



IMPROVING BANKABILITY OF E-BUS PROCUREMENT IN INDIA

Working Paper

May 2022

(STUDY PERIOD 2020 AND EARLY 2021)

Disclaimer

This document has been prepared with NITI Aayog in the form of a study and for the sole purpose of sharing the results of an assessment and resulting insights related to the procurement of e-bus services in India under the FAME-II program. This does not endorse individual vendors, products or services in any manner. Therefore, any reference herein to any vendor, product or services by trade name, trademark, manufacturer or otherwise does not constitute or imply the endorsement, recommendation or approval thereof.

Copyright © 2022
THE WORLD BANK GROUP
1818 H Street, N.W.
Washington, D.C. 20433, U.S.A.

Attribution

Please cite the work as follows. World Bank Group 2022. Improving Bankability of e-bus procurement in India. Washington DC: World Bank Group.

All Rights Reserved

The findings, interpretations and conclusions expressed in this paper are entirely those of the author(s) and should not be attributed in any manner to the World Bank, or its affiliated organizations, or to members of its Board of Executive Directors or the countries they represent. The World Bank does not guarantee the accuracy of the data included in this publication and accepts no responsibility whatsoever for any consequence of their use. The Boundaries, colors, denominations, other information shown on any map in this volume do not imply on the part of the World Bank Group any judgment on the legal status of any territory or the endorsement or acceptance of such boundaries.

The World Bank Group and/or its consultants prepared this document to share information with NITI Aayog. The World Bank Group and/or its consultants are not acting as advisers to NITI Aayog in relation to the matters contained in this document and accordingly, the World Bank Group and/or its consultants are not providing any input on which NITI Aayog may rely as advice. The World Bank Group does not act in a fiduciary capacity, nor does it assume any duty, responsibility or liability to the recipient of this document or any third party. The World Bank expressly disclaims any responsibility or liability to the recipient of this document or any third party for any damage, including but not limited to special, indirect, consequential, or compensatory, arising from or relating to the use of information in the document or any reliance thereon or for any omissions or errors (including, without limitation, typographical errors and technical errors) in the contents.

The material in this publication is copyrighted. However, it may be reproduced in whole or in part and in any form for educational or non-profit uses, without special permission provided acknowledgment of the source is made. Requests for permission to reproduce portions for resale or commercial purposes should be sent to askeex@worldbankgroup.org. The World Bank encourages dissemination of its work and will normally give permission promptly. The World Bank Group would appreciate receiving a copy of or link to the publication that uses this material for its source sent in care of the address listed.

Acknowledgements

This study was conducted in 2020 and early 2021 for NITI Aayog as part of the World Bank Group Support to the Transformative Mobility and Battery Storage Mission to inform government programs in accelerating the uptake of e-bus services in India.

It was conducted under the guidance of a World Bank Group team led by Gerald Ollivier, Lead Transport Specialist, World Bank, Daniel Pulido, Sr. Investment Officer, IFC, and Pratibha Bajaj, Investment Officer, IFC. The NITI Team was led by Mr. Sudhendu Sinha, Advisor, NITI Aayog and Mr. Randheer Singh, Director, NITI Aayog. The World Bank Group team comprised: Mani Khurana, Senior Energy Specialist, Rishi Kothari, Transport Specialist, Ravi Gadepalli, Public Transport Consultant, Kartik Gopal, Sr. Infrastructure Specialist, Kartik Gopal, Sr. Infrastructure Specialist, Firdaus Haque, Operations Officer, Gautham Nallavari, Investment Officer, and Suvranil Majumdar, Senior Transport Consultant, and Nikhil Aggarwal, Sr. Transport Consultant.

The study was executed by a team from Spoctech Solutions and Steer Group (referred to as Spoctech for the purposes of this report), led by Hitesh Hiran, Partner, Spoctech Solutions and Jaspal Singh, Team Leader for this study. The team included Ravikant Deshpande, Rajeev Dholakia, Andrew Mellor, Prashanth Udayakumar and Santosh Pandey. The World Bank team sincerely appreciates the hard work, dedication, and collaborative spirit of this team.

The team is grateful to the experts who peer reviewed the report: Yang Chen, Sr. Transport Specialist; Alice Thuillier, Sr. Investment Officer; Juan Samos Tie, Principal Industry Specialist; and Muneeza Alam; Sr. Transport Economist. The team is also thankful to Genevieve Dutta, Program Assistant for her administrative support in preparation of this report.

The team greatly valued the guidance from Shomik Mehndiratta, Practice Manager, Transport, Simon Stolp, Practice Manager, Energy, World Bank, Diep Nguyen-Van Houtte, Sr. Manager, IFC, throughout the assignment, and the guidance from Wendy Jo Werner, Country Manager, IFC and Arnab Bandyopadhyay during the Decision Review Meeting for this activity.

The World Bank also valued the nuanced industry insights provided by the external Subject Matter Resources (SMRs) on the study – Prasanna Patwardhan (President, Bus and Car Operators Confederation of India and CMD, Purple Mobility), Allah Baksh Afzal (General Secretary, Bus and Car Operators Confederation of India and CMD, Parveen Travels), Gautam Patel (Consultant & visiting faculty CEPT - Centre for Excellence in Urban Transport), Manoj Panda (Consultant to Uttar Pradesh Urban Transport Directorate), Vikash Sharda (Partner, Infranomics Consulting LLP) and Serbjeet Kohli (Director, Steer India).

Stakeholder interviews, for the study, were carried out by the team during the period September 2020 to March 2021. Findings of the report were shared, and feedback gathered over 25 virtual industry stakeholder consultations held during the same period. The World Bank team is deeply thankful to all the consultation participants for sharing their invaluable insights and comments.

Financial and technical support from IFC's Early-Stage Project Development (Upstream) Unit, the World Bank, the Mobility and Logistics Trust Fund, and the Energy Sector Management Assistance Program (ESMAP) for the work is gratefully acknowledged. The Energy Sector Management Assistance Program (ESMAP) is a partnership between the World Bank and 18 partners to help low and middle-income countries reduce poverty and boost growth through sustainable energy solutions. ESMAP's analytical and advisory services are fully integrated within the World Bank's country financing and policy dialogue in the energy sector. Through the World Bank Group (WBG), ESMAP works to accelerate the energy transition required to achieve Sustainable Development Goal 7 (SDG7) to ensure access to affordable, reliable, sustainable, and modern energy for all. It helps to shape WBG strategies and programs to achieve the WBG Climate Change Action Plan targets.

Contents

List of Figures	5
List of Tables	5
List of Abbreviations	6
Foreword.....	10
Executive Summary	11
1. Introduction.....	17
1.1. Overview of bus transportation in India	17
1.2. Electrification of bus transportation - The story so far	17
1.3. E-bus in cities to unlock national transition	22
1.4. Objectives of the study and approach adopted	22
2. E-bus Procurement – Current Practices and Challenges	24
2.1. Identification of key gaps / issues	28
2.2. Total Cost of Ownership (TCO)	30
2.2.1. TCO for intra-city operations.....	32
2.2.2. TCO for inter-city operations.....	32
3. Critical Actions to Unlock the Urban E-Bus Market.....	34
3.1. Improving bankability of existing e-bus procurement approach (i.e., GCC model).....	34
3.2. Introducing alternate business models / procurement approaches	41
3.2.1. Learning from international experience.....	42
3.2.2. State-led aggregator	46
3.2.3. Market-led aggregator.....	47
3.2.4. Secondary / supplementary business model.....	48
3.3. Policy and regulatory interventions.....	52
3.3.2. Fiscal measures.....	54
3.3.3. Non-fiscal measures	58
3.3.4. Indicative Institutional approach in implementation/coordination.....	61
3.4. Step-by-step action plans for State, Cities and STUs.....	62
4. Role of the World Bank Group to Unlock E-bus markets in India	67
5. Conclusion and Way Forward	69

List of Figures

Figure 1: E-bus deployment in India	18
Figure 2: FAME I and FAME II – Overview of e-buses envisioned and no. of eligible cities/STUs.....	19
Figure 3: E-bus awarded under FAME-II.....	21
Figure 4: Approach to the study objectives	23
Figure 5: Analysis of e-bus GCC rates (L1 bidder) discovered under FAME-II.....	25
Figure 6: Analysis of e-bus GCC rate (INR) discovery within a particular city.....	26
Figure 7: FAME-II GCC rates compared to utilization over contract tenure (9m AC e-buses, Intra-city) ...	27
Figure 8: Concerns of the Stakeholder groups	28
Figure 9: Analysis of e-bus GCC rates discovered under FAME-II for Intra-city bus operations (9M, AC) .	30
Figure 10: TCO for intra-city bus service (9M AC E-bus, 5600 KM month) under GCC model (base case scenario)	32
Figure 11: TCO Analysis (12M) – E-bus vs. Diesel BS VI (Intercity, AC - 168,000 KM per year i.e., 14,000 KM per month) under GCC model (base case scenario)	33
Figure 12: Major gaps to be addressed	35
Figure 13: Impact on GCC quote or TCO (for 9M, AC e-bus) for select measures.....	35
Figure 14: Existing GCC vs. Revised GCC Model.....	37
Figure 15: Learning from experiences of model cities and key enablers for e-bus (or low carbon) transport	42
Figure 16: State-led aggregator model	47
Figure 17: Market-led aggregator model.....	48
Figure 18: CaaS – Unbundling of Charging Infrastructure	49
Figure 19: Battery leasing – secondary alternate business model	50
Figure 20: Desirable characteristics and impact of alternate business models on bankability and scalability for Indian e-bus market.....	51
Figure 21: Planning and Program Roll-out.....	62
Figure 22: Action plan for states and cities	66

List of Tables

Table 1: Overview of Indian bus market.....	17
Table 2: Buses sanctioned and deployed under FAME-I Scheme.....	20
Table 3: E-buses successfully tendered and are in various stages of deployment under FAME-II scheme as of July 2021	20
Table 4: Overview of recent tenders for e-bus procurement under FAME-II reviewed for this study	23
Table 5: E-bus procurement model – current practices.....	24
Table 6: Sensitivity analysis of base case GCC with respect to various parameters (9M, AC e-bus).....	31
Table 7: Summary of recommendations for current e-bus procurement approach	36
Table 8: Measures to improve bankability – areas of improvement in the existing MCA.....	38
Table 9: Measures to improve bankability – areas of improvement in the existing RFP(s)	39
Table 10: CaaS – Unbundling of Charging Infrastructure	49
Table 11: Overview of recommended fiscal and non-fiscal measures.....	53
Table 12: List of lighthouse states/cities/agencies along with recommended business models.....	63
Table 13: IFC and The World Bank - Role in E-bus Value Chain.....	67
Table 14: Role of IFC in E-bus Value Chain.....	68
Table 15: Assumptions for analysis of Alternate Business Models.....	70

List of Abbreviations

12M	12-Meter
9M	9-Meter
AC	Air Conditioned
AD	Accelerated Depreciation
AJL	Ahmedabad Janmarg Limited
AMC	Annual Maintenance Contract
APIs	Application Programming Interface
ASRTU	Association of State Road Transport Undertakings
ASSAR	Advance Services for Social and Administrative Reforms
Avg.	Average
BEST	Brihanmumbai Electricity Supply and Transport
BG	Bank Guarantee
BM	Business Models
BMTC	Bangalore Metropolitan Transport Corporation
BOT	Build Operate Transfer
BS – IV	Bharat Stage – IV
BS – VI	Bharat Stage – VI
CA	Concession Agreement
CaaS	Charging as a Service
Capex	Capital Expenditure
CDM	Clean Development Mechanism
CESL	Convergence Energy Services Limited
CI.	Clause
CNG	Compressed natural gas
COD	Commercial Operation Date
COP26	The 26 th session of the Conference of the Parties (CoP26) to the United Nations Framework Convention on Climate Change (UNFCCC)
CP	Counterparty
CP	Conditions Precedents
CPI	Consumer Price Index
CPI-IW	Consumer Price Index - Industrial Worker
Cr.	Crores
D: E	Debt: Equity
Dadra & NH	Dadra and Nagar Haveli
DBFO	Design, Build, Finance and Operate
DBFOT	Design, Build, Finance, Operate and Transfer
DFI	Development Finance Institution
DHI	Department of Heavy Industries
DISCOMs	Power Distribution Companies
DMICDC	Delhi Mumbai Industrial Corridor Development Corporation
DMRC	Delhi Metro Rail Corporation Limited
DoM	Directorate of Mobility

DPRs	Detailed project reports
DTC	Delhi Transport Corporation
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
E-Bus	Electric Bus
EESL	Energy Efficiency Services Limited
EoI	Expression of Interest
EPC	Engineering, Procurement and Construction
ESMAP	Energy Sector Management Assistance Program
ESSI	Energy Efficiency Services Limited
ETVM	Electronic Ticket Vending Machine
EV	Electric Vehicles
excl.	Excluding
FAME	Faster Adoption and Manufacture of (Hybrid and) Electric Vehicles
FAs	Fleet Aggregators
FY	Financial Year
g/pass-km	Gram Per Passenger Kilometer
GCC	Gross Cost Contract
GHG	Green House Gases
Goi	Government of India
Govt.	Government
GSRTC	Gujarat State Road Transport Corporation
GST	Goods and Service Tax
HA	Highway Authority
HAM	Hybrid Annuity Model
HRTC	Himachal Pradesh Road Transport Corporation
HT-EV	High Tension - Electric Vehicle
IBRD	International Bank for Reconstruction and Development
ICE	Internal Combustion Engine
IE	Independent Engineer
IFC	International Finance Corporation
Incl.	Including
INR	Indian Rupee
ITS	Intelligent Transportation System
J & K	Jammu and Kashmir
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
KM	Kilometers
KPI	Key Performance Indicators
KSHIP	Karnataka State Highway Improvement Program
KUIDFC	Karnataka Urban Infrastructure Development and Finance Corporation
kWh	Kilo Watt Hour
L1	Lowest quote
LC	Letter of Credit
LNG	Liquefied Natural Gas

LONO	Low Emission, No Emission
ltr	Liter
M.P	Madhya Pradesh
Max.	Maximum
MCA	Model Concession Agreements
mg/pass-km	Milli Gram Per Passenger Kilometer
MGL	Mahanagar Gas Limited
Min.	Minimum
MMRDA	Mumbai Metropolitan Region Development Authority
MoF	Ministry of Finance
MoHUA	Ministry of Housing and Urban Affairs
MoP	Ministry of Power
MoRTH	Ministry of Road Transport and Highways, Government of India
MOST	Ministry of Science and Technology
MSRTC	Maharashtra State Road Transport Corporation
MTUs	Municipal Transport Undertakings
MV	Motor Vehicle
n/a	Not Applicable
NCC	Net Cost Contract
NHAI	National Highways Authority of India
NITI	National Institution for Transforming India
NMCG	National Mission for Clean Ganga
NMMT	Navi Mumbai Municipal Transportation
NMMTU	Navi Mumbai Municipal Transport Undertaking
NPAs	Non-Performing Assets
NPV	Net Present Value
NVVN	NTPC Vidyut Vyapar Nigam Limited
O&M	Operation and Maintenance
OD	Origin Destination
OEM	Original Equipment Manufacturer
Opex	Operating Expenditure
p.a.	Per Annum
pass-km	Passenger Kilometer
PCU	Passenger Car Unit
PGB	Performance Bank Guarantee
PK	Per Kilometer
PKM	Per Kilometer Fee
PM	Particulate Matter
PMPML	Pune Mahanagar Parivahan Mahamandal Limited
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PSA	Power Sale Agreement
PT	Public Transport (also referred for PT Authority)

PTA	Public Transport Authority
Pvt	Private
RACI	Responsible, Accountable, Consulted, Informed
RBI	Reserve Bank of India
REC	Renewable Energy Certificate
RfPs	Request for Proposals
ROI	Rate of Interest
RoW	Right of Way
Rs.	Rupee
RSRTC	Rajasthan State Road Transport Corporation
SaaS	Software as a Service
SDG7	Sustainable Development Goal 7
SECI	Solar Energy Corporation of India Limited
SIDBI	Small Industries Development Bank of India
SPV	Special Purpose Vehicle
SRTC	State Road Transport Corporation
STC	State Transport Corporation
STUs	State Transport Undertakings
TCO	Total Cost of Ownership
TNUDF	Tamil Nadu Urban Development Fund
TOD	Transit Oriented Development
TPA	Tri-Partite Agreement
TPC	Total project Cost
U.P.	Uttar Pradesh
UBS	Urban Bus Specifications
UK	United Kingdom
UKSRTC	Uttarakhand State Road Transport Corporation
ULB	Urban Local Bodies
UNFCCC	The United Nations Framework Convention on Climate Change
USA	United States America
VfM	Value for Money
VGf	Viability Gap Funding
w.r.t	With Respect To
WB	World Bank
WBG	World Bank Group
WDV	Written Down Value
WPI	Wholesale Price Index
WSA	Way-Side Amenities
YTD	Yield To Date
YTD	Year To Date

Foreword

*This working paper was prepared in **2020 and early 2021** and served as input in adjusting the approach to procuring e-bus services and adjusting existing government programs like FAME-II or tenders by BEST. As such, more recent events, like the outcome of the Convergence Energy Services Limited (CESL) tender are not reflected herein, although those built on findings shared in draft final versions of this document. Reference to "**current**" in this document means as of early 2021.*

Bus transport in India accounts for about 38 percent of passenger-kilometers in India¹ though its share in overall registered vehicles in India is just around 3.5 percent. Its electrification can help India achieve sustainable mobility with curtailment of fossil fuel demand, reduction of carbon emissions, improvement of air quality and public health.

As of early 2021, Total Cost of Ownership (TCO) for the e-buses (both 9 and 12 meters) in intracity application was high compared to that of corresponding internal combustion engine buses due to the relatively higher upfront capital cost of e-buses, which acts as a major deterrent to wider adoption in urban public transport. In order to promote electric vehicles in India, the government of India introduced the Faster Adoption and Manufacturing of Hybrid & Electric Vehicles (FAME) Scheme to provide capital subsidy for electric vehicles to help reduce the upfront capital cost of an e-bus. The scheme mandates adoption of Gross Cost Contracting (GCC) for procurement of e-bus by the State Transport Undertakings (STUs), Municipal Transport Undertakings (MTU) and city governments to avail subsidy. However, the GCC model as applied in 2020-early 2021 had room for further optimization.

Under this study, a review of various GCC tenders under FAME-II was carried out to identify issues and challenges in the approach as well as solutions to reduce the TCO gaps in intracity operation and achieve the overall goal of sustainable mobility in India.

This report outlines some immediate opportunities for adjustments to reduce cost of contracting under GCC by around 10 to 15 percent. Those include: (i) removal of subsidy bank guarantee; (ii) adequate time for bid preparation; (iii) enhanced termination and Force Majeure clauses; (iv) adequate payment securities; (v) measures to enhance creditworthiness of the contracting authorities; and (vi) capping of penalties.

In addition, the report includes an evaluation of alternate business models on the principle of fleet aggregation and unbundling of fleet provision and e-bus operation services which can dramatically bring down the cost of e-bus services. It notes, however, that the selection of suitable mechanism requires a good understanding of: (i) creditworthiness and capabilities of the authority; (ii) state creditworthiness; and (iii) the homogenization to the best suited environment amongst other factors. Those aspects can help select the most suitable option for a given local context.

Put together, the above measures were estimated to help reduce cost of e-bus services from 15 to 25 percent and bring the cost within 10 to 20 percent of that of the cost of Bharat VI (AC) diesel buses under GCC operation and help unlock a major transition towards cleaner and greener cities.

The CESL-led tender completed in May 2022 exceeded those estimates and achieved savings of about 37 percent through combination of such approaches and a newly introduced aggregation model in FAME II by the Government of India (GoI) for e-buses.

¹ India Transport Transition White Paper (2022). Deloitte for World Bank

Executive Summary

FAME II Scheme intends to support deployment of about 7000 e-bus as of early 2021

Electrification of the buses can help India achieve its goal to provide clean, convenient and affordable mobility solution and to help country to curtail fossil fuel demand, reduce carbon emissions, improve air quality and public health.

To give the necessary push to electrification of buses, Government of India launched the FAME India Scheme (Phase-II) in April 2019, wherein the government provides financial incentives for maximum 7,090 e-buses, with a total outlay of Rs. 3,545 Crores² (~USD 479 million)³. To avail subsidy under the FAME Scheme, many STUs and cities floated tenders for procurement of e-buses under a Gross Cost Contract (GCC) method. While a major step forward, these tenders were only partly successful with limited participation and higher than expected price quotes amongst other issues.

Due to various factors, the tenders of these cities could not be finalized in a time bound manner and tenders, which were opened, were often not feasible from a fiscal standpoint. Hence, at the request of NITI Aayog, the World Bank/ IFC hired the consulting firms M/s. Spotech Solutions (India) and Steer Group to conduct a detailed review of those contracts and recommend adjustments to improve e-Bus procurement bankability in India. This report summarizes the findings of this analysis and lays out a set of recommendations for consideration by different stakeholders.

