greenhouse gas emission factor which are considered as the major drivers of electric mobility transition.

Source: OLA Mobility Institute

Figure 4: e-car specifications

Considering this advantage, various companies have entered the commercial operation of electric car e.g. in the B2B segment companies like Lithium Urban Technologies started all electric transport fleet for corporates, Mahindra Electric started a connected mobility service called Glyd using electric cars whereas in B2C segment OLA carried out a pilot project in Nagpur, Maharashtra and companies like BluSmart are operating an all-electric fleet in Delhi NCR.

A study by NITI Aayog (2018) estimates that shared vehicles could reduce annual mobility demand by nearly 1,800 billion vehicle-km in 2035, by improving asset utilisation with high adoption of ride-sharing and public transit

Apart from private sector participation, Government of India also allocated subsidy for 370 electric four wheelers to four different cities namely Kolkata, Ahmedabad, Bengaluru and Indore under FAME

I scheme and more than 1500 electric cars have been delivered to Energy Efficiency Service Limited as of October, 2019. Various state governments have come up with their respective state policies to promote the transition of commercial fleet and corporate fleet in to electric fleet.

EV Policies	Incentives for electric four wheelers
Maharashtra	• 15% subsidy per vehicle up to max INR 100,000 • End user subsidy for 5 years for first 10,000 electric four wheelers • Exemption of road tax and registration fees
Karnataka	• Exemption of taxes for all electric non-transport and transport vehicles • Capital subsidy of 25% on charging equipment (max INR 500,000 per station for first 50 station)
Telangana	• Intracity goods delivery services to switch to EV by 2030 • 25% of commercial vehicle fleet to EV by 2022 and 100% by 2030 • Corporate offices with annual turnover of INR 10 million plus operating within GHMC limits to compulsorily migrate 25% of their employee commuting fleet to EVs by 2022 and 100% by 2030
Delhi	• Purchase Incentive of INR 10,000 per kWh of battery capacity shall be provided per electric four-wheeler for first 1000 e-cars • Purchase Incentive of INR 30,000 to the first 10,000 e-Carriers • Interest subvention of 5% on loans on purchase of e-Carriers • INR 7500 as scrapping incentive to purchasers of e-carriers

Table 11: Incentives for electric four wheelers

Although various initiatives have been undertaken by both public and private sector, the uptake of electric cars in the commercial fleet space is still limited which is mainly due to the lack of charging infrastructure and to facilitate this, DHI has allocated subsidy for implementation of 2636 charging stations in 62 cities in 24 states/UTs to accelerate the adoption of electric vehicle in the country.

2.2.1 Electric Four Wheelers (Shared Mobility) in Kolkata

Four wheelers in Kolkata for commercial operation is mainly dominated by cab aggregators like OLA, UBER and local taxi which also serves as one of the major modes of transport for the daily commuters. As per city government data, Kolkata had 41,393 licenced taxis operating in 2015[2] but as per ISGF secondary research and from publicly available data, it is estimated that Kolkata has some 14,000 conventional taxis and 30,000 vehicles running under cab aggregators[3] (2017). With commercial and corporate fleets increasing in numbers, transition to electric vehicle provides immense opportunity in terms of fuel savings and reduced greenhouse gas emission. Electric four wheelers also offer low operation and maintenance cost. According to the pilot project of OLA Mobility Institute in Nagpur Maharashtra, cost of operation of EV in a fleet comes out to be INR 11.54/km with fixed electricity tariff of INR 5/kWh and the cost of operation can be reduced to INR 9.77/km with reduced land lease rental, zero registration and permit charges.

Considering these benefits, New Town Kolkata Development Authority has already established 11 EV charging stations and proposed to reserve 2 percent mandatory space for parking of electric vehicles

[2] West Bengal Statistical Book 2015

[3] http://www.thehindubusinessline.com/economy/logistics/kolkatas-yellow-cabs-to-roar-on-tygr-app/article9640379.ece

with charging facility in new buildings. Govt. of West Bengal along with Energy Efficiency Services Limited (EESL) is also planning to install another 400 EV charging stations across the city of Kolkata and EESL has also proposed to the state government to provide electric sedans on two lease models i.e. on dry lease at INR 22,500 per month and wet lease at INR 37,000 per month for a period of six years.

