PROCUREMENT MECHANISMS TO SCALE UP ADOPTION OF ELECTRIC BUSES IN INDIA

FINAL REPORT: VOLUME- II

AUGUST 2019

About Shakti:

Shakti Sustainable Energy Foundation works to strengthen the energy security of India by aiding the design and implementation of policies that support renewable energy, energy efficiency and the adoption of sustainable transport solutions.

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About UITP:

INTERNATIONAL ASSOCIATION OF PUBLIC TRANSPORT (UITP) is the international network for public transport authorities and operators, policy decision makers, scientific institutes and the public transport supply and service industry. It is a platform for worldwide cooperation, business development and the sharing of know-how between its 1,500 members from 96 countries. UITP opened its first Liaison Office in the region in Bangalore in March 2007.

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LIST OF ABBREVIATIONS

AMC	:	Annual Maintenance Contract
DHI	:	Department of Heavy Industries
EoI	:	Expression of Interest
EV	:	Electric Vehicles
FAME	:	Faster Adoption and Manufacturing of Electric (&Hybrid) Vehicles
GCC	:	Gross Cost Contract
IPT	:	Intermediate Public Transport
LCC	:	Life Cycle Cost
MCA	:	Model Concession Agreement
RE	:	Renewable Energy
RfP	:	Request for Proposal
SLA	:	Service Level Agreement
SPV	:	Special Purpose Vehicles
SSEF	:	Shakti Sustainable Energy Foundation
STU	:	State Transport Undertakings
UITP	:	International Association of Public Transport

1 INTRODUCTION

1.1 BACKGROUND

The Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme launched in the 2015 kick-started the adoption of electric vehicles in India by providing financial incentives for Electric Vehicle (EV) purchase, charging infrastructure deployment and Research and Development (R&D) of electric vehicles. Coinciding with the end of phase I of FAME, Government of India (GoI) had announced the phase II of the scheme in April 2019, to accelerate India's transition from fossil fuel-based vehicles to zero emission vehicles. The FAME II scheme is rolled out with an overall outlay of INR 10,000 crores spread over three years i.e. between 2019-20 and 2021-22, to provide demand incentives for Electric Vehicles (EVs).

With an objective to maximise passenger-kms electrified, the scheme prioritises electrification of public transport vehicles which cater to the majority of passenger demand in Indian cities. Approx. 35% of the total incentive amount i.e. INR 3,545 crores allocated towards electric bus (e-bus) incentives. A further allocation of INR 2,500 crores i.e. 25% of the fund is allocated to electric three-wheelers which provide Intermediate Public Transport (IPT) or paratransit services complementing public transport systems. With this increased emphasis on electrification of public transport (e-buses), it is important that we strategically plan for the subsidies and deployment efforts. This report is prepared towards creating enabling mechanism to scale up adoption of e-buses in Indian cities.

1.2 PROJECT INTRODUCTION

International Association of Public Transport (UITP) with support from Shakti Sustainable Energy Foundation (SSEF) has undertaken the project on "Creating enabling mechanisms to scale up adoption of electric buses (e-buses) in Indian cities with the following objectives:

- To inform FAME-II guidelines to adequately address issues faced during FAME I
- To improve the capacity of bus agencies in procuring e-buses

The key activities taken up through the project include:

i. Review of international best practices on EV subsidy schemes

ii. Evaluate FAME I e-bus subsidy
iii. Inform FAME-II guidelines for e-bus subsidy
iv. Develop guidance material for PT agencies on contracting of E-buses
v. Dissemination of findings with central government agencies relate to FAME scheme and organize training programs for PT agencies to build their capacity on contracting, procurement, planning and operation of e-buses

The first three activities of the project have been compiled into the Volume-I report titled: 'Fiscal incentives to scale up adoption of electric buses in Indian cities' in March, 2019. The current report covers activities iv and v of the project i.e. to provide inputs to the procurement of for e-buses in Indian cities.

1.3 ORGANISATION OF THE REPORT

The report discusses alternative approaches for procurement of electric buses and provides technical inputs to agencies in their procurement processes. Chapter 1 provides brief introduction to the project and its objectives. Chapter 2 provides an overview of the available guidance material for procurement of electric buses and the need for the current report. Chapter 3 focusses on the specific technical inputs for e-bus procurement under alternative business models. Chapter 4 provides the key learnings from the project and the proposed way forward.

2 REVIEW OF AVAILABLE BUS PROCUREMENT GUIDELINES

Adopting the right procurement mechanism is the first step towards ensuring sustainability of e-buses in Indian cities. As cities progress towards inviting proposals to procure electric buses under FAME II, it is pertinent to incorporate learnings from past experiences and various global practices.

Towards supporting cities in their electric bus deployment, we have reviewed the following key guidance documents on bus procurement:

i) Model Concession Agreement (MCA) for electric buses issued by NITI Aayog (2019)
ii) UITP's tender structure document, 2018
iii) Model Request for Proposal (RfP) for outsourcing city bus operations issued by Ministry of Housing and Urban Affairs (MoHUA), 2014

The model RfP by MoHUA was developed specifically for the Indian context, based on detailed consultative process with cities and sectoral experts. However, it was developed for the case of Internal Combustion engine (ICE) based buses. While the MCA issued by NITI Aayog is specific to electric buses, it only focuses on the agreement with the selected operator/ service provider but doesn't detail out the tendering process to identify the right bidder. The UITP tender structure covers both ICE and electric buses and provides learnings from across the globe on the best practices in tendering. Therefore, we have built on MoHUA's model RfP and added e-bus specific inputs from the NITI Aayog MCA and UITP tender structure documents to develop guidance material for cities. Further, adequate care was taken to incorporate key learnings from the FAME I tendering process across cities.