Key issues and gaps identified based on secondary analysis and consultations

The secondary analysis involved review of 11 tenders (published till September 2020) for e-bus procurement in 28 cities in 7 states and comprising of total 2,965 e-buses (or 53% of 5,595 e-buses allotted under FAME-II program) and various other related documents. The major challenges identified in the procurement process of e-Buses under FAME-II are as follows:

- Many agencies received single bid participation. Only few cities received up to 3-4 bids
- Significant variation in rate (L1 i.e., lowest quotes) in the range of \pm 15% - 30%, with higher variation observed in 12-meter (12M) bus category
- Better rate discovery observed with higher assured kilometers (KM) over the contract tenure
- GCC rate discovery was better where number of participants were equal to or more than three (3)
- For many STUs/ Authorities, capabilities to undertake the tendering process for e-Bus needs improvement and handholding
- Several STUs/Authorities cancelled tenders or retendered or were yet to conclude their tendering process

² <https://heavyindustries.gov.in/writereaddata/fame/famedepository/2-notification.pdf>

³ Conversion rate of 1 USD = INR 74

Based on detailed analysis of the impact of each issue and gap in Total Cost of Ownership (TCO) vs bid participation, the following major areas for improvement in the current GCC approach were identified.

(1) Readiness of the Authority	(2) Timelines	(3) Subsidy Bank Guarantee	(4) Eligibility criteria	(5) Payment Securities (Creditworthiness)
(6) Fee Revision	(7) Penalties	(8) Payment for Underutilized KMs	(9) Force Majeure	(10) Termination Payment

Addressing the identified issues can improve bankability and scalability of e-bus adoption significantly and reduce TCO for the Authority by 10% to 15% (in terms of levelized rate over 10 years of operations). The most impactful recommendations include: (i) increasing the timelines for bid submission; (ii) removing the subsidy bank guarantee; (iii) introducing standard Request for Proposal (RfP) documents with flexible technical capacity requirements; (iv) improving the creditworthiness of the authority; (v) modifying the fee revision formula; (vi) amending termination payments; (vii) capping liquidated damages; and (viii) rationalizing Goods and Service Tax (GST) on sub-contracting. Many of these recommendations would warrant revisions in the Model Concession Agreement (MCA) and procurement approach for GCC in place at the time of the review.

Alternate Business Models for e-Bus are evaluated and three primary business models and two secondary business models are recommended

Beyond revisions to the current GCC approach, alternate business models are also evaluated. They entail adjustments to several enabling levers such as: (i) bankable contractual terms; (ii) unbundling of assets, roles and risks based on specialization; (iii) policy and regulatory interventions; or (iv) access to suitable financing instruments. Globally several cities have made such adjustments to enhance e-bus procurement & deployment as shown in the table below.

Model city or market experience	Key enabling levers
Santiago	<ul style="list-style-type: none"> Fleet (e-bus) provision unbundled from operations Fleet (e-bus) bundled with energy provision Bankable contracting terms
Bogota	<ul style="list-style-type: none"> Fleet (e-bus) provision unbundled from operations to allow aggregation Trust funds and direct repayments from authority to financiers Long-term maintenance contracts with Original Equipment Manufacturers (OEM)
London	<ul style="list-style-type: none"> Bundled e-bus operations in mature markets
Zenobe and Proterra	<ul style="list-style-type: none"> Battery leasing without adverse GST rates Bespoke solutions for e-bus
Shenzhen	<ul style="list-style-type: none"> Capital and operational subsidies
Delhi	<ul style="list-style-type: none"> Bankable contracting terms

On that basis, three primary alternate business models (BMs) and two secondary/supplementary business models are recommended for consideration in this report. The roles & responsibilities under each model are presented below:

	Fleet			Energy			Financing Instruments		
	Operations	Maintenance	Provision	Charging Infra	Grid connection	Depot Infra	Leasing	Loan	Equity
Primary Business Models									
GCC FAME-II	Bidder (mainly OEM led)							Bank	Bidder
State-led Aggregator Model	Opr	OEM	State	*	State / PT	PT	DFI / Bank	DFI / Bank	(State / City)
Private Aggregator (OEM led)	Opr	OEM		*	PT	PT		DFI / Bank	(OEM)
Private Aggregator (Non-OEM led)	Opr	Non-OEM		*	PT	PT	(OEM / Non-OEM)	DFI / Bank	(Non-OEM)
Secondary Business Models									
Charging infra unbundled as PPP		CaaS Player				(CaaS / PT)	(CaaS)	DFI / Bank	(CaaS)
Battery leasing		(OEM / Lessor)				PT	(OEM / Lessor)	DFI / Bank	(OEM / Lessor)

*Opr - Operator

It is estimated that the market player led aggregator model and the state led aggregator models would result in approximate TCO saving of 15-20% and 20-25% respectively. The estimated savings in TCO for the authority are mainly due to result of: (i) lowered cost of capital for respective entities; (ii) risk unbundling; and (iii) bulk discounts from higher volumes (assuming outright purchase of buses). Despite such savings, the possibility of applying such model is a function of the initial institutional and funding capacity of the contracting and overseeing agency as more unbundled model increase the level of sophistication required in contract management.

While the existing GCC contract (MCA) would need to be modified to suit the requirement of alternative business models as identified above, most of it could remain.

A systematic approach is required for rolling out alternative business models in select states and cities

A decision-making framework is required to assist states, cities and agencies in selection of suitable business model(s). The report suggests a framework based on: (i) institutional readiness; (ii) financial capacity of the states; and (iii) aggregation potential for procurement. The framework applies filters to select various states, cities, or agencies, and use a multi-criteria approach to map different business models to shortlisted different states, cities, or agencies. A list of potential lighthouse states/cities/agencies can then be identified to apply the improved GCC and/or alternate (aggregator) business models.

Policy and regulatory updates required for wider adoption of electric buses through various business models

To address issues identified in current GCC procurement and to enable alternate business model, 22 (twenty-two) recommendations (fiscal or non-fiscal measures) are provided in the following table.

Recommendation Item	Brief Description	Responsible Agency	Target Market (G – Government; P – Private)
Fiscal Measures			
(A) Subsidy & its structure			
1. Subsidy Amount for E-bus	Maintain the subsidy, delinking the same from GCC quote and linking that to battery capacity.	Central Govt. (Gol / DHI)	G
2. Commitment from State/ULB	Mandate States/ULB to meet additional commitment, especially for Opex support.	Participating States/ULBs	G
3. Subsidy Structure	Remove the subsidy bank guarantee and bring in a hybrid subsidy structure.	Central Govt. (Gol / DHI)	G
4. Additional Support to STUs	Outline financial support / commitments for infrastructure upgradation (or new infrastructure as applicable) by STUs / Cities.	Central Govt. (Gol / DHI) and Participating States / Cities	G
5. Subsidy for Private Buses	Extend demand incentive linked subsidy to private e-bus operator based on battery capacity with maximum cap.	Central Govt. (Gol / DHI)	P
6. Interest subvention scheme	Bring interest subvention scheme from empaneled list of banks.	Central / State Govt.	P
(B) Financing Eco-system			
7. Easy Access to Low-Cost Capital	Assign Priority Sector Lending Status for lending to manufacturing units, e-bus fleet procurement, charging and associated infrastructure.	Central Govt.	G & P
8. Credit Guarantee	Set up Credit Guarantee Fund Trust for Green Transport.	Central Govt.	G & P

Recommendation Item	Brief Description	Responsible Agency	Target Market (G – Government; P – Private)
9. Residual value / buyback assurance	Give co-assurance for 20% - 25% of the buyback value (subject to certain cap)	Central Govt.	G & P
(C) Taxation & Levy			
10. GST reforms – to enable leasing market	Reduce GST rate on outsourcing of services and leasing of e-buses, batteries and associated infrastructure to 5% (or NIL) from current 18%.	Central Govt.	G & P
11. Corporate Tax (Income Tax) benefits	Allow higher accelerated depreciation and permit 100% cost deduction under Income Tax Act.	Central Govt.	G & P
12. Road Tax, MV Tax, Passenger Tax, other taxes levied on buses	Provide 100% exemption to e-buses from all such applicable central taxes and at least up to 50% exemption from state taxes.	Central and State Govts.	G & P
13. Feebate Scheme for E-bus adoption	Levy carbon tax on fossil fuel private vehicle based on emission levels.	Central and States	G & P
Non-Fiscal Measures			
(D) Social & Environment Planning			
14. City EV Transition Plan	Mandate cities to prepare City EV Transition Plans including financing strategy, fiscal support for DISCOMs to set up charging infra and upgrading grid infra.	Central Govt., Concerned States and ULBs	G & P (and Other EVs as well)
15. Stop registration of new ICE buses	Allow registration of only E-buses and permitted low-emission / no-emission fuel-based buses to be allowed after 2030.	Central Govt., and States	G & P
(E) Infrastructure Planning			
16. Reliability of grid connectivity and power quality	Make it mandatory and legally binding on DISCOMs to provide consistent 24 x 7 power supply to designated e-bus depots and charging stations within a stipulated timeline.	Central and State Govts.	G & P

Recommendation Item	Brief Description	Responsible Agency	Target Market (G – Government; P – Private)
17. Infrastructure Sharing	Mandate unlocking of public (STU's) infrastructure for use by private buses.	Central and States	P
18. Commercial monetization of depot / terminal real estate	Apply TOD / Value Capture equivalent policy to monetize depot land.	Central – Policy Directions States – Regulations	G
19. Charging Infrastructure on major highways	Provide fast charging facilities (amenable to e-bus) on major inter-city routes in India.	Central and States	P
(F) E-bus standardization and guidelines			
20. Standardization of E-bus Specifications, Tender and Concession Agreement	Prepare "National Standards, Specifications for Electric Bus and Associated Infrastructure" and develop and/or approve standard tender document(s) and concession agreement.	Central Govt.	G & P
21. E-Bus Guidelines	Issue guidelines comprising of standards and specifications with respect to e-bus operation, battery recycling & associated infra planning etc.	Central Govt.	G & P
22. Capacity building	Mandate trainings and capacity building plan, covering aspects like technical training, PPP related capacity, procurement and performance monitoring etc.	State Govt	G

Institutional aspects for implementation

Currently, different central government ministries such as DHI, MORTH, NITI Aayog and others are working with different state governments and their departments along with city governments/ transport agencies. To implement various recommendations as summarized above, close coordination and a proper implementation structure between central government ministries, state government and city governments will achieve best results. Such structure would help focus on central level, state level and city level activities to achieve the overall objective of faster adoption of e-bus in India.

1. Introduction

1.1. Overview of bus transportation in India

Bus transport in India, historically, accounted for around 70% - 75% of total public transport trips⁴. Currently there are over 800,000 registered buses deployed for intracity and intercity transport operations by STUs and Private Stage and/or Contract Carriage operators. However, it accounts for only 3.5% of total registered vehicles (as of 31st March 2017)⁵. These exclude buses registered under private services vehicles and other bus segment category. All included, about 2 million buses ply in India.

Public bus transport market in India can be broadly divided into two segments- (i) Government (or Public) Bus Market and (ii) Private Bus Market.

Table 1: Overview of Indian bus market

Bus Type	Current Total Buses	Ownership Pattern
STU (Urban)	40,000	Consolidated
STU (Intercity, rural)	100,000	Consolidated
Private Stage Carriage	184,000	Fragmented
Private Contract Carriage	312,000	Fragmented
Private Service (Institutions)	195,000	Fragmented
Total	831,000	Fragmented

Source: CIRT (2017-18), MoRTH

The government bus market in India is well organized and comprise of intra-city and inter-city operations. It is largely managed by State Road Transport Undertakings (STUs), and in several cities by Municipal Transport Undertakings (MTUs) or Special Purpose Vehicles (SPVs) formed for urban bus services. Over 21% of this fleet is over aged above the target scrapping age set by individual STUs / MTUs⁶.

The public bus services have been a beneficiary of various central and state governments schemes over the years. In comparison, the private sector market remains fragmented, operating primarily in the inter-city bus segment and institutional transport services.

1.2. Electrification of bus transportation - The story so far

India is an important member of the recently concluded the 26th session of the Conference of Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC). The Prime Minister of India presented the vision of India to become carbon neutral by 2070, which included several measures including reduction of emissions intensity (or emissions per unit GDP) by at least 45 per cent by the year

⁴ Shakti Foundation, WRI

⁵ CIRT – STU Performance 2017-18

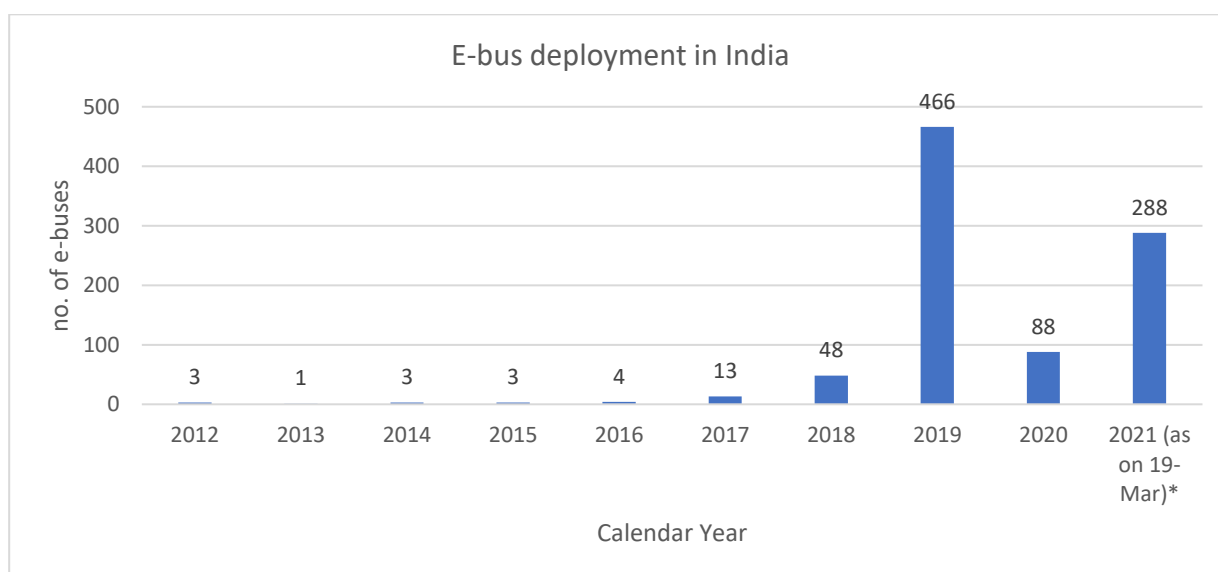
⁶ CIRT – STU Performance 2017-18

2030 from the 2005 levels. Transport sector is the 3rd most CO₂ emitting sector in India⁷, and therefore clean mobility seems to be an important part of India's policy direction to help achieve the reduction of emissions as above.

India's sustained commitment towards improved energy security, carbon emissions and air quality has introduced a paradigm shift towards electric mobility. Electric buses (e-buses) have potential to bring in significant energy efficiency and emission benefits compared to Internal Combustion Engine (ICE) powered buses. Energy cost for a 9M e-bus is around Rs. 5-7/KM as compared to Rs. 25-35/KM for an ICE Diesel Bus. On a per-passenger, per-kilometer (pass-km) basis, electric buses eliminate about 2 to 20 mg/pass-km of PM_{2.5} emissions and 0.3 to 0.5 g/pass-km of NO_x emissions. The life cycle environmental impact will naturally depend on the source of electricity⁸, but the shift towards renewable energy will enhance the GHG impact of electric buses. The bus transport having a high mobility share in India, electrification of the buses can help India achieve its goal to curtail fossil fuel demand and reduce carbon emissions, which will have a positive impact on other local issues, like improving air quality and public health.

Over the past 3-5 years, e-buses were introduced by several cities under the Faster Adoption and Manufacture of (Hybrid and) Electric Vehicles (FAME)-I scheme, Smart City Mission, and other initiatives. About 900 e-buses are currently operational across India (as of March 2021), which is a very small proportion (<0.1%) when compared to total registered bus stock in India.

Figure 1: E-bus deployment in India



Source: Vahan Dashboard (as on 19th March 2021), Spoctech Solutions (Review & Analysis)

* YTD till 19th March 2021

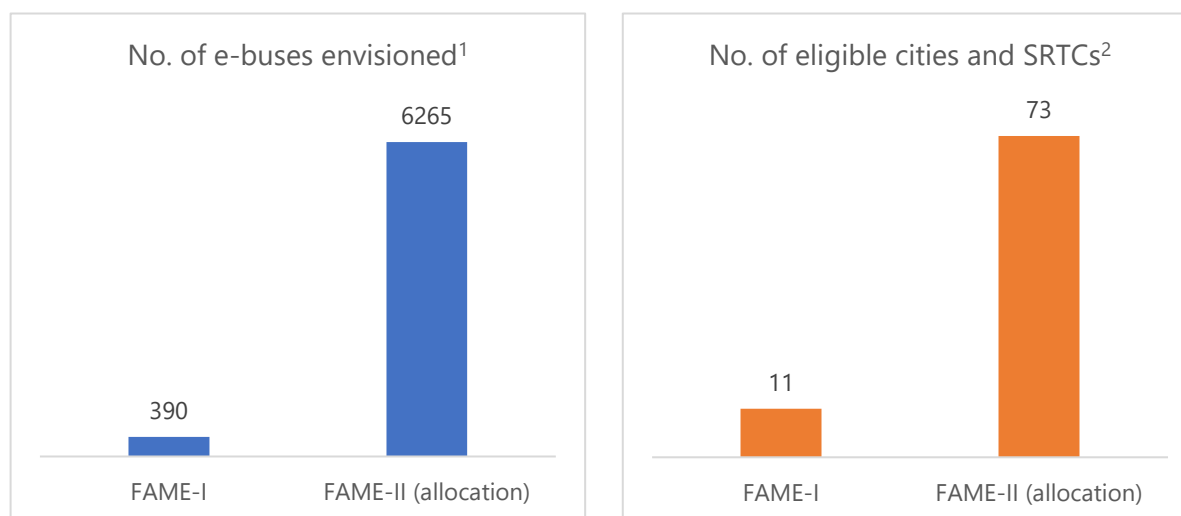
The main push for e-bus deployment in India is led by the Department of Heavy Industries (DHI), Government of India (GoI) through its Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles

⁷ Emissions inventory for road transport in India in 2020: Framework and post facto policy impact assessment (Namita Singh, Trupti Mishra, Rangan Banerjee – IIT Bombay)

⁸ Source: The Case for All New City Buses in India to be Electric, Lawrence Berkeley National Laboratory (Dec 2018)

in India (FAME-India). E-buses procured under FAME Scheme are deployed for providing public transport services through STUs, MTUS and urban bus SPVs.

Figure 2: FAME I and FAME II – Overview of e-buses envisioned and no. of eligible cities/STUs



Source: Department of Heavy Industries, Government of India

1. FAME-II scheme envisaged deployment of 7,000 electric buses through subsidy under FAME-II scheme. In its initial phase, DHI allocated 5,595 on August 2019. In September 2020, DHI allocated additional 670 e-buses to 5 cities and 2 SRTC's (for intercity). The FAME-II program was adjusted in June 2021 to refocus on cities above 4 million inhabitants. The analysis in this report refers to pre-2021.

2. Beneficiaries of FAME-II include 64 cities, 8 SRTC's (for intercity operations) and DMRC for metro feeder services. A revision to the Scheme in June 2021 refocused it towards the nine Tier 1 Cities.

In addition to the FAME scheme, urban bus providers in Ahmedabad, Pune, Bangalore, and State Transport Undertakings (STUs) like Maharashtra State Road Transport Corporation (MSRTC), Himachal Pradesh Road Transport Corporation (HRTC), are also procuring e-buses directly under the Smart City Mission program, ULB and/or State budgetary support.

Gross Cost Contract (GCC) and Outright Purchase are the two primary business models for bus procurement in India, and GCC was mandated to be the only model adopted under FAME-II Scheme.

Around 400 e-buses and 25 hybrid electric buses were put under operation under the FAME-I scheme (Table 2). Under the FAME-II scheme, of the allotted 6,265 electric buses to 73 beneficiary cities and SRTC's, supply order for 3,118 electric buses have been issued by the selected entities⁹ as of July 2021 (Table 3). Figure 3 shows the allocation of 3,968 e-buses by OEM wise e-bus tenders won or awarded in the recent e-bus procurement under FAME-II scheme, as of August 2021.