2.2.2 Roadmap for Private Sector Participation in electric four wheelers in Kolkata

Considering these benefits, Government of West Bengal may take necessary steps to facilitate the electrification of commercial taxi fleets. Besides, cab aggregators, corporate fleets, various private fleets are operating from different parts of Kolkata for transporting daily commuters to corporate hubs and business centres like Salt Lake and New Town which offers significant opportunity for the electric mobility transition to have an impact. To facilitate this transition state government should come out with effective policy measures including incentives for scrapping of old vehicles, exemption of registration fee and road tax etc. and business models like EV only entry to select zones in the city and business centres etc. to attract the private sector participation. Key measures that may be undertaken are mentioned below:

Roadmap for Private Sector Participation			
Key Areas of Intervention	**Immediate (next 2 years)**	**Near-Term (3-5 years)**	**Long Term (6-8 years)**
Proposed Deployment	• 50% of all new taxis in the city to be EV ONLY • Government fleets, commercial fleets of hotels and 25% of corporate fleet, goods carrier and commercial fleet of cab aggregators to be converted to electric fleet	• All new taxis in the City to be EV ONLY • 75% of the commercial fleet of cab aggregators and 100% of the corporate fleet and goods carrier to be converted to electric fleet	100% electrification of commercial fleet of cab aggregators
Policy and Regulations	• Formulate EV policy • Formation of an EV cell comprising of members from KMC, WBTC, CESC and WBSEDCL for fast track implementation of EV projects • Single window clearance for registration and vehicle transfer process and issuance of permits for commercial electric cars • Standard guidelines and single-window clearance for approvals from Municipal authorities and other Statutory bodies for the construction and operation of charging stations • Conduct public education and outreach to raise awareness to use e-autos and e-rickshaws • Change in building code to include 20% of parking space	• Creation of state fund by levying pollution cess, additional road tax etc. on ICE vehicles which can be used to subsidize EVs • Promote local manufacturing and/or assembly of EVs, batteries and components, and charging stations • Stop new registration and renewal of permits for internal combustion engine (ICE) based four wheelers • Open permit for electric goods carriers	• Enable large scale local manufacturing and import of EV batteries and components

	in malls, supermarkets, hotels etc. for public charging		
Incentives	• Exemption from registration charges and road tax • Free parking for EVs • GST rate should be rationalized on EVs and EV components • Rebate in municipal charges for digging and laying of cables on the side of the road for charging station implementation • Exemption of permits for commercial EV fleets • Ease import duties for lithium-ion batteries, chargers	• Preferential parking for EVs • Bulk insurance at concessional rate for commercial fleets • Exempt import and custom duty on EVs and EV components • Scrapping incentive to fleet or car owners which is redeemable only if electric cars are purchased • Reduced GST on charging stations • Reduced property tax for EV and battery manufacturers	• Only EV commercial fleet to operate within the city • Incentives for engaging in Vehicle Grid Integration activities
Business Model	• Creation of dedicated EV zones near corporate hubs and business centres • Declaration of few congested routes as green routes with EV only mandate • Implementation of charging stations on state highways to reduce range anxiety of commercial fleets and coupling the infrastructure cost with the toll to reduce the upfront cost • Installation of charging stations at hotels, airports, railways stations, tourist spots and govt. buildings by distribution utility and WBERC to allow utilities to pass on the cost to entire customer base which will ensure negligible increase in the tariff • There should be no cap on the service charge to be charged by the charging station service operator as it will deter the private sector investors owing to less number of EVs getting charged at the beginning • App based delivery service companies can install charging stations at their warehouse and can promote it as part of CSR activity	• Concessional locations for charging stations at bare minimum lease rental • Entire corporate hubs and business centres to be made EV only zones • Corporate fleets to install charging stations in their own premises and should pay for its operation and maintenance along with electricity charges for EV charging by charging a smaller fee for transportation from the employees and lease EVs through their CSR funds • Implementation of charging stations by supermarkets, big retailers • The state should offer cash back rebates for short first and last mile connectivity trips in app based cab services to promote shared mobility • Charging stations with supermarkets and other ancillary facilities to be created on state highways and state should provide rebate on the land rate as these charging stations will increase the commercial EV fleet movement and increase the toll collection of the state	• Consider secondary use of retired EV batteries for stationary and grid applications

Electricity Tariff Design	• WBERC to notify separate tariff for EV charging and should not exceed average cost of supply • Demand charge to be exempted from electricity tariff for EV charging • Power procurement through open access to be allowed and WBERC should consider lowering the minimum eligibility of 1 MW to participate	• WBERC to consider net metering rate for EV charging station • WBERC to notify separate tariff for Charging Stations for enabling Vehicle Grid Integration services • Integration of renewables introduction of Time of Use tariff for EVs to address load variability	• Enable electricity market redesign to use Battery Leasing Agency's charging infrastructure as grid resources
Grid Upgradation	• Planning and siting for implementation of EV charging stations to be carried out through proper load flow analysis of the distribution grid, assessment of nearness to distribution substation etc. • Distribution companies to assess the availability of spare capacity in DTs • Upgradation of electrical infrastructure for charging station installation in terms of distribution transformer, metring etc.	• Upgradation expense shared by OEMs or 3rd party service providers of charging stations • Charging station owners at supermarkets, big retailers should upgrade electrical network at own cost.	• Facilitate EV owners to participate in demand response programs • Grid asset modernization by utilities for implementing V2G solution

Table 12: Roadmap for Private Sector Participation