⁹ <https://pib.gov.in/PressReleasePage.aspx?PRID=1742666>

Table 2: Buses sanctioned and deployed under FAME-I Scheme

State	City/ Authority	Number of buses deployed under FAME-I
Maharashtra	Navi Mumbai	30
	Mumbai (BEST)	40
	Mumbai Metropolitan Region Development Authority (MMRDA)	25 (Hybrid)
	Total	95
West Bengal	Kolkata	80
Himachal Pradesh	Intercity services	75
Jammu and Kashmir	Srinagar	40
Uttar Pradesh	Lucknow	40
Madhya Pradesh	Indore	40
Assam	Guwahati	15
Telangana	Hyderabad	40

Source: Department of Heavy Industries (DHI) and Ministry of Road Transport & Highways (MoRTH), Government of India

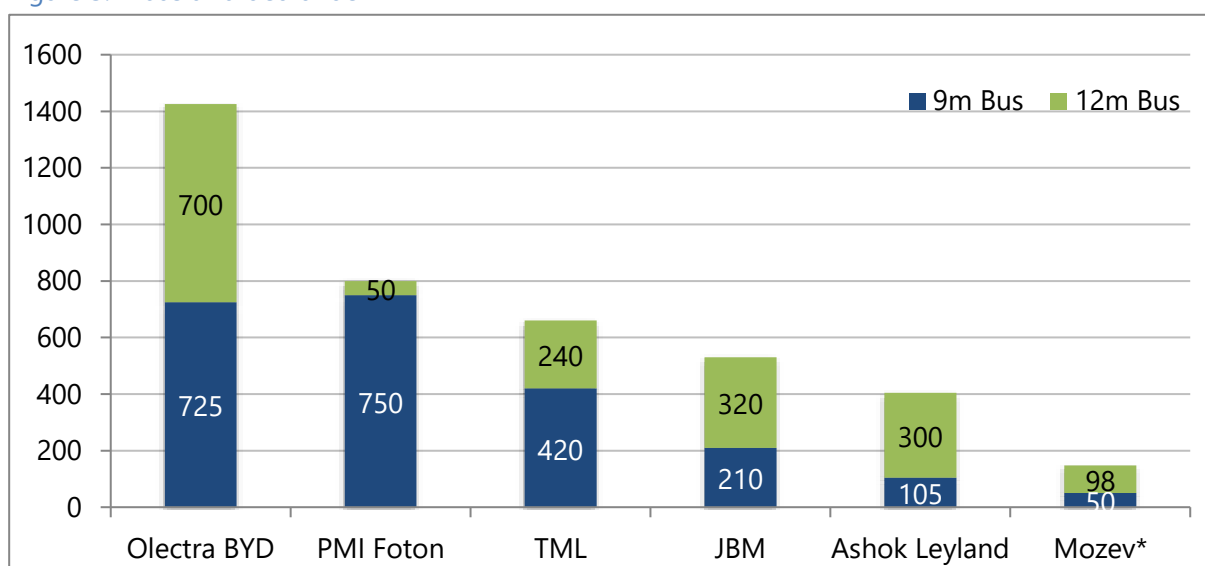
Table 3: E-buses successfully tendered and are in various stages of deployment under FAME-II scheme as of July 2021

State	City/ Authority	Number of buses deployed under FAME-II
Maharashtra	Navi Mumbai	150
	Mumbai (BEST)	340
	Pune (PMPML)	150
	Nashik	50
	Maharashtra State Road Transport Corporation (MSRTC)	50
	Nagpur	40
	Total	780
Uttar Pradesh	Lucknow	100
	Agra	100
	Kanpur	100
	Prayagraj	50
	Varanasi	50
	Ghaziabad	50
	Meerut	50
	Bareilly	25
	Moradabad	25
	Aligarh	25
	Jhansi	25
	Total	600
Delhi	Delhi Transport Corporation (DTC)	300
	Delhi Metro Rail Corporation (DMRC)	100

	Total	400
Gujarat	Ahmedabad	300
	Surat	150
	Rajkot	50
	Gujarat State Road Transport Corporation (GSRTC)	50
	Total	550
Madhya Pradesh	Indore	100
	Bhopal	100
	Jabalpur	50
	Ujjain	50
	Gwalior	40
	Total	340
Rajasthan	Jaipur	100
	Rajasthan State Road Transport Corporation (RSRTC)	48
	Total	148
Uttarakhand	Dehradun Smart City	30
	Uttarakhand State Road Transport Corporation (UTC) (Inter city)	30
	Total	60
Goa	Kadamba State Road Transport Corporation (Inter city)	50
West Bengal	Kolkata New Town	50
Odisha	Bhubaneshwar	50
Chandigarh		40
Bihar	Patna	25
Dadra and Nagar Haveli	Silvassa	25

Source: Department of Heavy Industries (DHI) and Ministry of Road Transport & Highways (MoRTH), Government of India

Figure 3: E-bus awarded under FAME-II



Source: Press Information Bureau (PIB), Spoctech Solutions – Research & Analysis

* 50 e-buses (9M) for DMRC feeder bus service are assumed to be allocated to Mozev, however, the bidder has a choice to allocate it to either Mozev or JBM (Source: stakeholder consultation).

1.3. E-bus in cities to unlock national transition

India's urban public transport bus market is comprised of around 40,000 buses (primarily diesel and CNG buses), which are largely managed by state and local governments. With India's urban population expected to reach 600 million by 2030 (or 40% of total population)¹⁰, demand for urban bus services is likely to grow rapidly. Climate change considerations have created the political will to accelerate a shift towards clean energy vehicles and electric buses in cities in the current decade. Urban public transport buses are mostly operated by public operators or under their aegis in India and represent only two percent of buses operated in India. Nonetheless progress made in the urban public transport market directly create awareness and experience with this new technology. It enables the development of manufacturing capacity and charging infrastructure and will lead to a steady reduction in associated capital expenditures and the technological fit of e-buses in India. With those elements in place, other buses used for employee transport or school services in cities will gradually shift towards e-bus technology, when a suitable price point, technology and charging point access become available.

The larger bus transport market - the intercity bus segment, is very competitive, with a large private sector presence than government STUs. In this market, technological fit in terms of range, availability of charging and unit economics drive the adoption. Fuel cost also plays a large role in intercity transport in comparison to urban transport, a factor made even more relevant by recent rapid fluctuations of fuel prices¹¹. Lowering of e-bus service delivery costs, together with a government's policy push for charging infrastructure will substantially impact the rate of adoption in medium-term for this market.

In the immediate, the urban public bus transport bus will generate the initial impetus, leveraging on policy momentum.

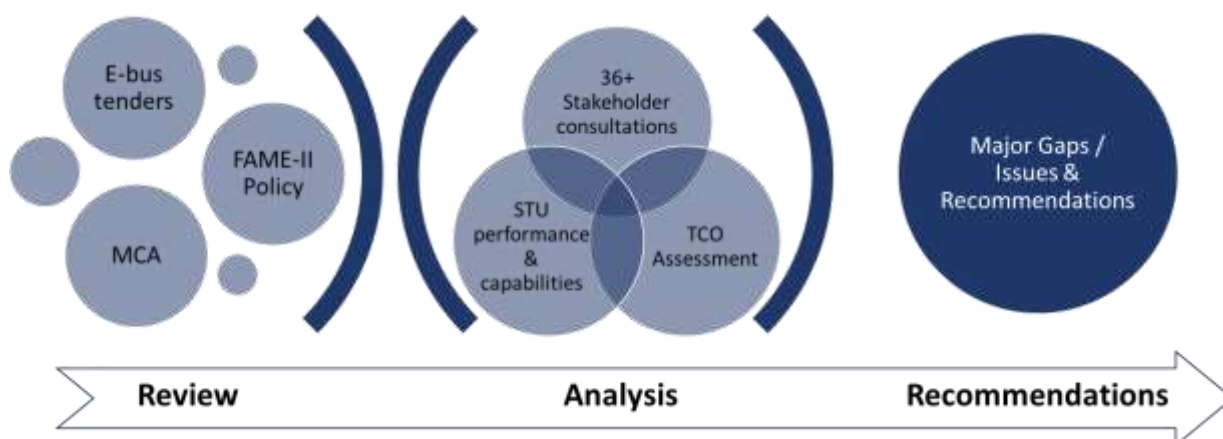
1.4. Objectives of the study and approach adopted

NITI Aayog in partnership with the World Bank Group (WBG) is looking at developing sustainable business models for electric mobility in India, with strong emphasis on the e-bus market scale-up. The bankability and competitiveness of e-bus services requires solutions to improve procurement practices for both e-buses and associated charging infrastructure and alternative business models, in addition to the current GCC model, to unlock financing at scale. The current study seeks to develop recommendations to improve existing RfPs and MCAs for GCC and suggest alternate business models to enable this transition.

¹⁰ Source: Smart City Guidelines (2015); High Powered Expert Committee (HPEC, 2011)

¹¹ Diesel prices have increased by over Rs. 30 per liter in past 2-3 years

Figure 4: Approach to the study objectives



The World Bank Group together with its consulting team, led by Spoctech Solutions and including Steer Group, carried out an in-depth analysis of the policy, MCA, a review of recent e-bus tender documents issued by cities / State Road Transport Corporations across 7 states (Table 4), and wider stakeholder consultations.

Table 4: Overview of recent tenders for e-bus procurement under FAME-II reviewed for this study

State/City	Contracting Authority	Type of bus	Number of buses
Uttar Pradesh (UP)	14 cities across UP	9m	700
Tamil Nadu	8 cities across Tamil Nadu	9m	525
Mumbai	Brihanmumbai Electric Supply & Transport Undertaking (BEST)	9m & 12m	340
Delhi	Delhi Transport Corporation (DTC)	12m	300
Bengaluru	Bengaluru Metropolitan Transport Corporation (BMTCL)	12m	300
Ahmedabad	Ahmedabad Janmarg Limited (AJL)	9m	300
Pune	Pune Mahanagar Parivahan Mahamandal Limited (PMPML)	12m	150
Surat	Surat Citylink Limited (SCL)	9m	150
Madhya Pradesh	Indore and Bhopal	9m	100
Navi Mumbai	Navi Mumbai Municipal Transport (NMMT)	9m & 12m	100

Except M.P. and Tamil Nadu, contracts have been awarded successfully in rest of the cities. However, BMTCL (Bangalore) and DTC (Delhi) retendered several times before successfully awarding the contracts.

Source: Spoctech Solutions – Research and Analysis

A wider stakeholder consultation was held across various stakeholder groups such as Original Equipment Manufacturers (OEMs), bus operators and associations, charging infrastructure OEMs and/or service providers, international transport operators, government agencies (STUs and concerned state government departments) as well as financiers comprising of both equity and debt investors.

These consultations unveiled the stakeholder’s perspective on challenges faced in recent tenders as well as helped validate findings from the independent analysis of tenders and their outcome.

2. E-bus Procurement – Current Practices and Challenges

E-Bus in India is largely procured for intracity operation by the STUs, MTUs and SPVs largely under FAME-I and II schemes. The procurement approach adopted by transport agencies are summarized as follows:

Table 5: E-bus procurement model – current practices

Schemes	Procurement Models ¹²		
	Outright Purchase	Gross Cost Contract (GCC)	Net Cost Contract (NCC)
FAME-I	Yes (e.g., Lucknow, Indore*, Kolkata, Guwahati, etc.)	Yes (e.g., Mumbai, Hyderabad, Ahmedabad, etc.)	Indore*
FAME-II	n/a	All Cities availing FAME-II scheme (e.g., Mumbai, Pune, Surat, Navi Mumbai, Ahmedabad, DMRC, etc.)	n/a
ULB / Smart City Funded	Mumbai	Pune, Bangalore**, Ahmedabad***	n/a

* In case of Indore, Authority procured e-buses on Outright Model, however, operator was selected on NCC model, wherein operator is required to contribute 20% - 25% of cost of electric bus, collects and appropriates fare collected and receives subsidies as per bidding criteria. Also, intercity bus routes were bundled with intracity operations to cross-subsidize the viability gap funding needs of the operator.

** Bangalore - BMTC (90 e-buses for metro feeder service)

*** ULBs in Gujarat procuring buses under Chief Minister Urban Bus Service

In response to DHI's request for expression of interest for allocation of e-buses under FAME-II scheme, DHI received 86 proposals from 26 States/UTs for the deployment of 14,988 e-Buses. DHI selected 64 cities across India to receive financial incentives for the deployment of 5,595 e-buses under FAME-II.

Under Phase-1 of FAME-II (till March 2020), tendering process for procurement of 2,450 e-buses on Gross Cost of Contract (GCC) across 13 states were completed. This included:

- 2,270 e-buses for urban services in 30 cities;
- 180 e-buses for intercity operations across 4 STUs; and
- 100 e-buses for DMRC for its feeder services.

Under GCC model of FAME-II, the scope of bidder included: (i) fleet (including charging infrastructure) financing, procurement, and provision; (ii) operations and maintenance including provision for drivers, depot operations for charging, maintenance of buses and infrastructure; and (iii) meeting operational key performance indicators (KPIs). Provision for greenfield maintenance depot is an optional scope item and was observed in few tenders only. The bidders shall be paid on per kilometer basis. On the other hand, the scope of authority included provision of conductors, ticket collection and revenue appropriation, as well as scheduling of operations.

¹² Outright purchase means procurement of e-buses by the Authority on capex model, whereas under GCC or NCC, it is on opex model (typically INR per KM basis). Under NCC, ticket revenue is with the bidder as compared to that under GCC wherein ticket revenue is with the Authority.

Key insights from analysis of tenders from Phase-1 of FAME-II process are as follows.

A. Limited Participation

Many tenders saw single bid participation, while only few cities received up to 3-4 bids

Analysis of participants (by OEMs) in these tenders shows that only 2 bidders (i.e., Tata Motors and Olectra-BYD) participated in most of these tenders.

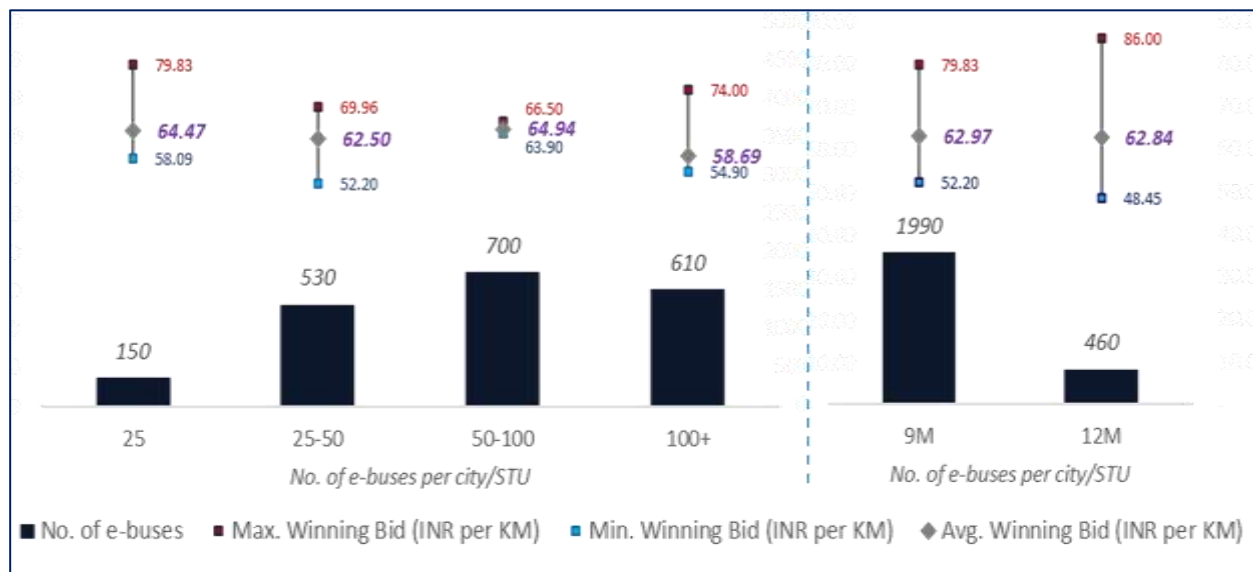
Low participation could be attributed to the one or more of the following reasons:

- Short time available to respond for tenders – left bidders to be selective in bid participation
- Know-how of / presence in certain region, existing operations, or relations with tendering authorities – selective participation approach
- Perception of the authority’s past track record with private sector, availability of budget, etc.
- Limited presence of non-OEMs – Most tenders required OEMs to be either lead member or mandatory part of the consortium. This has resulted in limited number of market players taking part in the bids (limited by qualified OEMs) despite showing keen interest to participate in bidding process.

B. Significant variation in price – Across Cities

Significant variation in rate (L1 quotes) in the range of ± 15%-30% range, higher variation in 12M bus category (lower rates being mainly for inter-city operations with monthly assured KM of 14,000+)

Figure 5: Analysis of e-bus GCC rates (L1 bidder) discovered under FAME-II



Source: Spoptech Solutions (Analysis)

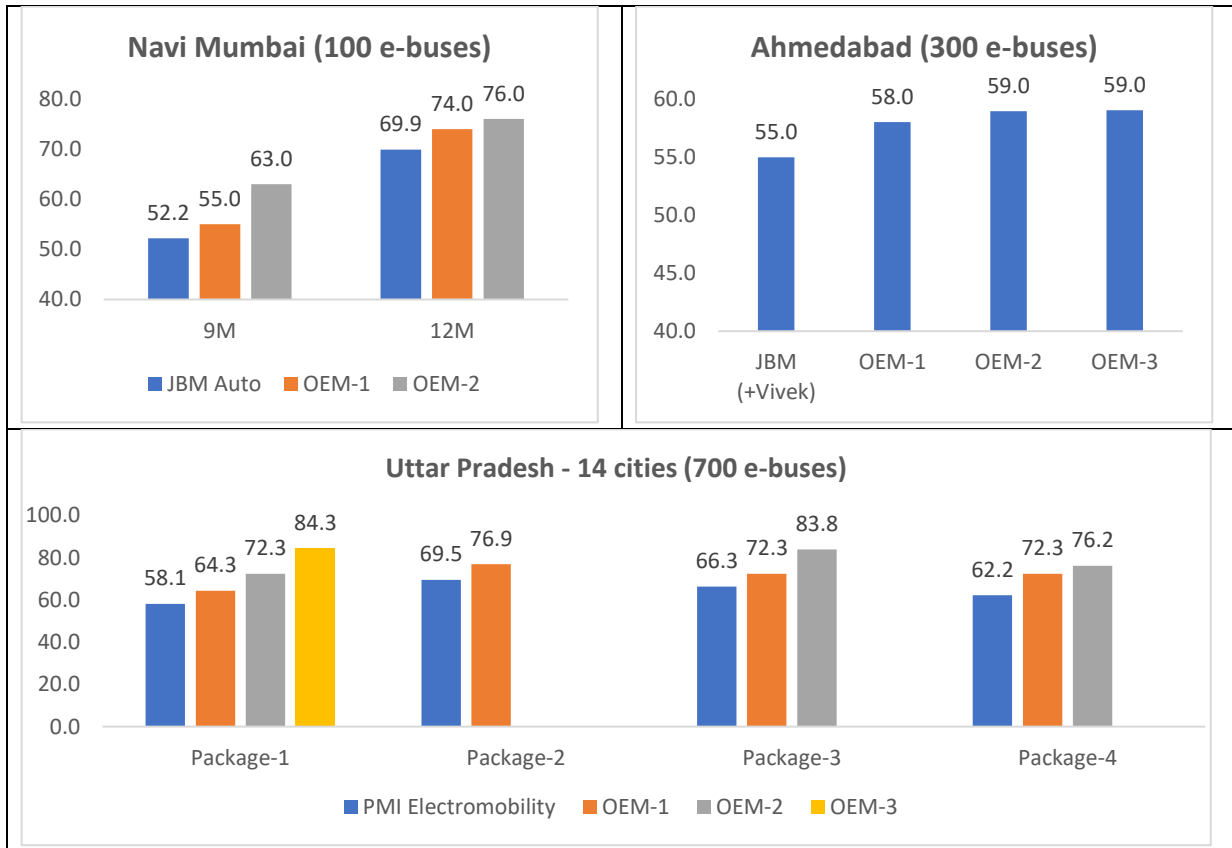
C. Significant price variation – Within Cities

Prices also varied significantly among bidders for a given city / tender, implying varying level of risk perception and risk premium bundled in the bid prices

For instance, difference between L1 and L2 in case of Navi Mumbai and Ahmedabad was 5-6% of L1, however, it was ~14% and ~2% between L2 and L3 in respective cities. In case of Uttar Pradesh (U.P.) difference between L1 and L2 varied across package from 9% to 16%.

Except cities / STUs in Gujarat (for instance, Ahmedabad), the variation in rates was relatively large with respect to the lowest quote (L1 quote).

Figure 6: Analysis of e-bus GCC rate (INR) discovery within a particular city



Source: Spotech Solutions (Research and Analysis)

D. Better rate discovery observed with higher assured KM over the contract tenure

Higher assured KMs over the contract tenure has resulted in lower GCC quotes. However, few exceptions in cities from U.P and M.P. were observed. Different cities have specified different Minimum Assured KM based on their own requirement.

Figure 7: FAME-II GCC rates compared to utilization over contract tenure (9m AC e-buses, Intra-city)



Source: Spoctech Solutions (Analysis)

* M. P. – received 2 bids in Indore & Bhopal and single bids for other 3 cities (Ujjain, Jabalpur & Gwalior)

D1. Dehradun - 30 e-buses (INR 66.78 per KM)

D2. Silvassa (Dadra & Nagar Haveli) – 25 e-buses (INR 66.01 per KM)

D3. Jaipur – 100 e-buses (INR 66.5 per KM)

Note – color in the chart is used only for easy representation purpose, to identify cities within a particular state having similar tender conditions.

E. Concerns of various stakeholder groups in the current process

Concerns of different sets of stakeholders vary according to the underlying nature of risks they are comfortable taking.

Figure 8: Concerns of the Stakeholder groups

Bidders (OEMs, Operators, etc.)	Authorities	Financiers
<ul style="list-style-type: none"> • High Subsidy Bank Guarantee a deterrent • Limited time to respond to tenders • Deviations from MCA • Restrictive eligibility criteria • Lack of Authority's creditworthiness 	<ul style="list-style-type: none"> • Need for adequate time required for planning, consultation and preparedness • Need for standardized tender documents • Capacity building measures 	<ul style="list-style-type: none"> • Missing long term e-bus fleet induction plan • High credit risk • High payment default risk • Infrastructure risk best managed by Authority

Industry participants (or bidders) indicated relatively more concerns about the restrictive criteria and ability to get project financed from lenders. This impacted less large OEM that rely on corporate financing for those tenders. While financiers are found to be wary of counterparty risks, for the authorities, lack of adequate planning and capacity were some of the bigger concerns.

The bidder is expected to provide subsidy bank guarantee on 100% of the subsidy amount. Similarly, eligibility criteria were mainly focused on OEMs of electric buses which were restricting over types of bidders such as operators and financial intermediaries. In several tenders, the Authorities deviated from the MCA especially with regards to termination clauses, payment mechanism and securities. These were some of the critical elements impacting the ability of bidders to participate and the pricing of additional risk premium in GCC quotes.

2.1. Identification of key gaps / issues

Review and analysis of tender documents, bidding outcomes and stakeholder consultations led to the identification of **critical factors affecting adequate participation** of market players and bankability of projects and **issues impacting bankability as well as risk-return equilibrium** between the Contracting Authorities and Bidders

Key gaps or factors and issues identified in the existing procurement approach are classified under four broad categories as follows.

Policy aspects



- Implementation approach
- Program Timelines*
- Subsidy Bank Guarantee (BG)
- Subsidy calculation
- Missing Elements in Policy

RFP and Tendering process



- Eligibility criteria
- Evaluation & Selection Criteria
- Bid timelines
- Market sounding

Concession Agreement



- Ambiguity in scope, roles and responsibilities
- Performance monitoring mechanism
- Financial covenants (includes 10+ parameters like payment terms, fee revision, etc.)
- Force majeure & termination
- Change of scope
- Change in ownership

Counterparty related aspects



- Readiness of the Authority / Project
- Institutional capability
- Creditworthiness of counterparty
- Market perception
- Existing total cost of operations
- Perceived Political Risks

* Refers to overall timelines from application for EOI, preparation for tendering, bid process and post-award implementation

Source: Spoctech Solutions – Research & Analysis

During this study, around 36 stakeholders across e-bus value chain were consulted to validate the issues and challenges identified in e-bus procurement in India and provide inputs with respect to improving bankability in e-bus procurement in India

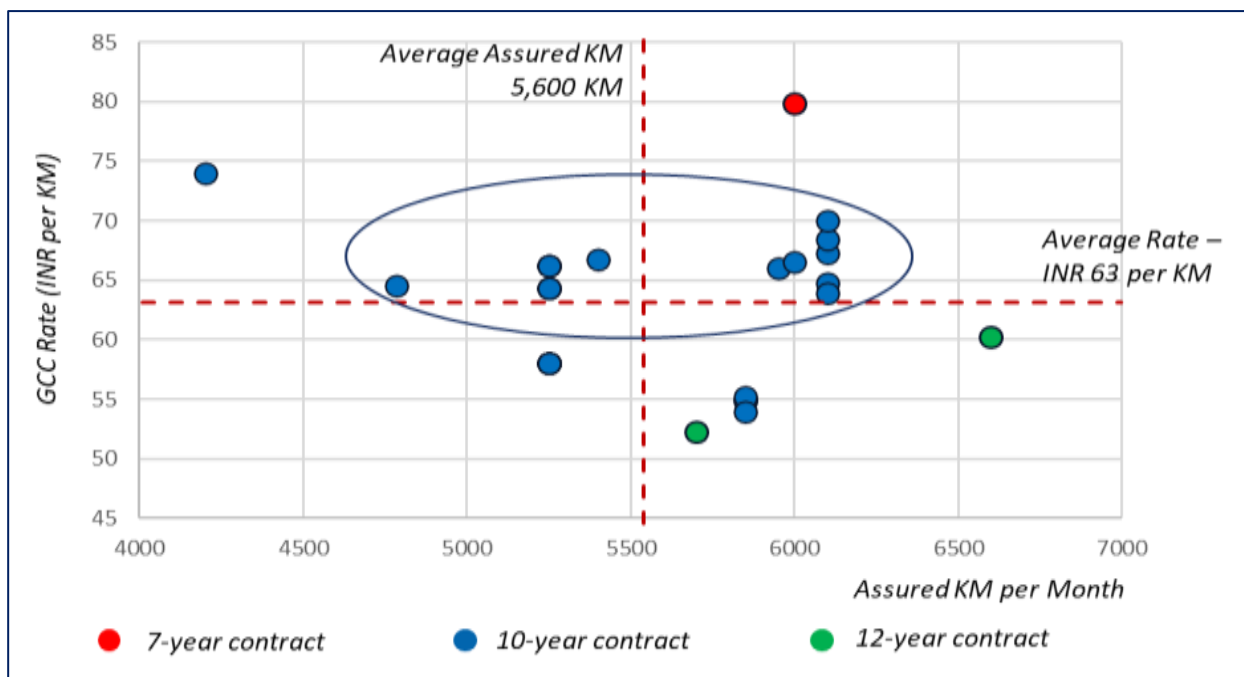
2.2. Total Cost of Ownership (TCO)

STU/ Cities have adopted TCO as an important consideration to accept the bid for e-bus tender. Under FAME-II tenders, the results for e-bus tenders of 33 cities/SRTCs were analyzed. It comprised of 1,990 e-buses of 9M by 28 cities / SRTCs and 460 e-buses of 12M size by 7 cities / SRTCs. Few cities (For example, Navi Mumbai and BEST Undertaking in Mumbai) have floated tenders for mix of 9M and 12M e-buses.

With respect to 9M e-buses, the average of Minimum Assured KM offered by cities was around 5,600 KM per month (range was 4,200 to 6,600 KMs per month) and average of L1 GCC quoted rate was estimated to be ~INR 63 per KM (range was INR 52.2 to INR 79.83 per KM) after considering the subsidy provided under FAME II.

Of the 27 cities mapped for results of 9M e-buses tenders, electricity cost was to be borne by the operator except in few cities like Surat, Rajkot, and Patna where electricity cost was to be borne by the authority.

Figure 9: Analysis of e-bus GCC rates discovered under FAME-II for Intra-city bus operations (9M, AC)



Source: Spoctech Solutions – Analysis

A base case scenario was developed and tested for sensitivity on various parameters based on: (i) review and analysis of FAME-II tenders and results; (ii) review of MCA; (iii) stakeholder consultations; and (iv) generally accepted industry assumptions including expected return on equity of 16% to 18% for projects of such nature. The following table summarizes impact of various parameters on the base case GCC assessment for 9M e-buses. A similar assessment was carried out for 12M e-buses.

A sensitivity analysis indicated that the following parameters had the most impact on the L1 GCC rate (and hence TCO for most parameters except depot, electricity payment and fee revision) for e-buses, ranked in order of impact (high to low):

- Minimum Assured KMs
- Electricity tariff rate and electricity payment by Authority vs. Operator
- Depot responsibility (greenfield depot construction) by Authority vs. Operator

- Fee Revision Rate
- Subsidy Bank Guarantee
- Creditworthiness of Authority and/or adequate payment securities

Any positive actions with regards to the above parameters can significantly address bankability issues as well as reduce GCC/TCO for the Authority.

Table 6: Sensitivity analysis of base case GCC with respect to various parameters (9M, AC e-bus)

Key Risk Factors	Base Case	Most favourable scenario	Worst-case scenario	GCC Impact w.r.t. Base Case GCC (i.e., INR 70 - 71) (INR Per KM)	
				Favourable	Worst Case
Assured KM	5,600 (~ 185 KM per day)	220 KM per day	150 KM per day	- 8 to 10	+ 11 to 13
Fee Revision	0%	3% p.a.	0% p.a.	- 6 to 7	-
Subsidy & Performance BG	Required	Subsidy BG – Removed	Required	- 3 to 6	-
Creditworthiness of CP (Payment Security) *	Good	Good – Adequate Security Provided	Security Not adequate	-	+ 2 to 4
Termination	Reasonable	As per good industry practice	One-sided in favor of Authority	-	+ 1 to 2
Depot Responsibility	Authority	Authority	Operator	-	+ 7 to 8
Time period for bidding*	Adequate	Adequate	Inadequate (Rushed)	-	+ 1 to 2
Interest Rate	11%	9%	13%	- 1 to 2	+ 1 to 2
Electricity Tariff	6 per kwh	4 per kwh	8 per kwh	- 2 to 4	+ 2 to 3
Electricity paid by	Operator	Authority	Operator	- 8 to 9	-
Estimated range of GCC quote (INR)	70.0 – 71.0	37.0 - 44.0	95.0 – 105.0	- 26 to 34	+ 25 to 34

Source: Spoctech Solutions – Analysis

*It is assumed that operator would seek additional 2% - 4% of returns for individual risk associated with uncapping of liability, lower creditworthiness of authority, unfavorable termination terms, and timing of bidding.

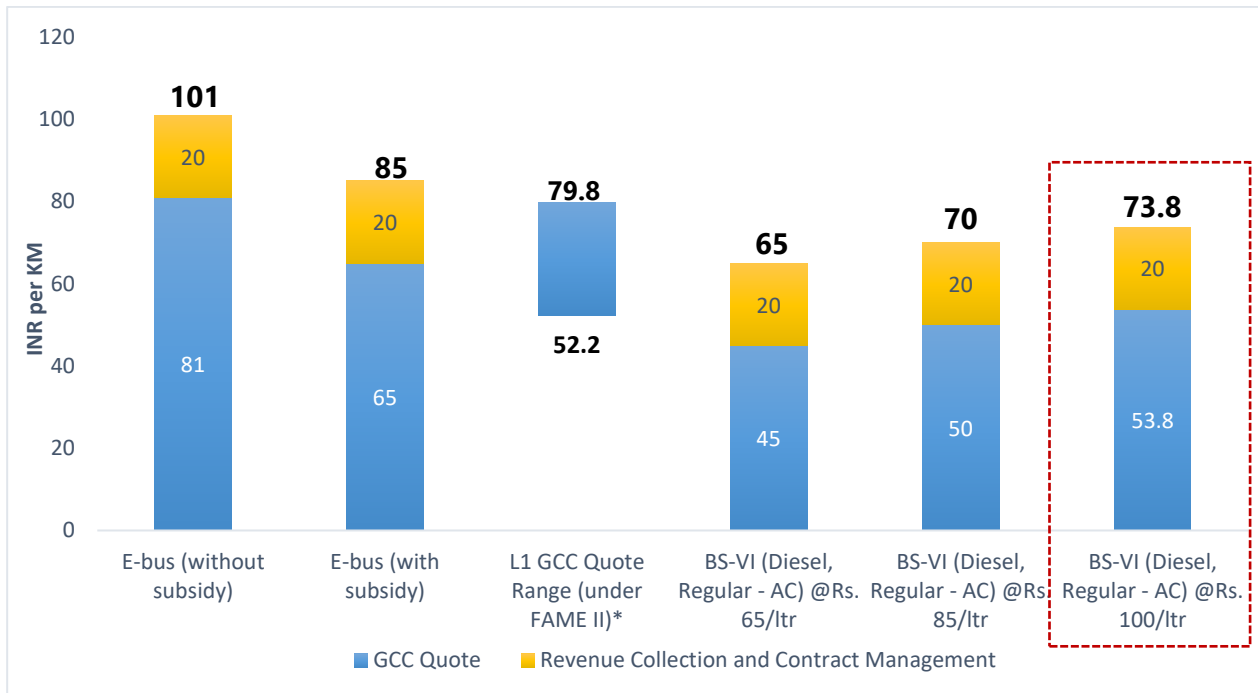
The estimated risk premium is subject to change based on underlying base case GCC, which itself is sensitive to any change in assumptions.

Total Cost of Ownership (TCO) in above analysis includes all capex and opex related to procuring and operating electric buses and associated infrastructure, financing costs, replacement of batteries, and so on.

2.2.1. TCO for intra-city operations

Subsidy under FAME-II has helped reduce the initial cost of e-bus which in turn helped reduce TCO for e-bus operation. However, many STUs/ Cities have either cancelled the tender or retendered because of higher TCO for e-bus operation. Since, intracity bus operations are mainly delivered through government agencies (city / state transport undertakings), it is important to analyze and look at TCO in intra-city operation as presented below.

Figure 10: TCO for intra-city bus service (9M AC E-bus, 5600 KM month) under GCC model (base case scenario)



Source: Spoctech Solutions – Analysis

* Monthly Assured KM ranged from 4,200 to 6,600 for intracity operations for 9M e-bus segment, with weighted average discovered rate of INR 62.9 per KM

**Prevailing rate of diesel is over INR 95 per liter in Delhi (October 2021)

The above analysis indicates that TCO parity in intracity e-bus operation has improved recently owing to high diesel prices, however, higher capital cost of electric buses and operating revenue shortfall due to low fare structure are major areas of concern for adoption of e-buses for intra-city use.

To harness e-bus potential of intracity bus segment, subsidy support continuation in the form of Capex and/or Opex is critical.

2.2.2. TCO for inter-city operations

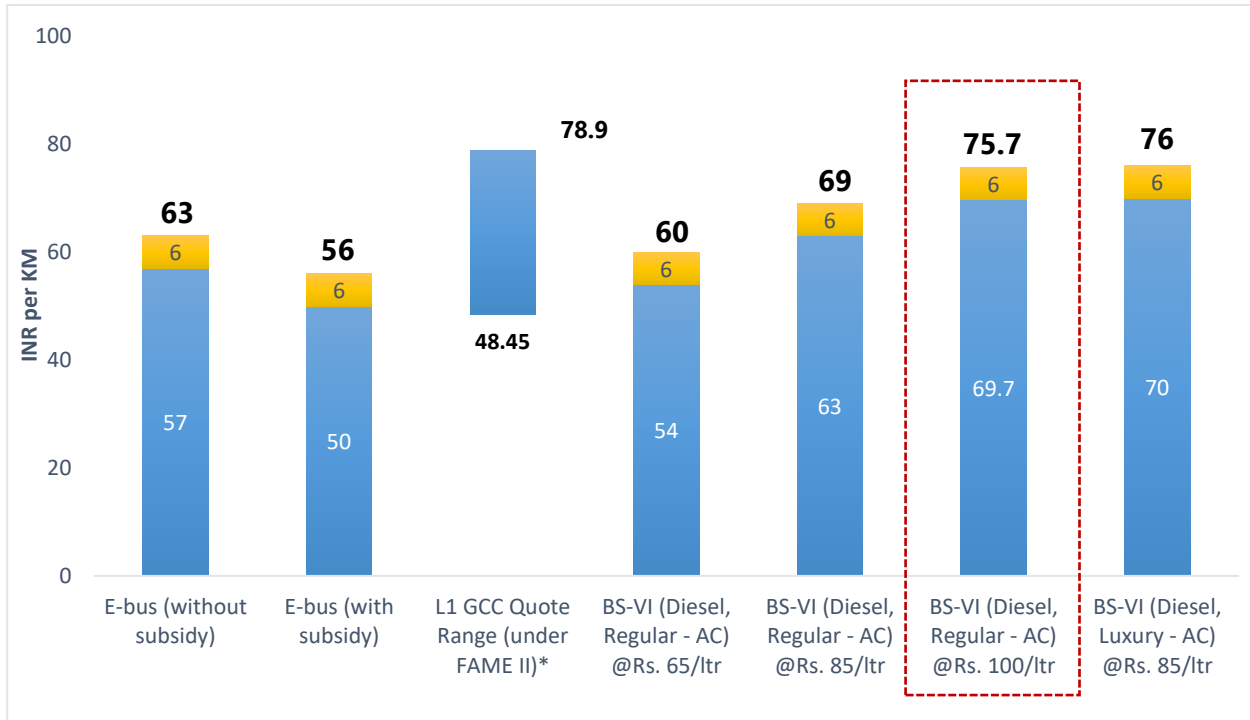
Inter-city (also includes inter-state) bus market is a competitive market with presence of both government (SRTC) and many small to large private bus operators. SRTCs also provide bus transport services to rural areas.

The intercity bus market size is much larger compared to the intracity bus market with over 70% of registered bus stock deployed on inter-city routes. 12M buses are preferred for intercity deployment,

especially between high traffic routes (for example, Mumbai – Pune, Mumbai – Nashik, Chennai – Bangalore, Delhi – Agra, and so on).

The following chart summarizes the estimated range of TCO for inter-city use case for 12M electric bus for inter-city segment.

Figure 11: TCO Analysis (12M) – E-bus vs. Diesel BS VI (Intercity, AC - 168,000 KM per year i.e., 14,000 KM per month) under GCC model (base case scenario)



Source: Spotech Solutions – Analysis

* Annual Assured KM ranged from 80,400 (Kadamba SRTC) to 180,000 (Rajasthan SRTC) for intercity operations for 12M e-bus segment, with weighted average discovered rate of INR 56.37 per KM

TCO for 12M E-bus is compared with the TCO for BS-VI standard diesel buses as well as discovered range of L1 quote in the chart above.¹³ MSRTC and RSRTC procured 50 e-buses each on GCC model (under FAME-II) with discovered L1 GCC quote (inclusive of electricity cost) of Rs. 48.45 per KM (Monthly Minimum Assured KMs of 14,000) and Rs. 53.70 per KM (Monthly Minimum Assured KMs of 15,000) respectively.

TCO parity does exist for inter-city bus services, with subsidy, however, relatively high upfront capital cost of e-bus, limited range per charge (most e-buses available with range of less than 300 km per single charge are not suitable for long distance journey), unavailability of charging infrastructure and longer lead time for charging (i.e., fueling time) are some of the limiting factors affecting the adoption of e-bus in inter-city bus segment as compared to diesel buses. Availability of charging infrastructure and longer distance per charge can help to a large extent in adoption of e-bus in inter-city bus operation.

¹³ Cost of Diesel BS VI 12M bus for inter-city application is assumed to cost INR 1.30 – 1.40 Crore for luxury bus (AC) and INR 0.80 – 0.90 Crore for regular bus (AC) for government inter-city bus market. In case of intracity bus application, cost of bus is assumed to be INR 0.50 – 0.60 Crore (regular intra-city AC bus category). - Source: Stakeholder Consultations.

3. Critical Actions to Unlock the Urban E-Bus Market

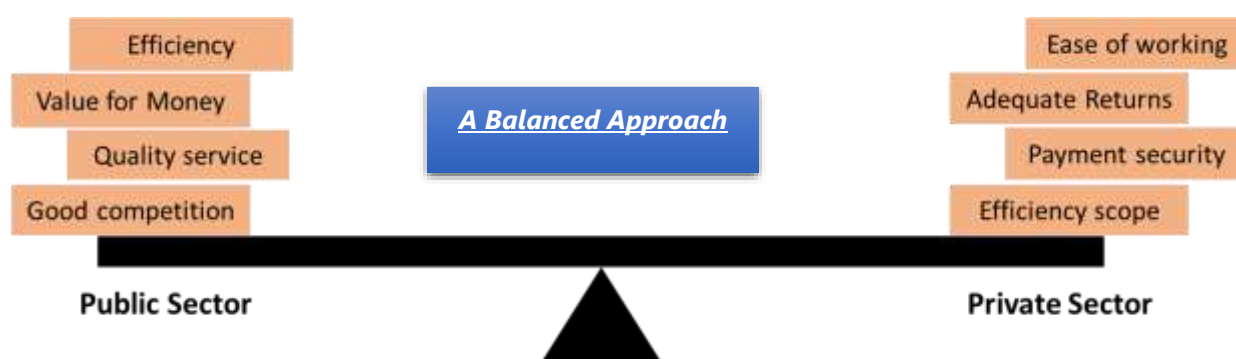
To unlock e-bus market in India, a three- pronged strategy is recommended:

- Improving bankability of existing procurement approach (i.e., GCC model)
- Introducing alternate business models building on international experience
- Policy and regulatory interventions as enabler for unlocking the market

The above measures can also help unlock e-bus market for intercity operations in the long term.

3.1. Improving bankability of existing e-bus procurement approach (i.e., GCC model)

Specific improvements can be brought in the policy and bid documents (RfP and MCA) while adopting a **balanced approach** between the Public and Private sector entities as presented below:



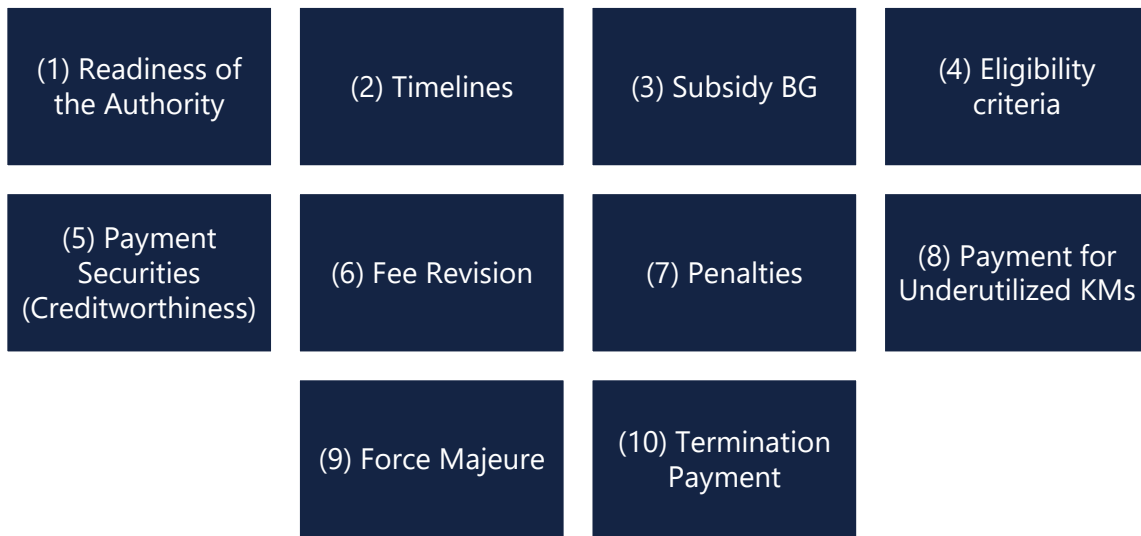
The MCA for e-Bus procurement at GCC, issued by the NITI Aayog, is an overall balanced document. Enhancement in certain provisions of the MCA can improve bankability of e-bus procurement.

This study identified factors where changes can have high impact on bankability of e-bus procurement, based on the:

- a) perspectives of various stakeholders,
- b) level of their estimated impact on (i) bid participation, and (ii) cost and bankability

These factors are depicted in the figure below and can be addressed in part by enhancing RFP & MCA provisions, related to these factors.

Figure 12: Major gaps to be addressed

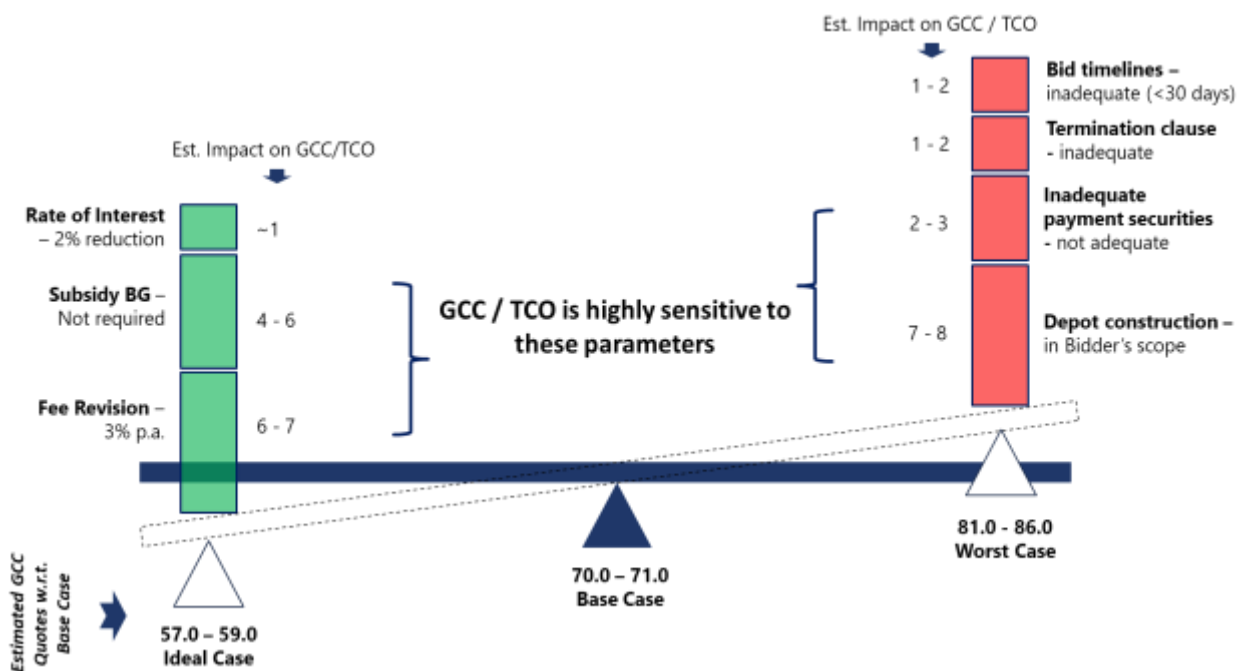


Source: Spoctech Solutions – Analysis

The readiness of the Authority above includes detailed project assessment and planning, clarity of roles and responsibilities, commitment of funds from city / state government, depot infrastructure readiness and so on.

Addressing above gaps can improve bankability and scalability of e-bus adoption significantly and reduce GCC quote and/or TCO for the Authority by 10% to 20% as shown below.

Figure 13: Impact on GCC quote or TCO (for 9M, AC e-bus) for select measures



Source: Spoctech Solutions – Analysis

Some of the above parameters like fee revision and depot construction can only impact GCC quotes and not actual TCO for the Authority, as these are either deferred costs over the contract tenure or passed on to the Authority.

To address the major gaps identified under this study, specific measures are suggested based on their impact on bid participation and TCO. The following table summarizes these measures in order of their respective priorities considering the impact on TCO and / or bid participation.

Table 7: Summary of recommendations for current e-bus procurement approach

Impact on Bid Participation	High	PRIORITY-II	PRIORITY-I
		- Standardization of RFP and MCA - Program Timelines - E-Bus Specifications	- Removal of (relaxation in) Subsidy Bank Guarantee requirement
		- Relax exit rules (change in ownership) - Payment Security - Escrow Account (Supplementary Escrow Agreement)	- Capping of penalties - Payment securities - Termination and force majeure
		- Eligibility criteria	- Bid timelines
			- Readiness of the Authority - Creditworthiness of the Authority
	Low	PRIORITY-III	PRIORITY-II
		- Advisory Cell within DHI - Accelerated Depreciation	- Reduction in GST rate on leasing, supply, subcontracting activities - Change in subsidy structure
		- Payment Cycle	- Fee Revision - Payment for Underutilized KMs
		Low	High
	Impact on TCO		

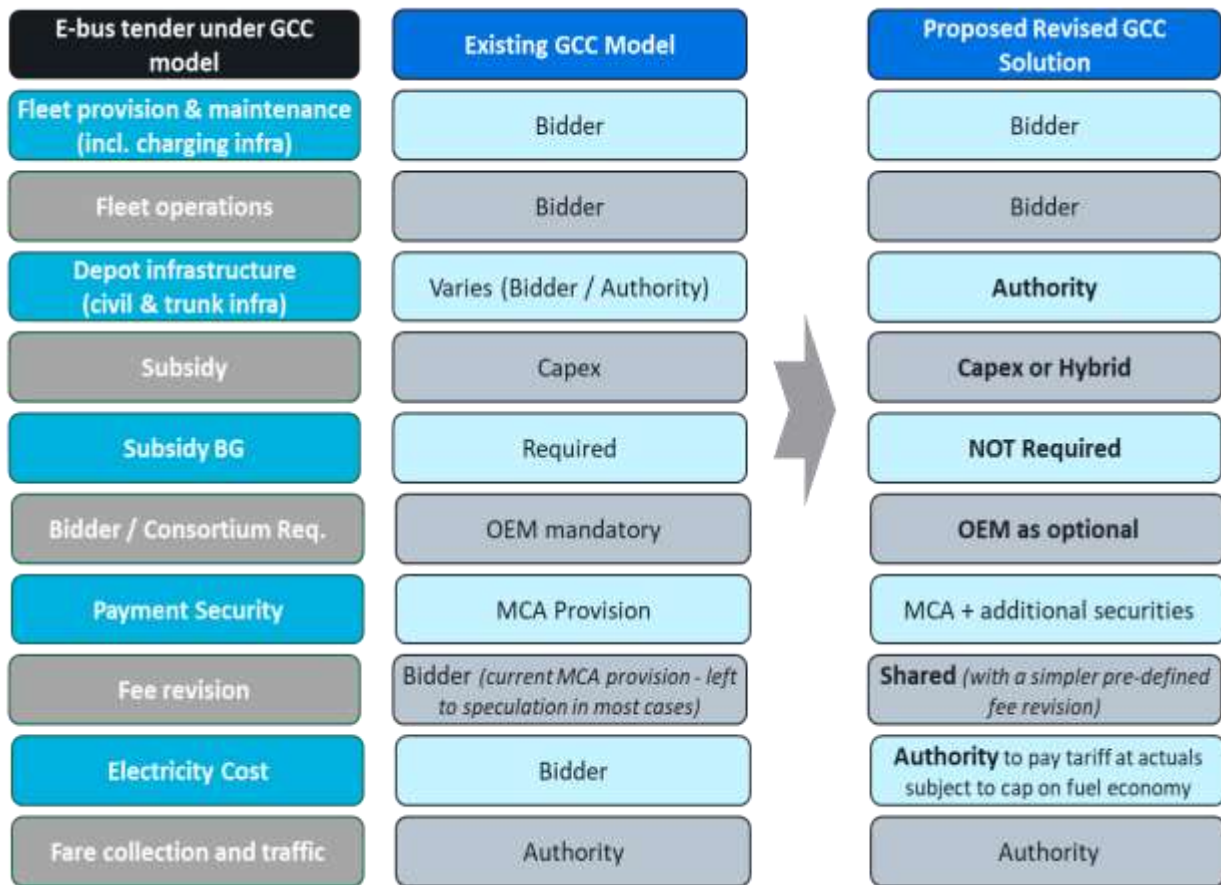
Legend:

Policy Level Interventions <i>primarily to be done by GoI (NITI Aayog, DHI, and respective line ministries)</i>	RFP and Tendering Process <i>Primarily to be addressed by respective tendering authorities</i>
Concession Agreement <i>Primarily to be addressed by GoI (NITI Aayog and DHI) and followed by respective tendering authorities</i>	Counterparty <i>Primarily to be addressed by respective tendering authorities and respective state/city governments</i>

Source: Spoctech Solutions – Analysis

The current procurement model of GCC would undergo change with recommended improvements / modifications (summarized in Figure 14) and is termed as “**Revised GCC Solution**”. This solution can significantly improve bankability of the current procurement approach.

Figure 14: Existing GCC vs. Revised GCC Model



Source: Spoctech Solutions – Research & Analysis

It can be noted that certain risks and responsibilities are reallocated to the Authority as they are relatively better placed to manage them. This is expected to result in reduction of GCC quotes as well as increase bid participation.

Measures to improve bankability – areas of improvement in the existing MCA

The following are some of the important changes in the existing MCA which could help improve bankability of e-bus procurement significantly.

Table 8: Measures to improve bankability – areas of improvement in the existing MCA

Area of improvement	Suggested Improvement
Capping of Penalties <i>(Damages for failure to achieve KPIs)</i>	Cap can be introduced as equivalent of [3% to 5%] of the monthly bill amount . Any deterioration in KPIs for continuous period of [3 / 6] months shall lead to gradual increase in the penalty cap as 1% per month for subsequent months (subject to maximum cap of 10% of the monthly bill amount) .
Force Majeure	Following addition to the existing provision be made for event(s) wherein Authority is unable to deploy buses due to actions of the Government(s) prohibiting normal bus operations, (a) it shall be treated as Indirect Political or Political events (based on underlying cause) , and accordingly, payment to the Operator shall be made as per Cl. 29.7.2 of the MCA. -- OR -- (b) Authority shall make the payment to Operator as per provisions under Payment for Underutilized KM.
Termination Payment	Existing MCA provisions to be amended with following additions, under any termination event <ul style="list-style-type: none"> ➤ Ownership of all project assets (incl. e-buses, charging infra and other equipment) to be transferred to the Authority ➤ Debt due component of termination payment to be released within 60 to 90 days of the date of termination. ➤ Alternate to Debt Due being paid to the Bidder / Operator, outstanding loan less insurance cover can be transferred to the STU books with no haircut for banks – STU and Bank to agree mutually STU / Authority can be provided with Partial Risk Guarantee facility from institutions like World Bank/IFC to meet termination payment obligations and mitigate termination payment risks for the financing institutions and bidders.
Exit Rules <i>(Change in Ownership)</i>	Minimum 51% of ownership till Commercial Operation Date (COD) and minimum 26% till [1 or 2] years from COD <i>(i.e., permit 100% exit after 2 years from COD)</i>
Payment Securities	Payment securities structure be adopted in line with one followed by U.P., Navi Mumbai and SECI's Model Power Purchase Agreements (PPA): (a) Escrow Account Mechanism (as per existing MCA provisions) requiring the Authority to <i>(i) maintain at least an amount equivalent to 2 months (preferably 3 months) of O&M Fee;</i> OR <i>(ii) provide Revolving Letter of Credit (LC) from the scheduled bank for at least an amount equal to [2 or 3-month] of O&M Fee</i>

	<p>(b) State Guarantee (as State Guarantee, Payment Security Fund and/or Guarantee Loans backed by multilateral funding agency)</p> <p>Alternatively, a more creditworthy institution can be created, or existing institutions be given responsibilities as Tendering Authority and/or as Guarantor.</p>
Fee Revision	<p>Approach-1:</p> <p>GCC Fee without electricity cost – to be escalated at [2% or 4%] per annum starting from [2nd or 3rd] year</p> <p>Change in Electricity Cost - Authority to pay for cost of electricity consumed in charging of E-buses, or operator responsible for electricity cost up to a capped tariff, both subject to fuel economy cap.</p> <p>Approach-2:</p> <p>GCC Fee without electricity cost – Inflation indices linked adjustment from base year till COD and then annual revision.</p> <p>$GCC_2 = GCC_1 * [1 + (X1 * CPI-IW + X2 * WPI)]$</p> <p>Change in Electricity Cost – same as Approach-1</p> <p>where, CPI-IW – Consumer Price Index Numbers for Industrial Workers and X1 the staff cost percentage under GCC</p> <p>WPI – Wholesale Price Index and X2 for other consumable cost percentage</p>
Payment for Underutilized KMs	<p>If the Authority is unable to demand Minimum Assured KMs from the Operator, it shall</p> <ul style="list-style-type: none"> ➤ make monthly payment for underutilized KM per month at GCC Fee (or lower proportion but not less than 70%); and ➤ reconcile with Annual Assured Bus KM on YTD (Year-to-Date) basis (from 1st April of the financial year) at a quarterly / half-yearly frequency to account for Actual Bus KM operated vs. Assured Bus KMs.

Measures to improve bankability – areas of improvement in the existing RFP(s)

The following are some of the important changes in the existing RFP(s) which can help improve bid participation as well as help improve bankability

Table 9: Measures to improve bankability – areas of improvement in the existing RFP(s)

Area of improvement	Suggested Improvement
Eligibility Criteria	<ul style="list-style-type: none"> ➤ GoI (DHI) to empanel qualified OEMs and eligible e-bus models ➤ OEMs – not to be made mandatory part of the bidding entity/consortium

	<ul style="list-style-type: none"> ➤ Allow Non-OEM bidders/consortium to participate, by submitting an undertaking from (one or more) OEMs or procure from empaneled list of OEMs ➤ Widen the participation of industry by – OEMs, Operators, Aggregators, Financiers and Others ➤ Financial criteria can be strengthened to enable ease of financing
<p>Bid Timelines & Standard RFP</p>	<ul style="list-style-type: none"> ➤ Allow at least 45 (or 60) days for bid submission ➤ Guidance to cities/Authorities, on <ul style="list-style-type: none"> ➤ Standard tendering documents (RFP, etc.) ➤ Timing of floating tenders

3.2. Introducing alternate business models / procurement approaches

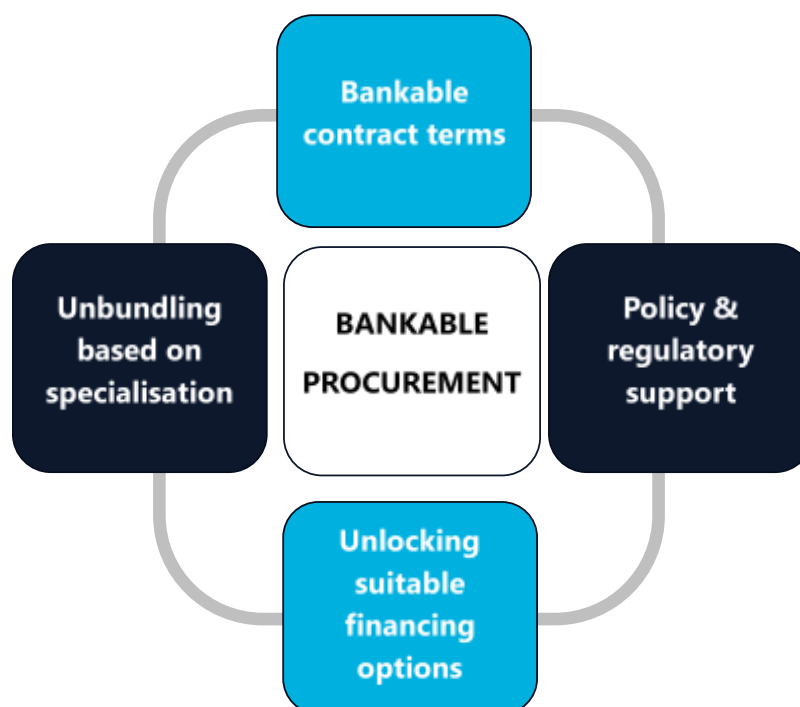
The current challenges in the GCC model under FAME-II are:

- 1) Structural issues pertaining to policy, concession agreement, RFP and tendering process, and counter party related aspects discussed in above sections, and
- 2) Lack of flexibility in the procurement model i.e., GCC model mandated to be used for procurement to avail subsidy.

From our assessment and stakeholder consultations, it is noted that:

- **Existing STUs / SPVs / City Bus Authorities across India are at varying levels of maturity in bus transport**
- **Roles, responsibilities, and risk-taking capability varies from one stakeholder to other stakeholders**
- **E-bus demand aggregation as well as economies of scale are required for depot level infrastructure cost recovery**

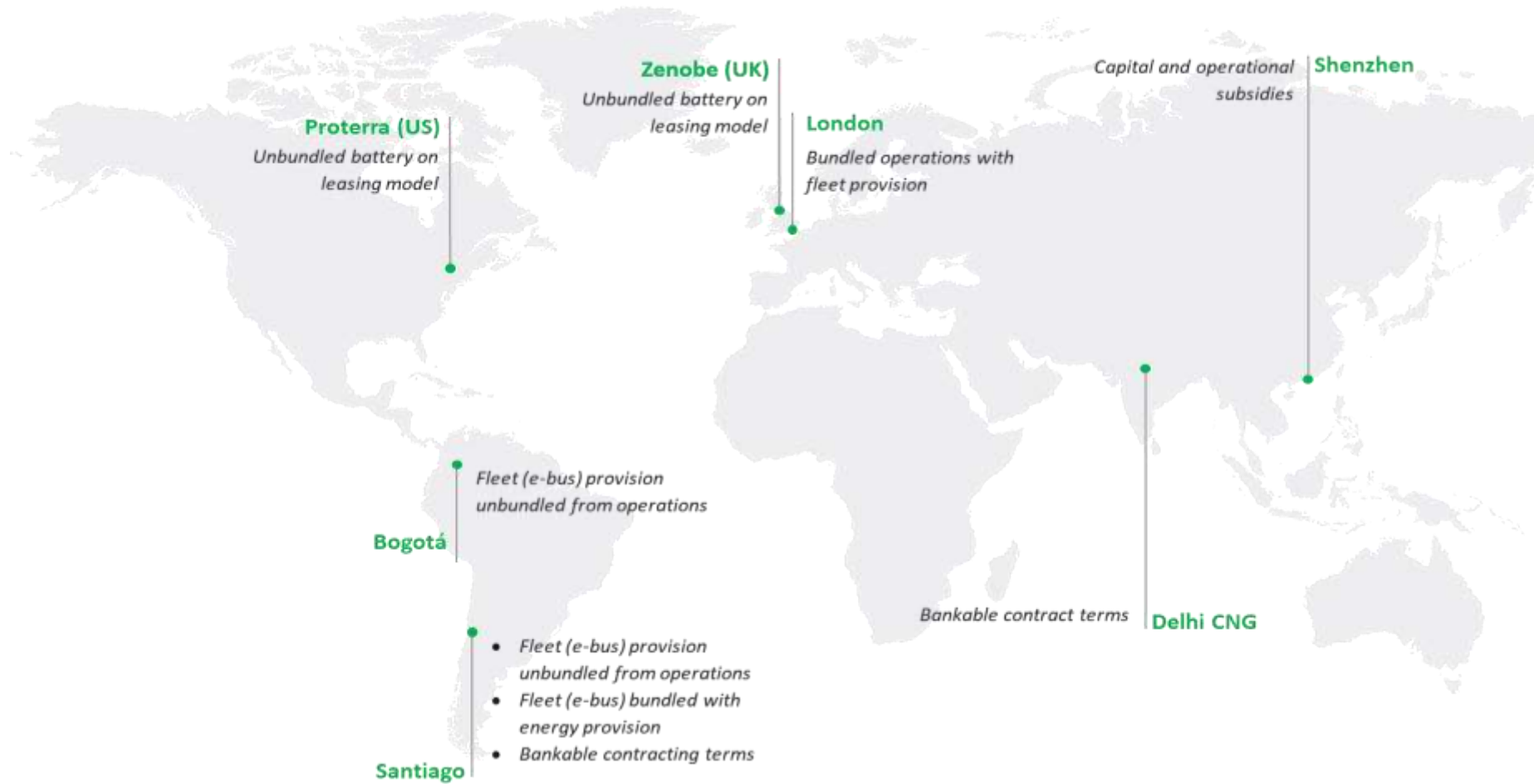
Based on findings from the gap assessment, we identified four broad categories of enabling levers that can improve bankability of e-bus contracts.



3.2.1. Learning from international experience

Select cities across the geographies were studied to analyze the key learnings from their experience and key enablers for adoption of e-bus / low carbon transport.

Figure 15: Learning from experiences of model cities and key enablers for e-bus (or low carbon) transport



Key learnings from the model cities are captured below.

Santiago

Santiago is the capital city of Chile, a middle-income country in Latin America. Santiago has a population of 5.6 million and 6,756 buses operated by six different operators on 360 different routes and a metro rail system with seven lines totaling 140 km¹⁴. Since 2013, energy providers in Santiago have partnered with private bus operators and bus manufacturers to pilot and deploy e-buses. Notable partnerships included an energy provider, a bus operator and an OEM. The key enabling factors for e-bus procurement success in Santiago with Metbus-ENEL-BYD partnership as an example include the following:

- Energy provider contributed from pilot stages to early contracts through investment in charging infrastructure and fleet provision/financing.
- For fleet renewal with considerable increase in operational km, authority provided operator with CAPEX difference between diesel buses and e-buses
- Direct pass-through payments on fleet and energy from authority to fleet provider
- Buses will remain in system until debt is paid to financiers of fleet
- Negotiations, cooperation between stakeholders from pilot stage to bus deployment, and timing of deployment aligned with close of previous contracts

Bogota

Bogota, a city of 8 million residents and the capital of the Latin American nation of Colombia, is well known to be a global pioneer and leader in city bus transport. Bus operation in Bogota faced several challenges such as low ridership and less than expected payment resulting in banks and financial institutions losing confidence in transport operators. The new contractual models introduced in 2018 sought to unbundle fleet supply from fleet operations. The key enabling factors for e-bus procurement success in Bogota include the following:

- Unbundled roles and risks: fleet operations, provision and maintenance, energy
- Direct payments to lender subaccount from trust funded by fare box revenue.
- Payment for fleet provision not tied to payment for operation
- Quality/cost-based selection to attract reliable fleet providers and operators
- Favorable long-tenure maintenance contracts with OEM
- Energy provider brings expertise and capital into charging infrastructure and e-depots
- Potentially good financing terms based on project finance
- Zero VAT and import duties on e-buses

London

London, with a population of 9 million, is renowned globally for its public transport system that includes a range of services encompassing bus, metro, local trains, taxi, cycling provisions and rover services. As of

¹⁴ Source: Steer

August 2020, London has 3,773 hybrid buses (2,773 double-deck and 1000 new Routemaster) and 316 e-buses (115 double-deck and 201 single-deck) under operation.

The London example was identified and studied to show the contrast between bundled and unbundled business models for e-buses. London's contracts for hybrid and e-buses are mostly bundled where the operator procures and operates the e-buses, even owning most depots. This can partly be attributed to London's wealthier status compared to cities in Latin America, along with having several old established private operators with creditworthiness to procure fleet and depot ownership. Leasing is also carried out by financial institutions as there is confidence in the secondary market for e-buses with other operators, if one operator defaults. This is an example to demonstrate that historical, institutional, market and financial characteristics are critical decision-making factors in identifying the suitability of business models.

Financial and institutional characteristics of public transport authority and operators in Indian context is very different from that in London and would require corresponding adjustments.

USA- Proterra

US transit authorities tend to favor electric buses with much larger battery packages. The main suppliers are Proterra, NFI Group (New Flyer) and BYD. BYD established a partnership with Generate Capital in 2018 to offer leases for buses, batteries and charging infrastructure, helping to leverage grant funding. Generate Capital invests in a range of renewable energy projects and is willing to take residual value risk.

Proterra, under their 12-year battery lease, will own and guarantee the performance of the batteries throughout the life of the vehicle. The battery lease agreement provides a battery performance warranty which includes battery replacement at mid-life. Replacing batteries at midlife will help to ensure consistent vehicle performance, lock in battery costs, and provide customers access to Proterra's latest battery technology as it improves over time.

In April 2019, Proterra launched a partnership with Mitsui to create a \$200 million credit facility in support of a battery lease program. This program is the first of its kind in the North American public transit industry and allows Proterra to scale its battery leasing program to benefit customers.

Delhi

Delhi with a population of over 19 million is served by an extensive system of public transport modes consisting of metro, buses, and paratransit. Delhi has successfully awarded tenders for several CNG buses to the private operators.

Delhi's CNG tenders provide several learnings for procurement generally for any type of bus technology. These learnings demonstrate success and coming from an Indian city, these are directly relevant to most Indian cities with similar challenges.

- Substitution agreement between government and operators for surety to bank in the case of default
- Judicial backing and regulatory mandate for conversion to cleaner bus technology
- CNG stations are setup by utility company (IGL) in the depot without any additional cost to the authority and the operators
- Cost indexation related to fuel (CNG price), manpower (minimum wages) and other consumables (WPI-IW)

- o Escrow accounts and 15-day payment cycles help alleviate payment risk perceptions and improve cashflow for operators.

Shenzhen

Shenzhen in China is a renowned example of mass electrification of e-bus fleet. Buses in Shenzhen are operated by three government operators. Through significant capital (50-70% of procurement costs) and operational subsidies from the government, Shenzhen electrified its entire fleet of 16,000 buses by 2018.

Shenzhen along with other cities in China have shown the biggest successes in fleet electrification plans globally, highlighting the significance of strong institutional mechanism and the applicability of unbundling. In the process Shenzhen benefitted from substantial subsidies in bringing fleet electrification up to a stage where TCO parity is closer and market forces can operate without much state support. This can be difficult to replicate considering current urban transport funding arrangements in India.

Potential Alternate Business Models for Indian market

Based on learnings from model cities and markets coupled with the initial list of models and existing GCC model structure, the following primary and secondary alternate business models can be considered for the Indian context for e-bus procurement and allied infrastructure:

Primary business models	Secondary/supplementary business models
<ul style="list-style-type: none"> ➤ State-led fleet aggregator ➤ Market-led fleet aggregator <ul style="list-style-type: none"> • OEM or non OEM-led aggregator 	<ul style="list-style-type: none"> ➤ Unbundled charging infrastructure ➤ Battery leasing

The roles & responsibilities under each model are presented below:

	Fleet			Energy			Financing Instruments		
	Operations	Maintenance	Provision	Charging Infra	Grid connection	Depot Infra	Leasing	Loan	Equity
Primary Business Models									
GCC FAME-II	Bidder (mainly OEM led)							Bank	Bidder
State-led Aggregator Model	Opr	OEM	State	*	State / PT	PT	DFI / Bank	DFI / Bank	(State / City)
Private Aggregator (OEM led)	Opr	OEM		*	PT	PT		DFI / Bank	(OEM)
Private Aggregator (Non-OEM led)	Opr	Non-OEM		*	PT	PT	(OEM / Non-OEM)	DFI / Bank	(Non-OEM)
Secondary Business Models									
Charging infra unbundled as PPP		CaaS Player				(CaaS / PT)	(CaaS)	DFI / Bank	(CaaS)
Battery leasing		(OEM / Lessor)				PT	(OEM / Lessor)	DFI / Bank	(OEM / Lessor)

*Opr – Operator

The alternative business models proposed above for electric bus deployment in the Indian market would move away from the traditional model of the cities owning and operating buses. The emerging business models typically involve an asset and/or manpower light model for the cities wherein several stakeholders come together, with each of them bringing in expertise in a sub-component of electric bus deployment. As a result, a wide range of stakeholders are involved for the ownership, operation, financing and maintenance of various assets and the provision of their manpower. While such models enable expertise-specific involvement, they also multiply the risks of the project as the failure of any of any of the stakeholders can put the overall project implementation at risk.

The risks involved across business models can broadly be classified into technological risks and contracting and financial risks. While technological risks are common across business models, contracting and financial risks vary between business models. Technological risks include operational and safety performance of buses and their various components such as battery, charger and power infrastructure. Adequate warranties, component availability and service requirements need to be mentioned in fleet procurement contracts to mitigate the technological risks involved in various business models.

Contracting and financial risks cover a wide-range of risks involved in pursuing the innovative business models proposed to electrify mobility. These cover items like ambiguities in role and responsibilities in case of non-performance by one of the parties, delays in project commissioning due to lack of infrastructure readiness, delays in payments to fleet and charging providers and operators, payment risks due to inadequate contract management capabilities and poor financial health of contracting authority, inadequate provisions for cost escalation during the contract tenure to incorporate variable of the costs such as staff and energy costs, liabilities corresponding to statutory taxes and their likelihood to change during the contract tenure etc. The nature of these financial risks and parties involved vary between business models. Hence, cities need to analyze the various risks involved with each business model to identify the most suitable model for their context and at the same time ensure adequate mitigation measures are put in place for the selected business model.

The following sections explain the various stakeholders involved in each business model and their contractual arrangements to help cities assess them for their feasibility and risk mitigation.

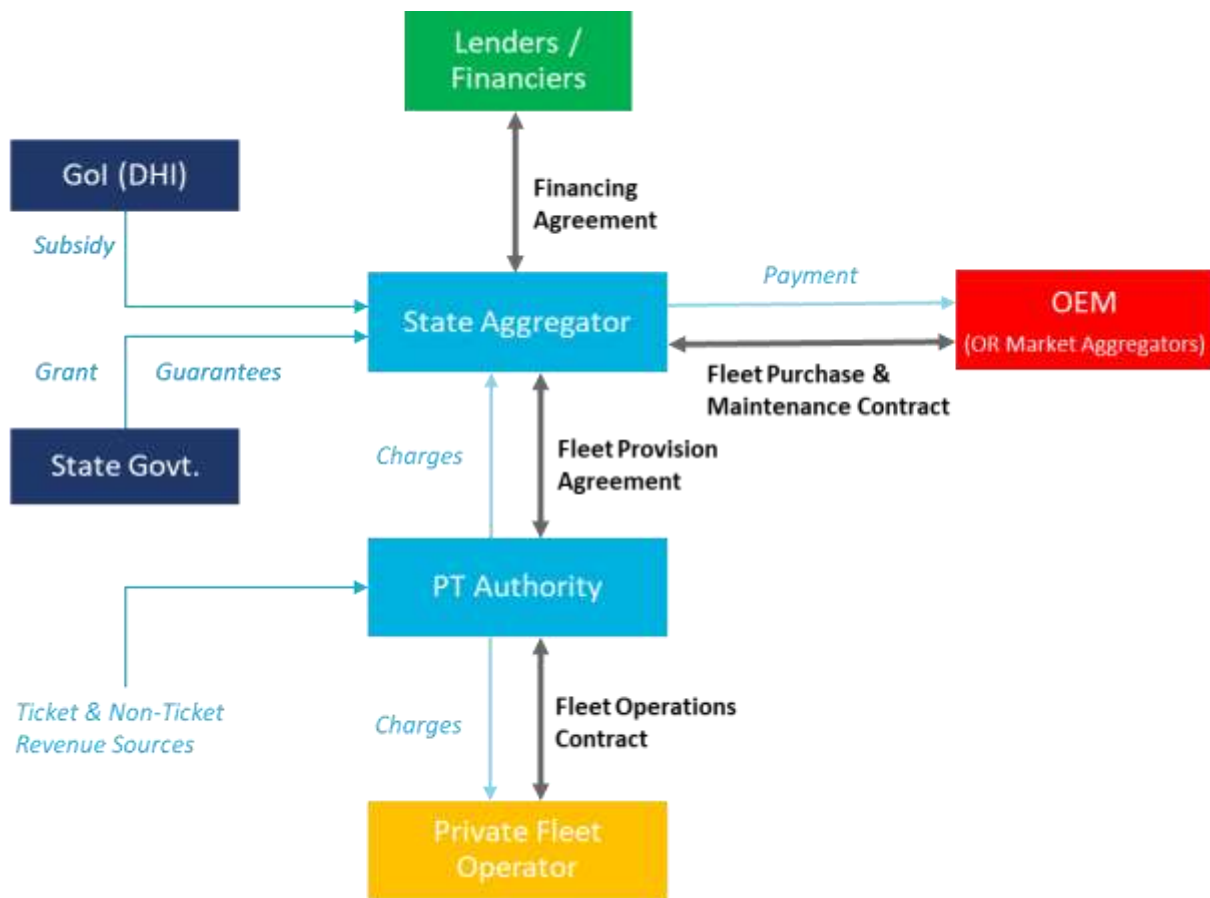
3.2.2. State-led aggregator

The model is suitable for state-led procurement wherein a creditworthy government agency takes initiative for fleet procurement aggregated across routes, cities and PTA with long-term electrification plan. This model can be expanded to national multi-state led model as pursued under the CESL Grand Challenge program under the second phase of FAME-II.

In this model, credit and payment risks are transferred to more creditworthy agency. Further, payments to financiers / investor would be made through a ring-fenced funds with committed funding and backed by State guarantee.

Aggregator model can work on the principle of unbundling of fleet provision and operations. The aggregator procures the buses (including charging infrastructure unless it is unbundled as defined in 3.2.4 A) from OEMs (or market-led aggregators) on outright or opex models. An alternative is aggregation of bundled services.

Figure 16: State-led aggregator model



Source: Steer, Spoctech Solutions

The model primarily helps in reducing capital investment and financing cost (both debt and equity) due to economies of scale, creditworthy institution as counterparty and government guarantees.

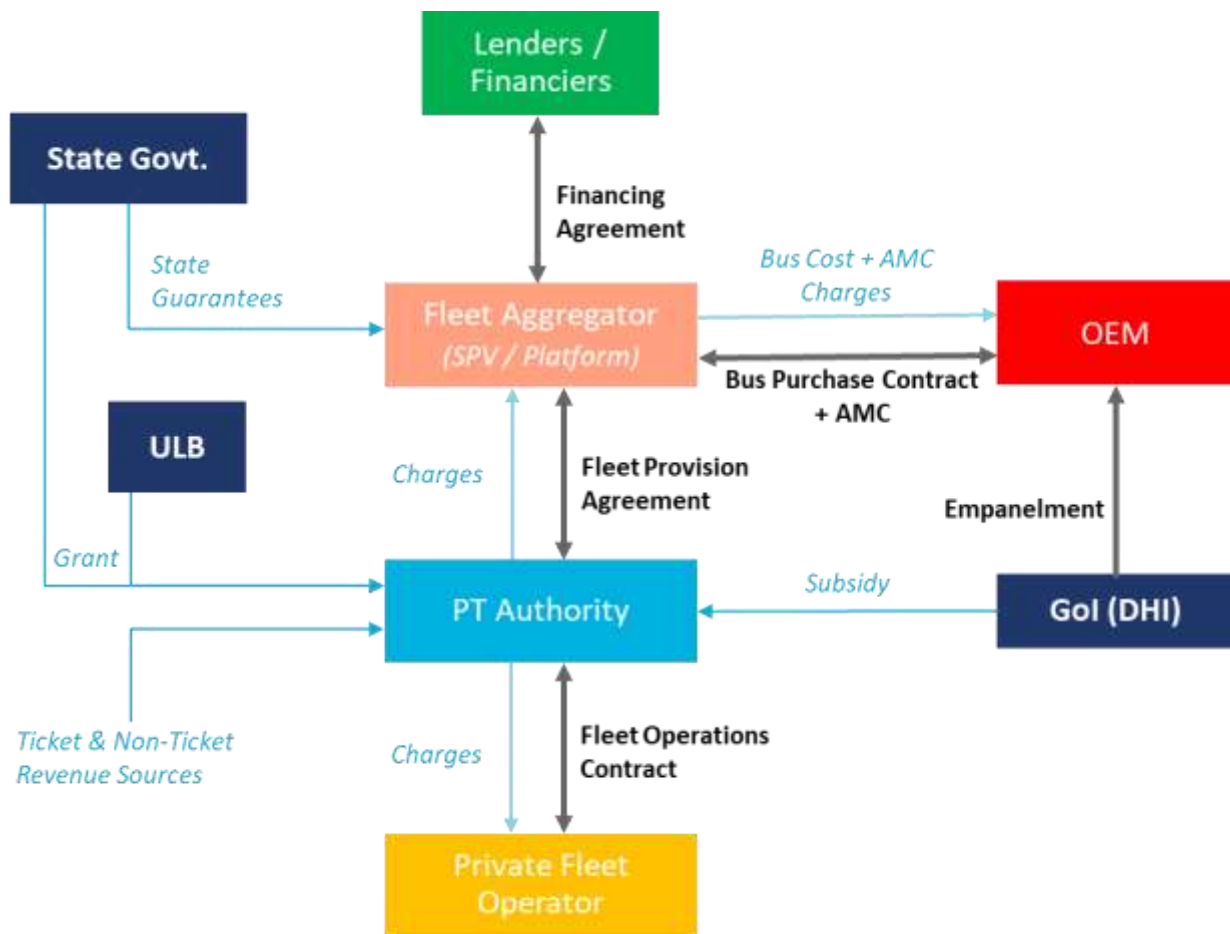
3.2.3. Market-led aggregator

Market-led aggregator (or private-sector led aggregator model) can be either OEM-led or Non-OEM-led platforms.

In this business model, the fleet aggregator aggregates fleet for STUs/SRTCs/Cities based on requirement to gain economies of scale, commercial viability, and lower costs.

Credit and payment risk, which is transferred to more creditworthy aggregator, is mitigated to some extent by State Guarantees (and/or Partial Payment Guarantees from institutions like World Bank Group if Government avails it). Further, payment default risk by the counterparty for financiers can be addressed by way of pooled mechanism at aggregator platform level.

Figure 17: Market-led aggregator model



Source: Steer, Spoctech Solutions

This model primarily helps in reducing capital investment and financing cost (both debt and equity) due to economies of scale, pooling of multiple contracts under aggregation and government guarantees.

In this market-led aggregator model, the PT Authority shall select the fleet aggregator as per similar process of e-bus procurement adopted under the FAME-II, however, with appropriate changes in accordance with the commercial model selected (i.e. Gross Cost Contract, unbundling of operations, etc.).

The market-led aggregator above procures buses and charging infrastructure (unless it is unbundled as defined in 3.2.4 A) from OEMs either on outright or opex models.

3.2.4. Secondary / supplementary business model

(A) Unbundling of charging infrastructure

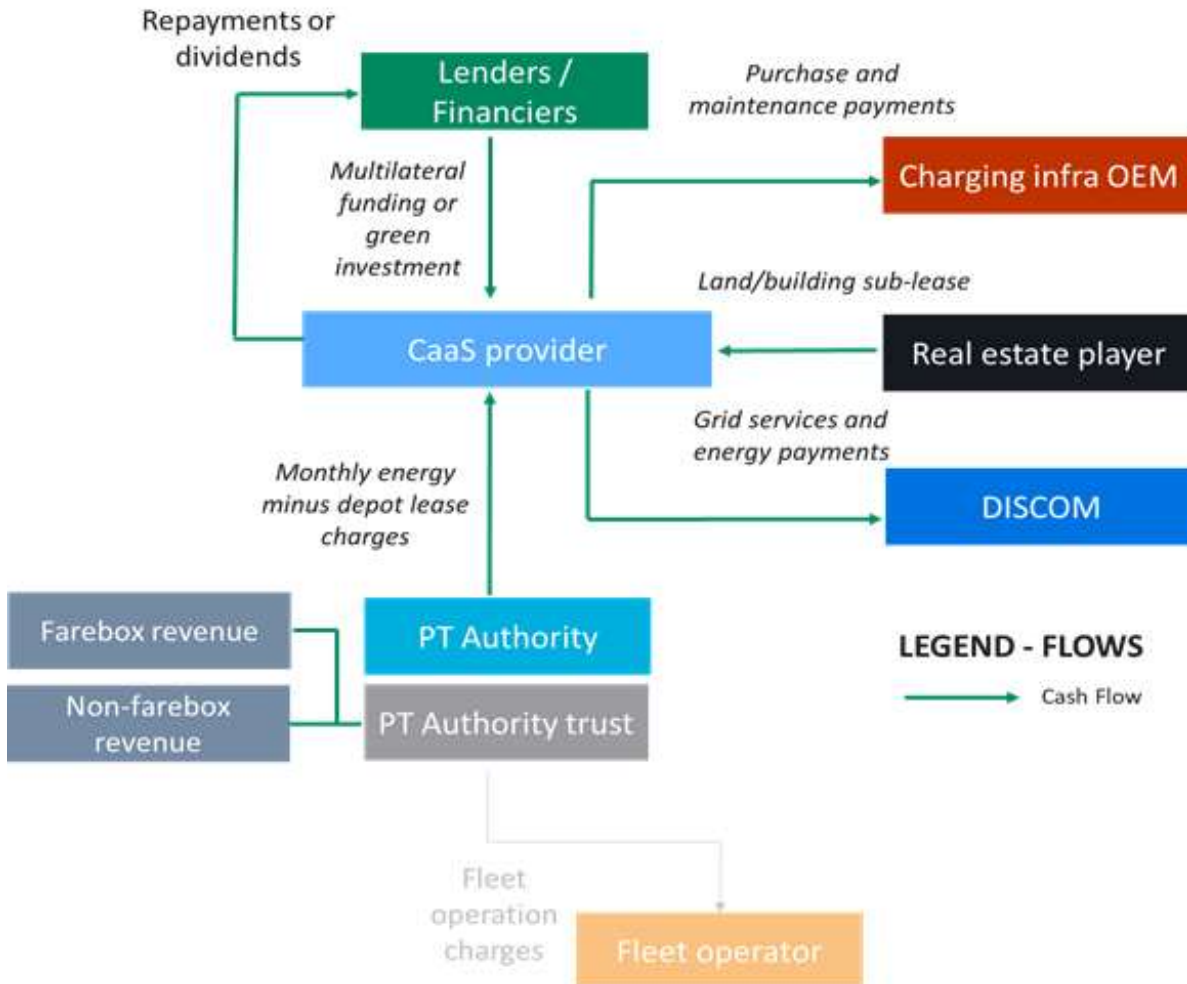
The primary characteristic of this group is that the charging infrastructure is unbundled from fleet provision and operations.

Business models that may be suitable for the Indian context under the unbundled charging infrastructure provision type include the following.

- One variant may have a PPP arrangement between the energy (charging as a service - CaaS) provider and the PT authority.

- o The second variant may again be CaaS where the CaaS provider may have grid connections arranged and charging infrastructure installed at their network Way Side Amenities (WSA), restaurant complexes or fuel outlets on the highway network.

Figure 18: CaaS – Unbundling of Charging Infrastructure



Source: Steer, Spoctech Solutions

Table 10: CaaS – Unbundling of Charging Infrastructure

	Fleet business		Routes		Charging type		Location	
	Private	Public	Intracity	Intercity	Opportunity	Full Charge	Depot / Terminal (OD)	En-route
PPP + CaaS	✓	✓	✓	✓	✓	✓	✓	
CaaS	✓	✓		✓	✓			✓

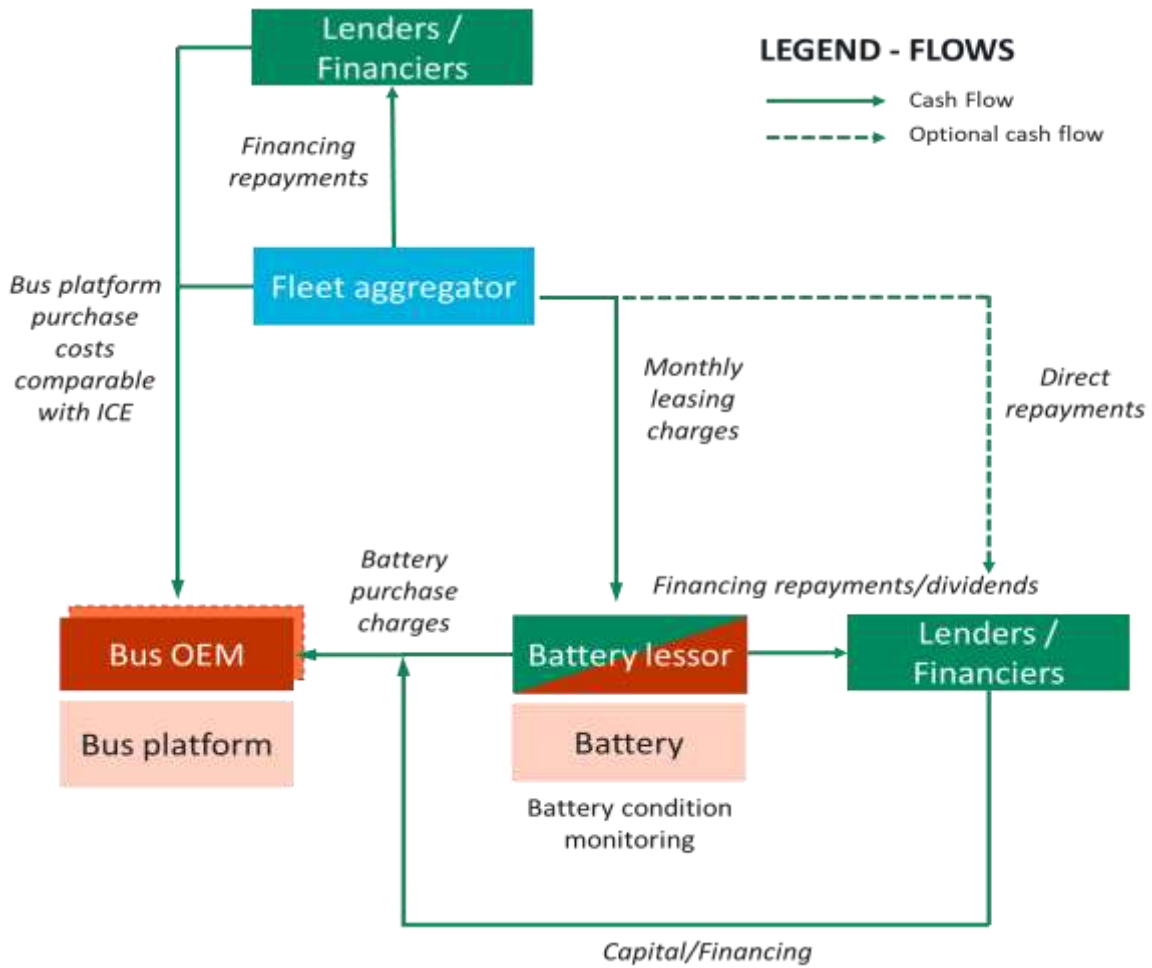
*Abbreviation: OD = origin-destination; Source: Steer, Spoctech Solutions

(B) Battery leasing

Battery is supplied with the bus but can be separated in terms of financing (benchmarked cost). Cost and performance risks are therefore with the battery lessor, who could either be OEM or a bespoke e-mobility solutions provider.

OEM can partner with financiers to provide credit facility to support large-scale implementation on favorable terms.

Figure 19: Battery leasing – secondary alternate business model



Source: Steer

Each primary business model has been further analyzed and compared on certain factors and enablers to arrive at the potential cost savings (financial savings only) for the STUs/ Cities and same is presented below.

Desirable characteristics and impact of alternate business models on bankability and scalability for Indian e-bus market

Figure 20: Desirable characteristics and impact of alternate business models on bankability and scalability for Indian e-bus market

Increasing order of bankability and scalability

	Revised GCC Solution	Unbundled GCC Solution	Alternate Business Models (Fleet Aggregator)	
Description	Existing GCC model with proposed changes	Revised GCC + unbundling fleet provision & operations	Market-led aggregator	State-led aggregator
Bus Technology	E-bus	E-bus	E-bus	E-bus (+ LONO* buses)
Fleet provision & maintenance contract	Combined contract	PTA with OEM or Fleet Aggregators (FAs)	Aggregator with OEM or other FAs	Aggregator with OEM or other FAs
Fleet operations contract		PTA in-house / Outsource	PTA in-house / Outsource	PTA in-house / Outsource
Bus specifications – standardization	Desirable	Desirable	Essential	Essential
PTA creditworthiness	Essential	Essential	Desirable	Desirable
State creditworthiness	Desirable	Desirable	Essential	Essential
Suitable for....	Standalone STUs or Cities aspiring to have own City Bus Transport	Standalone STUs with In-house O&M Capability	STUs/Cities offering large volume commitment	Creditworthy Agency as State Aggregator

X% Estimated TCO savings over existing GCC model

* LONO – Low Emission, No Emission

While in all the models above, ultimate fleet provider is the OEM and/or private led fleet aggregator, the state agency under BM1 provides the necessary cushion of creditworthy intermediary between the bidder and the PT Authority. The comparative analysis of estimated savings with underlying assumptions is provided in the Annexure of this report.

3.3. Policy and regulatory interventions

Based on the various aspects of the study as covered in this report, we have proposed recommendations for policy and regulatory changes under three major heads as follows:






Each of the above has been discussed in detail in the sub-sections below.



Table 11: Overview of recommended fiscal and non-fiscal measures




Themes	Affordability	Unlock commercial financing ecosystem	Scalability	Participation / Adoption
Fiscal Measures (13 measures)	<ul style="list-style-type: none"> ✓ Subsidy for E-buses (<i>for STUs, MTUs</i>) ✓ Subsidy structure ✓ Subsidy for private e-buses ✓ Interest reduction scheme ✓ GST reforms to enable leasing market ✓ Corporate (income) tax benefits ✓ Exemptions in Road Tax, MV Tax, Passenger Tax, etc. 	<ul style="list-style-type: none"> ✓ Easy access to low-cost capital ✓ Credit Guarantee ✓ Residual value / buyback assurance 	<ul style="list-style-type: none"> ✓ Feebate scheme for E-bus adoption 	<ul style="list-style-type: none"> ✓ Funding commitment from State / ULB (<i>especially for opex shortfall</i>) ✓ Additional support to STUs (<i>for infrastructure upgradation</i>)
Non-fiscal Measures (9 measures)		<ul style="list-style-type: none"> ✓ Commercial monetization of depot / terminal real estate 	<ul style="list-style-type: none"> ✓ City EV Transition Plan ✓ Infrastructure sharing ✓ Standardization of E-bus specifications, tender and concession agreement ✓ E-bus guidelines 	<ul style="list-style-type: none"> ✓ Stop registration of new ICE buses ✓ Reliability of grid connectivity and power quality ✓ Charging infrastructure network on major highways and O-D ✓ Capacity building (<i>of STUs / MTUs for public bus market</i>)

3.3.2. Fiscal measures

(A) Subsidy and its structure

		Recommendations	Action Plan	Impact
1	Subsidy Amount for E-bus 	<ul style="list-style-type: none"> • Maintain required subsidy at current level (at least) to incentivise e-bus procurement • Delink eligible subsidy from the GCC quote, as practiced currently • Link subsidy to the battery capacity subject to applicable Cap 	<ul style="list-style-type: none"> • GoI (DHI) to amend the existing policy or bring new policy (say FAME 3) 	<ul style="list-style-type: none"> • Helps STUs to plan better with certainty about the subsidy to be received from GoI (DHI)
2	Funding Commitment from State / ULB 	<ul style="list-style-type: none"> • Revise the policy to mandate States/ULB to meet additional commitment, especially for Opex support 	<ul style="list-style-type: none"> • Participating states / STUs / ULBs to prepare feasibility report as per policy guidelines • STUs/SRTC's to provide commitment as a part of its proposal for GoI's (DHI's) subsidy approval. 	<ul style="list-style-type: none"> • Sends positive signal and provide comfort to the bidders & lenders with commitment from the State / ULB for funding operational support.
3	Subsidy Structure 	<ul style="list-style-type: none"> • Remove the Subsidy Bank Guarantee • Have a hybrid subsidy structure (Capex + Opex) instead of only Capex subsidy 	<ul style="list-style-type: none"> • GoI (DHI) to amend policy specifying subsidy structure, and process of subsidy disbursement. • GoI (DHI) to define reporting formats for STUs to submit monthly performance report 	<ul style="list-style-type: none"> • Reduce the non-funding requirement from the banks and in turn reduce cost burden on project. • Reduce overall TCO.

 **Public (Govt.) Bus Market**
 **Private Bus Market**


		Recommendations	Action Plan	Impact
4	Additional Support to STUs 	<ul style="list-style-type: none"> Revise the policy to clearly outline financial support / commitments for infrastructure upgradation (or new infrastructure as applicable) by STUs / Cities 	<ul style="list-style-type: none"> GoI/DHI to amend the existing policy or introduce new policy (say FAME 3) GoI/DHI to hold consultation with state governments (states transport departments) and industry stakeholders 	<ul style="list-style-type: none"> Helps efficient e-bus operation and monitoring by Infra upgradation and ITS with financial support.
5	Subsidy for Private Buses 	<ul style="list-style-type: none"> Extend demand incentive linked subsidy provided to private EVs. Subsidy amount of Rs. 10,000 per kwh battery capacity, subject to maximum cap of Rs. 20 or 25 lakhs per E-bus <i>Estimate cost – Rs. 200 - 250 Cr per 1000 e-buses</i> 	<ul style="list-style-type: none"> GoI/DHI to amend the existing policy or introduce new policy (say FAME 3) Policy to be approved by the Union Cabinet and / or presented as part of next Union Budget 	<ul style="list-style-type: none"> Reduces the gap between capital cost of ICE buses and E-buses, incentivizing private bus operators to adopt e-buses. Reduces credit risk exposure for financiers.
6	Interest reduction scheme * 	<ul style="list-style-type: none"> Revise / bring new policy for interest reduction through risk sharing facility, subsidy or interest subvention scheme from empaneled list of banks. <i>Estimate cost – Rs. 150 - 200 Cr per 1000 e-buses over 5 to 8 years loan tenure</i> 	<ul style="list-style-type: none"> GoI and / or respective States to amend EV policies to provide interest rate reduction scheme Respective states can enable this through existing mechanism used for interest subvention scheme under industrial policies. 	<ul style="list-style-type: none"> Reduces the cost of financing for the private bus operators in comparison to ICE buses Provides ease of accessing finance from empaneled banks

* Based on availability of budgetary sources with the Central Govt and/or State Governments, private bus market can be allowed **to opt for both Capital Subsidy and Interest Subvention Scheme or Only One of the two schemes.**

(B) Financing Ecosystem



		Recommendations	Action Plan	Impact
7	<p>Easy Access to Low-Cost Capital</p> <p>G P</p>	<ul style="list-style-type: none"> • Provide Priority Sector Lending status—for lending manufacturing units, e-bus fleet procurement, charging and associated infrastructure • Set up Green Transport Fund of Funds • Create ecosystem for leasing through Development Financial Institution (DFI) 	<ul style="list-style-type: none"> • Representation to the MoF to make recommendation to RBI for assigning priority sector status to e-bus lending • DHI to hold consultation with relevant stakeholders and recommend to the MoF, GoI for Green Transport Fund and DFI, 	<ul style="list-style-type: none"> • Increase the adoption of e-bus and EVs. • Help private sector look at e-mobility favourably with better financial viability and long tenure leasing market.
8	<p>Credit Guarantee</p> <p>G P</p>	<ul style="list-style-type: none"> • Set up Credit Guarantee Fund Trust for Green Transport <ul style="list-style-type: none"> • <i>(Indicative)</i> for 10% of bus cost (capped at Rs. 10 lakhs per bus) • SIDBI as potential implementing agency 	<ul style="list-style-type: none"> • GoI to hold consultation. Based on consultation, this Fund Trust to be set up. • GoI can also tap resources from the World Bank Group and similar institutions especially as partial guarantee provider. 	<ul style="list-style-type: none"> • Improve access to the lending for e-bus operation.
9	<p>Residual value / buyback assurance</p> <p>G P</p>	<ul style="list-style-type: none"> • Enable residual value / buyback assurance by the OEMs • Post buyback, ownership of e-buses may rest with OEMs 	<ul style="list-style-type: none"> • GoI to hold wider consultation with OEMs, Operators, Financiers, and other relevant stakeholders to discuss the role of each party to be played to create this market. 	<ul style="list-style-type: none"> • Improved access to the capital for e-bus operation because lenders would get good amount of comfort in the absence of secondary / resell market




(C) Taxation and Levy

		Recommendations	Action Plan	Impact
10	GST reforms – to enable leasing market 	<ul style="list-style-type: none"> Reduce GST rate on outsourcing of services and leasing of e-buses, batteries and associated infrastructure to 5% (or NIL) from current 18%. 	<ul style="list-style-type: none"> NITI Aayog, DHI, Industry Associations and/or State Transport Departments to make a representation to the GST Council, Ministry of Finance for reduction in applicable GST rates 	<ul style="list-style-type: none"> Reduce e-bus opex and improve its adoption. Enable viable market for leasing batteries, resulting in lower capital cost of e-buses.
11	Corporate Tax (Income Tax) benefits 	<ul style="list-style-type: none"> Allow Higher Accelerated Depreciation (say 80%) on e-buses with sunset period) OR Permit 100% cost (excl. capex subsidy) deductions under Income Tax Act 	<ul style="list-style-type: none"> NITI Aayog / DHI to make representation to Ministry of Finance for higher accelerated depreciation under the Income Tax Act of India. 	<ul style="list-style-type: none"> Reduce the overall tax liability of the operators which in turn would help reduce the overall cost of e-bus operation
12	Road Tax, MV Tax, Passenger Tax, other taxes levied on buses 	<ul style="list-style-type: none"> 100% exemptions to e-buses from all such applicable central taxes 100% (or minimum 50% of the applicable rates on non-electric buses) exemptions to e-buses from all such applicable state taxes 	<ul style="list-style-type: none"> DHI / NITI to make a representation to the MoRTH, GoI and State Govt Departments. MoRTH (GoI), State Govt Departments / ULB (if applicable) can also take initiative to exempt e-buses from these taxes/levies. 	<ul style="list-style-type: none"> Reduce the vehicle related taxes/levies burden of the operators which in turn would help reduce the overall cost of e-bus operation.
13	Feebate Scheme for E-bus adoption 	<ul style="list-style-type: none"> Levy carbon tax on fossil fuel private vehicle based on emission levels. <i>STU/SRTC operated ICE buses for public transport can be exempted from the Feebate scheme.</i> Pass on incentives through fiscal measures for e-bus deployment 	<ul style="list-style-type: none"> State Government can impose the carbon tax through a notification. 	<ul style="list-style-type: none"> Discourage the purchase of ICE vehicles and help State Govt generate extra revenue to promote purchase of E-buses / Evs which in turn helps faster adoption of E-buses

3.3.3. Non-fiscal measures

(A) Social and Environmental Planning

		Recommendations	Action Plan	Impact
14	City EV Transition Plan 	<ul style="list-style-type: none"> Mandate cities with 1+ million population <ul style="list-style-type: none"> to achieve up to 100% e-bus fleet (and/or no-emission clean fuel buses) by 2035 to prepare City EV Transition Plan including financing strategy Plan to include fiscal support for DISCOMs to set up charging infra and upgrade grid infra 	<ul style="list-style-type: none"> States can prepare a policy in this regard and issue a notification mandating ULBs to prepare and operationalize the City Level EV Transition Plan. 	<ul style="list-style-type: none"> Helps STUs/ City Govts to be better prepared for transition to e-bus Sends the positive signal in the market giving long term clarity to stakeholders resulting in better competition
15	Stop registration of new ICE buses 	<ul style="list-style-type: none"> Stop registration of new ICE buses by 2030 Allow registration of only E-buses and permitted low-emission / no-emission fuel-based buses (which may include CNG, LNG, Hydrogen, Hybrid Electric, etc.) after 2030, 	<ul style="list-style-type: none"> GoI and states to hold consultation with stakeholders and amend policy and amend/enact appropriate law(s) in this regard. 	<ul style="list-style-type: none"> Results in increased adoption of e-buses as well as Low-emission / no-emission fuel-based buses in India.

 *Public (Govt.) Bus Market*
 *Private Bus Market*
 *Other EV Segments*

(B) Infrastructure Planning

		Recommendations		Impact
16	Reliability of grid connectivity and power quality G	<ul style="list-style-type: none"> Make it mandatory and legally binding on DISCOMS to provide consistent 24 x 7 power supply to designated e-bus depots and charging stations within a stipulated timeline (within 1 year or max up to 2 years) – stricter enforcement and compliance mechanisms to be enabled 	<ul style="list-style-type: none"> State Governments shall issue a government order in this regard and make it mandatory on the part of DISCOM to provide 24x7 power supply to designated e-bus depots and charging stations within a stipulated timeline. 	<ul style="list-style-type: none"> Increases the development of important supporting infrastructure for the e-bus operation Results in higher adoption of e-bus in India.
17	Infrastructure Sharing P	<ul style="list-style-type: none"> Mandate unlocking of public (STU's) infrastructure for use by private buses on commercial basis (for e.g. at least 30% of charging infra and parking capacity at a depot) through policy States can use economic cost saved to fiscally support STUs to upgrade their depot infrastructure for e-bus 	<ul style="list-style-type: none"> State Governments / ULBs can pass a necessary order after consultation with public transport authorities and private bus operators in this regard. 	<ul style="list-style-type: none"> Improves the viability of supporting infrastructure like charging stations in the depot and also enable the faster availability of infrastructure for larger market
18	Commercial monetization of depot / terminal real estate G	<ul style="list-style-type: none"> Monetize depot land for commercial use without affecting STUs operational requirement by TOD / Value Capture equivalent policy. 	<ul style="list-style-type: none"> State Governments / ULBs can bring in necessary changes in the existing policies or issue new policy in this regard. 	<ul style="list-style-type: none"> Generates additional revenues for the STUs which can help fund EV transition
19	Charging Infrastructure on major highways P	<ul style="list-style-type: none"> Provide fast charging facilities (amenable to e-bus) on major inter-city routes in India on priority basis along the routes as well as at origin and destination. 	<ul style="list-style-type: none"> MORTH, NHAH and state highways department shall establish charging infrastructure on major highways in association with ESSL and other such agencies. 	<ul style="list-style-type: none"> Unlocks profitable and sizable inter-city market and resultant faster adoption of e-bus by private sector.

(C) E-bus standardization and guidelines

		Recommendations	Action Plan	Impact
20	<p>Standardization of E-bus Specifications, Tender & Concession Agreement</p> <p>G P</p>	<ul style="list-style-type: none"> Form High Powered National Steering Committee comprising of NITI Aayog, DHI, MoHUA, MORTH, MoP, MOST, and others (from select State / STUs and Industry Associations), which shall <ul style="list-style-type: none"> prepare “National Standards, Specifications for Electric Bus and Associated Infrastructure” - for urban and inter-city bus service develop and/or approve standard tender document(s) and concession agreement 	<ul style="list-style-type: none"> NITI Aayog, DHI, MoHUA, MORTH, MoP, MOST, and others (from select State / STUs and Industry Associations) shall form a committee to prepare the standards for e-bus and associated infrastructure requirement. 	<ul style="list-style-type: none"> Helps in adoption of large procurement of e-bus in short time. Standardization helps OEMs scale up their production which may result in cost reduction.
21	<p>E-Bus Guidelines</p> <p>G P</p>	<ul style="list-style-type: none"> Issue Guidelines comprising of standards and specifications, guidance on network and infrastructure planning, uniform scrappage and battery recycle policy, fiscal support, guidelines/ framework for asset valuation to enable resale market, and all other aspects necessary to promote clean mobility in public transport. 	<ul style="list-style-type: none"> High Powered National Steering Committee to also prepare and issue E-bus guidelines 	<ul style="list-style-type: none"> Helps create new market opportunities and promote the adoption of e-buses.
22	<p>Capacity Building</p> <p>G P</p>	<ul style="list-style-type: none"> Trainings and capacity building plan to be mandated, covering aspects like <ul style="list-style-type: none"> Technical training - specific to e-bus implementation and O&M aspects PPP capacity building Procurement and contract management Performance monitoring capacity building 	<ul style="list-style-type: none"> State Govt/ City Govt can take the assistance of institutions like the World Bank Group and prepare the Capacity Building Program for the STUs and concerned authorities. 	<ul style="list-style-type: none"> Improves the capacity of STUs and get the desired performance delivered from the PPP / GCC operator in case of PPP contract, Help STUs to plan their e-bus transition effectively.

3.3.4. Indicative Institutional approach in implementation/coordination

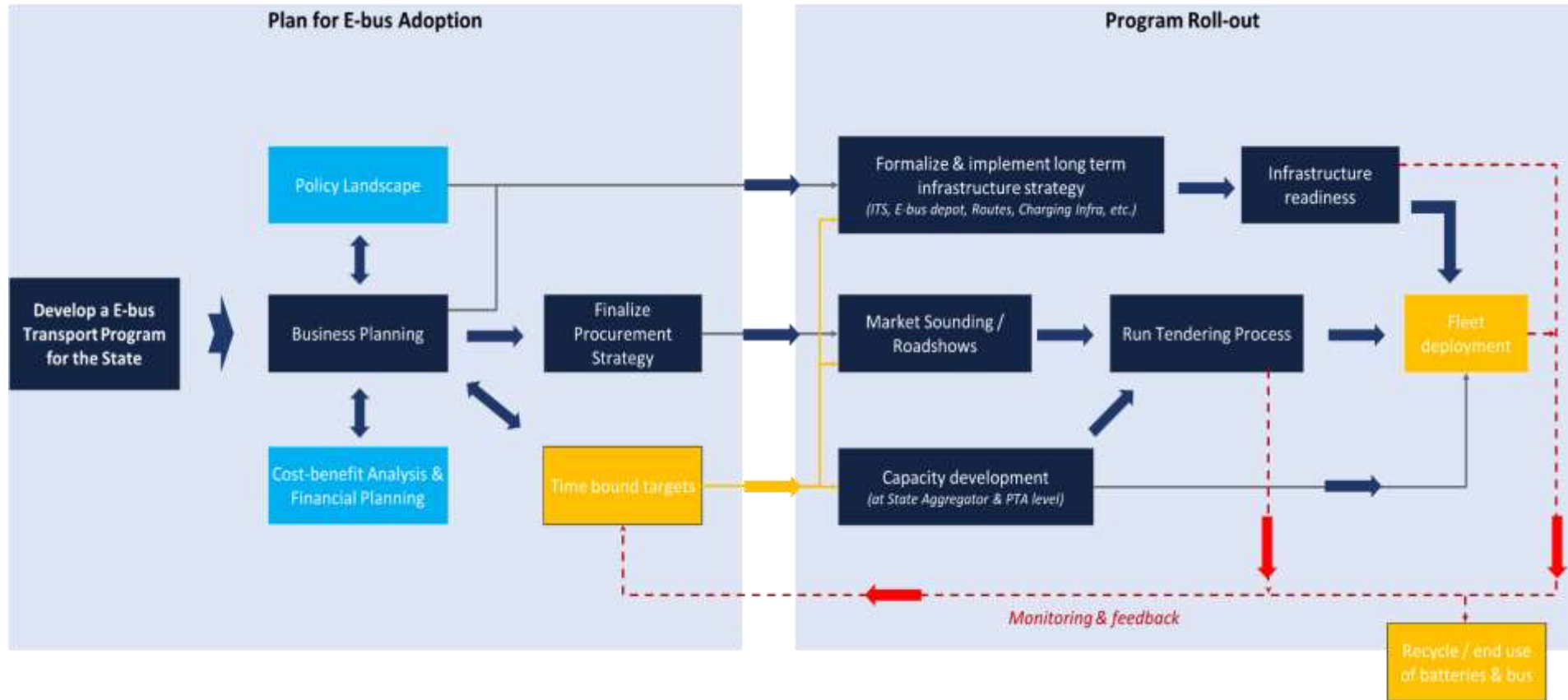
E-mobility initiatives in India are primarily led by Department of Heavy Industries (DHI) through FAME Schemes. Since the sector requires cross sectoral coordination, other nodal ministries are playing important role in the value chain as well. Implementation of proposed National E-bus Transport Policy and other related recommendations above would require as strong institutional mechanism at central, state and city level. For this, the proposed indicative structure below can be adopted.



3.4. Step-by-step action plans for State, Cities and STUs

The following schematic illustrates how planning leads to the program rollout, therefore now moving to a comparatively shorter timescale of action plan.

Figure 21: Planning and Program Roll-out



Source: Spoctech Solutions - Review and Analysis

Developing an e-bus program for the state or city is critical for planning and medium to long-term rollout of e-buses. This results in building confidence and trust amongst market players (fleet providers, OEMs, private operators, financiers, and energy providers) to invest time, resources, and capital in the e-bus market. The program roll-out will follow the plan for e-bus adoption which will have time-bound targets. A market-sounding exercise with key stakeholders to gain buy-in, besides infrastructure readiness and capacity building, would be critical to ensure program success.

The study has reviewed 100+ cities and have filtered initial set of lighthouse states / cities that can demonstrate success for the revised GCC and alternate (aggregator) business models.

Table 12: List of lighthouse states/cities/agencies along with recommended business models

S. No.	State	City	Key agencies involved in bus governance and operations	Proposed business models
Phase-I				
1.	Delhi	• Delhi	DTC, DIMTS	Market Player-led aggregation
2.	Gujarat	• Ahmedabad	AMTS/Janmarg	Market Player-led aggregation (state/city level)
3.		• Surat	SMC/Sitilink	
4.		• Vadodara	VMC/VTCOS	
5.	Maharashtra	• Mumbai	BEST, MMRDA	BEST – Revised GCC or Market Player-led aggregation MMRDA – State Aggregator (Regional)
6.		• Navi-Mumbai	NMMT, MMRDA	NMMT - Revised GCC MMRDA – State Aggregator (Regional)
7.		• Pune	PMPML	Revised GCC - OR Market Player-led aggregation
8.		• Nashik	Nashik Municipal Transport / MSRTC	Revised GCC
9.		• Mumbai-Pune-Nashik Intercity	MSRTC	State-led aggregation OR Market Player-led aggregation
10.	Tamil Nadu	• Chennai	MTC, IRT	State-led aggregation
11.		• Madurai	TNSTC Madurai, IRT	

S. No.	State	City	Key agencies involved in bus governance and operations	Proposed business models
12.		• Intercity market	Private operators	Market Player-led aggregation
13.	Telangana	• Hyderabad	TSRTC	Revised GCC - OR State-led aggregation
Phase-II				
1.	Andhra Pradesh	• Visakhapatnam	APSRTC	Revised GCC
2.		• Vijayawada		
3.	Karnataka	• Bangalore	BMTC	Market Player-led aggregation
4.	Kerala	• Thiruvananthapuram	KSRTC	Market Player-led aggregation
5.	Madhya Pradesh	• Indore	AICTSL	Revised GCC
6.	Punjab	• Amritsar	Amritsar Metrobus	Revised GCC
7.	Tamil Nadu	• Coimbatore	TNSTC Coimbatore, IRT	State-led aggregation
8.	Uttar Pradesh	• Kanpur	UPSTRC/UPULD	State-led aggregation

Source: Consultant Review and Analysis

A three-pronged stakeholder-wise action plan involving (1) planning, (2) implementation and (3) monitoring of tasks is critical in successfully achieving objectives of the e-bus adoption. While planning essentially precedes implementation, monitoring begins at implementation stage and continues throughout. As shown in the text in bold font, (a) following a program approach, (b) setting up a dedicated contract management and procurement cell, (c) setting up dedicated funding, and (d) improving charging infrastructure (e-depot and grid upgrade) readiness stand out as significant action points.

Intelligent Transport Systems (ITS) is required for effective contract management and should be brought in at inception. The need for effective management of operations through service monitoring and contract management has already been highlighted in the previous section. Indian cities have significant scope to improve their contract management practices by moving from predominantly manual performance management to ITS-based automated management practices. Service delivery efficiency of the operator and any deviation from the pre-defined service plans can be automatically analyzed using ITS systems, thereby improving the efficiency and transparency in contract management. The World Bank's Reimbursable Advisory Services (RAS) provided to Government of India, in collaboration with the Transport for London (TfL), has provided specific guidance on the need for extensive usage of ITS for effective contract management and the key areas of improvement in Indian ITS systems.

The ITS systems need to be developed with output objectives in mind. This includes defining the overall role of ITS in fulfilling passenger information, service planning, real-time and periodic performance management for contract management. Within contract management, the Key Performance Indicators (KPIs) specific to operational efficiency of the operator as mentioned in the Service Level Agreements (SLA) of their concession agreement need to be identified. The reports and dashboards prepared as a part of the ITS system should be able to generate accurate reports on various KPIs such that the city can review operator's performance objectively while making decisions such as payment due to the operator, penalties for under-performance on any KPIs etc.

Clear definition of various KPIs for contract management, their input data sources, their needs at different levels of management, such as at the depot or city level, needs to be clearly defined. These KPIs shall be generated regularly and used for contract management. Additionally, cities need to improve their manpower capabilities to handle ITS systems and utilize their outputs towards meaningful contract management in cities. This requires upskilling and/or recruiting new staff to manage the ITS system within the bus agency.

In summary, ITS offers the potential to bring-in automated and transparent contract management practices and is therefore a key pre-requisite for large-scale electric buses being procured globally.

Figure 22: Action plan for states and cities

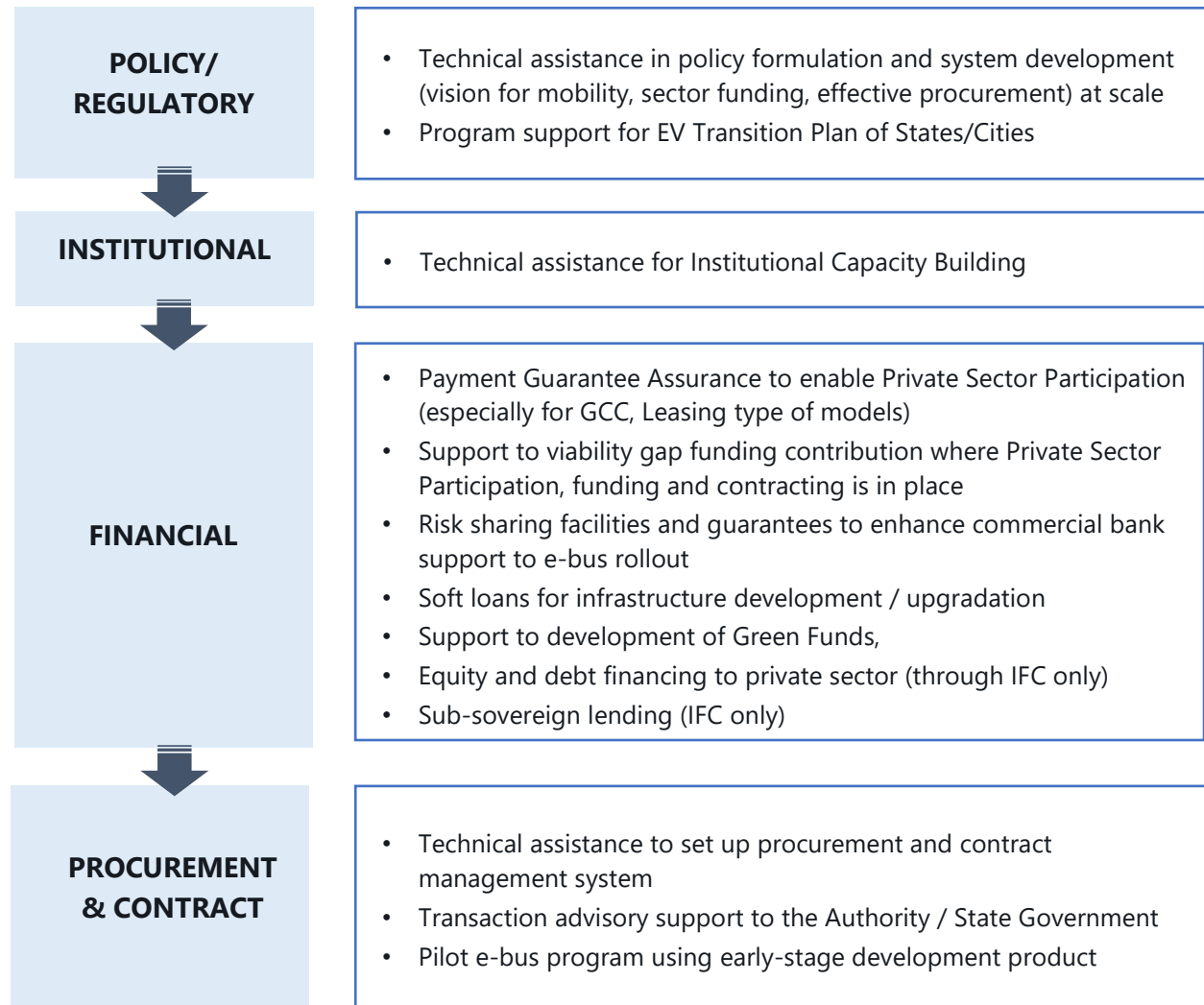
	Govt of India (NITI Aayog, DHI, others)	State Government	State Agency (Transport Dept./ SRTC/ ...)	PT Authority (PTA) (DTC / BEST / BMTC /)	DISCOM
Planning	<ul style="list-style-type: none"> Necessary changes in relevant policies Standardization in E-bus specification GST reforms for E-mobility Battery recycling policies 	<ul style="list-style-type: none"> Prepare E-Bus program, business and financial plan, capacity development need, procurement strategy for State Agency and PTA level, and long-term infrastructure strategy Policy formulation by the state Identify suitable depots or land for depots to accommodate e-buses both for public and private operations Form contract management and procurement cell at State and Agency level 			<ul style="list-style-type: none"> Identify grid / power distribution infrastructure upgradation requirement
Implementation	<ul style="list-style-type: none"> Disburse subsidy for E-buses and associated infrastructure 	<ul style="list-style-type: none"> Securing DFI funding Disburse funds and subsidies / payment (as applicable) to State Agency and PTAs Performance-linked subsidy support for PTAs State guarantees as required 	<ul style="list-style-type: none"> Set up appropriate fund Set up Data Analytics Cell Run tendering process, market sounding / roadshows Implement infrastructure readiness (Agency's scope) 	<ul style="list-style-type: none"> Implement infrastructure readiness (PTA's scope) GCC / O&M tender for private bus operations (if to be outsourced) 	<ul style="list-style-type: none"> Upgrade grid / power distribution network at identified locations Provide consistent power supply 24 x 7 basis to designated e-bus depots and e-bus charging terminals
Monitoring	<ul style="list-style-type: none"> Monitor performance of subsidy disbursed against the Policy objectives 	<ul style="list-style-type: none"> Periodic review of E-bus program Cost-benefit assessment, climate change and environment benefits Increase project replicability 	<ul style="list-style-type: none"> Contract monitoring Performance review Evaluate project and improve procurement approach Develop planning tools 	<ul style="list-style-type: none"> Contract monitoring Performance review Evaluate project and improve operations 	<ul style="list-style-type: none"> Evaluate project and improve operations

Source: Spoctech Solutions - Review and Analysis

4. Role of the World Bank Group to Unlock E-bus markets in India

The World Bank Group can play active role in supporting the Central, State and City Governments in improving bankability of e-bus procurement and help achieve required scale required for efficient bus service delivery. The type of challenges faced in expanding e-bus services is systemic in nature.

Table 13: IFC and The World Bank - Role in E-bus Value Chain



The World Bank and IFC can effectively support governments for transition to E-buses by investing across the E-bus Value Chain. Further, IFC can incorporate blended finance to bring down the cost of EV financing.

Table 14: Role of IFC in E-bus Value Chain

Market Segments/Investment Avenues	Investment Needs*	Impact
Vehicle OEMs 	<ul style="list-style-type: none"> • Growth capital for manufacturing capacity expansion 	<ul style="list-style-type: none"> • Medium
Charging Infrastructure Providers  <ul style="list-style-type: none"> • Charger Manufacturers • Charge Point Operators • SAAS providers 	<ul style="list-style-type: none"> • Growth capital for manufacturing capacity expansion • Charging infrastructure build, own & operate projects 	<ul style="list-style-type: none"> • Medium
Non-Banking Financial Institutions and Leasing Companies	<ul style="list-style-type: none"> • IFC can fund credit facilities for the specific purposes of on-lending to Bus operators 	<ul style="list-style-type: none"> • Medium
Fleet Operators	<ul style="list-style-type: none"> • IFC can directly fund bus concessionaires through project finance or equity infusion 	<ul style="list-style-type: none"> • High
Municipal Governments	<ul style="list-style-type: none"> • IFC can provide loans to Muni Governments for transition to electric bus fleets 	<ul style="list-style-type: none"> • High

Source: The World Bank Group

Note: All IFC investment subject to due diligence and management approval

5. Conclusion and Way Forward

E-bus operation in urban public transport got a major impetus from the FAME-II scheme of GoI which mandates capital subsidy to the STUs and MTUs for procurement of e-bus through GCC model. However, adoption in 2020 and early 2021 was slowed by several issues and challenges in the procurement approach initially adopted. This study has identified those and suggested several measures to enhance the provisions of GCC as well as potential alternate business models to improve the bankability and speed up the adoption of e-buses in India's public transport sector.

The recommendations suggested under this study indicate potential savings of 10 to 25% in the associated levelized GCC cost, which would considerably reduce the level of viability gap funding required from public authorities. Aggregating demand is projected to have a very significant impact on price discovery. For 1000 buses operating 10 years, this represents about INR490 Crores to INR1,225 in savings (US\$66 to 165 million).

The Government of India launched a large-scale tender for 5,450 buses for five cities, under the name of Grand Challenge organized by CESL as part of the revamped FAME-II. It included large-scale aggregation, contract improvement (assured kilometers, payment security, normalized variables, standardized approach to charging, enhanced safety and data requirement). CESL undertook detailed stakeholder consultations to make those adjustments. The Grand Challenge tender, opened in May 2022, led to a highly competitive price of only INR44.99 per km for AC 9M standard floor buses with FAME-II subsidy, with savings of 28% to 52% achieved for the respective cities substantially better than what was anticipated through a simple revised GCC model (INR55 per km). Those real-life results validate the findings of this report (table 15).

The type of suitable solutions depends on the stage of maturity of the corresponding transport organization and their financial capacity. They require coordinated actions by the identified responsible ministries and departments and a coordinating institutional structure to operationalize recommendations in an effective manner.

The World Bank Group and IFC, can support such process by partnering with the central and state governments and enhancing planning, financing, contract management, capacity building, de-risking and addressing other aspects of e-bus procurement value chain.

The following action points are recommended on priority basis:

- ✓ Amendments to existing MCA for GCC
- ✓ Implementation of alternate business models in select cities
- ✓ Standardization of electric bus specifications (for intracity operation use cases)
- ✓ Constitution of institutional structure to implement key recommendations
- ✓ Development of de-risking solutions for timely payment of contracted bus services
- ✓ Capacity and capability building for contracting PTA to plan and oversee e-bus service delivery

Annexure: Assumptions for quantitative assessment of alternate business models

The table below highlights the differences in the assumptions made for business models for analysis purpose with respect to base case assumptions for existing GCC model. In all the cases, it is assumed that the fleet aggregator shall procure e-buses (incl. charging infra) on outright purchase basis, however, different commercial structures could be adopted (like leasing of vehicle, battery on lease, etc.) which may result into varying degree of reduction in GCC / TCO.

It can be observed that higher savings could be achieved as one move towards fleet aggregator models (market player led or state-led). Aggregator model can potentially reduce GST tax leakage; however, aggregator models may lead to higher direct tax (i.e., income tax) outgo.

Table 15: Assumptions for analysis of Alternate Business Models

Parameter	Existing GCC (base case scenario)	Revised GCC model	Market player-led fleet aggregator models		State-led aggregator model	
			Fleet Aggregator	Operator	Fleet Aggregator	Operator
Capital Cost (9M AC E-bus)						
Number of e-buses deployed (or confirmed procurement plan)	Min. 25 & above	Min. 50 & above	Min. 250 & above		Min. 1000 & above	
Price per e-bus (including charger but excluding subsidy) (INR lakhs)	120	120	15% - 25% reduction		20% - 30% reduction	
Capital Subsidy (INR Lakhs) for 9M e-bus	45	45	45		45	
Means of Finance (after capital subsidy)						
Debt : Equity Ratio	3:1	3:1	4:1		4:1	
Cost of Debt	10 – 12%	10 – 12%	9% - 11%		8% - 10%	
Debt Repayment Tenure	5 years	5 years	7 years		9 years	
Min. Equity Internal Rate of Return (i.e. Cost of Equity)	18%	16%	15%		12%	
Subsidy Bank Guarantee (as % of Subsidy Amount)	100%	Nil	20%		Nil	
EBIDTA margin expectations#				10% - 20%		10% - 20%
Operating Parameters						
Fee Revision	0%	2% to 4%	0%	5% to 7%	0%	5% to 7%
Electricity Cost	Operator	Operator (pass through)*	-	Operator (pass through)*	-	Operator (pass through)*
Performance Bank Guarantee (% of TPC or per bus)	3% of TPC	3% of TPC (capped at Rs. 3 lakhs per bus)	-	Rs. 3 lakh per bus	-	Rs. 3 lakh per bus

Parameter	Existing GCC (base case scenario)	Revised GCC model	Market player-led fleet aggregator models		State-led aggregator model	
			Fleet Aggregator	Operator	Fleet Aggregator	Operator
Outcome of Analysis						
Estimated GCC Quote (average, in INR per KM) – 1 st year to achieve expected equity returns	70 – 71	55 – 58	19 – 21	28 – 32	16 – 18	28 – 32
Levelized GCC Rate over 10-year contract period (INR per KM)**	70 – 71	61 – 64	19 – 21	37 – 39	16 – 18	37 – 39
% savings over existing GCC model (based on levelized GCC rates)		~ 10 – 15%	~15% - 20%		~20% – 25%	

Source: Spoctech Solutions – Review and Analysis

* The Authority shall pay for cost of electricity consumed in charging of Electric Buses subject to the applicable cap on fuel economy. Tariff Paid by the Authority shall be debited from the payment to the Operator.

** Derived based on estimated weighted average cost of capital