This report adopts the following structure to detail out these activities:

i) **Establishing the need for a model tender/ RfP document** by evaluating its contents against the procurement framework proposed in the UITP bus tender structure
ii) **Developing a 'Toolkit for e-bus procurement'** to support cities in deciding between outright purchase and Gross Cost Contract (GCC) mode of procurement
iii) **Preparing 'Model tender documents for electric bus procurement** through GCC and outright purchase

2.1 NEED FOR GUIDANCE MATERIAL BEYOND MCA

Figure 1 outlines the various stages involved in a typical procurement exercise of buses. NITI Aayog issued a Model Concession Agreement (MCA) in January, 2019 to support electric bus procurement under FAME II. As the name suggests, the focus of the document is to assist cities with the contract award under Gross Cost Contract (GCC) mode of procurement. However, the document doesn't adequately cover the Request for Proposal (RfP) or tendering stage where the electric bus service provider is identified. The current project aims to address this gap by developing model RfP documents for e-bus procurement under both GCC and outright purchase models. Towards this, we first mapped the various specifications of the MCA against the 15 key features of electric bus service procurement tender identified by the 'UITP tender structure' document. Table 1 presents the key features of e-bus procurement missing from the MCA which shall be addressed in the model RfP document.

Figure 1: Lifecycle of a typical electric bus procurement exercise

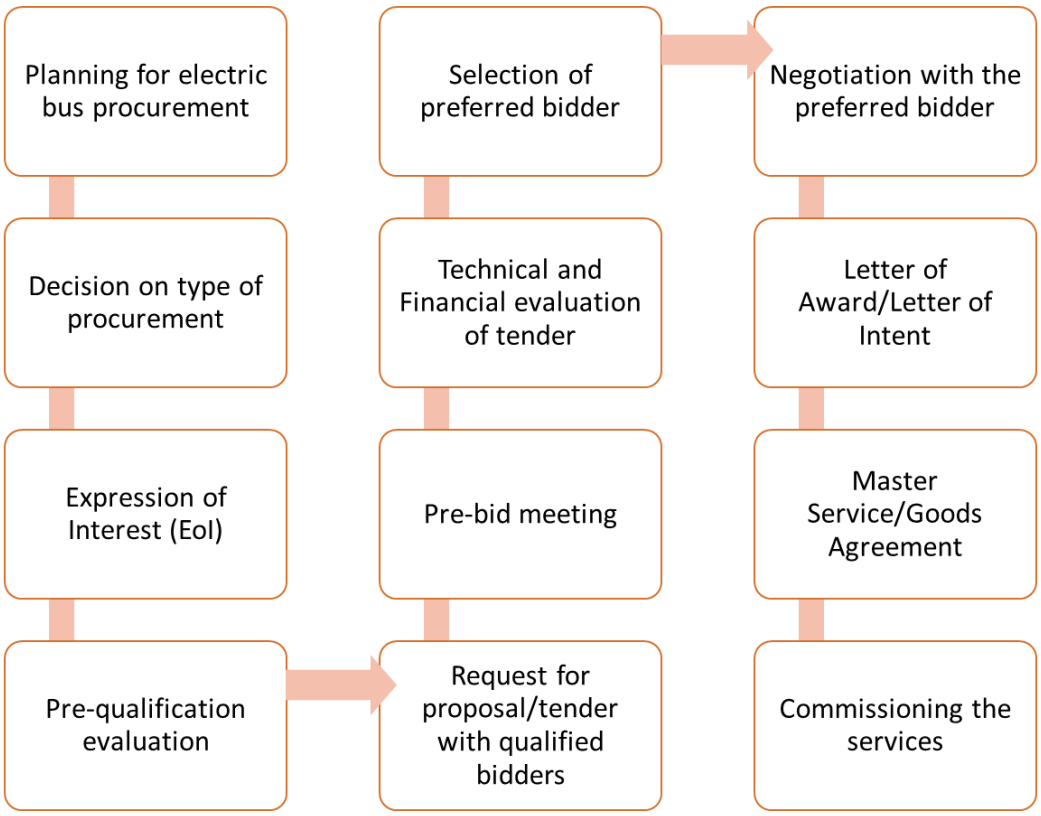

Table 1 Comparison NITI Aayog's MCA for e-buses with UITP tender structure

No.	Feature	Brief description and significance	Summary of MCA and key gaps
1	Main characteristics of the tender	The overall requirements under the contract shall be described here including: • Location • Number of vehicles • Type of operation (urban/ sub-urban) • Type of bus • Business model (Gross Cost/ Net Cost contract)	• MCA clearly states that the ownership and maintenance of the buses and charging infrastructure stays with the operator throughout the contract duration. • MCA recommends a contract duration of 16 years which is longer than the bus life. The e-bus technology is still evolving and such long commitments to the current technology may restrict STUs from taking advantage of upcoming technologies • The operator isn't required to transfer the buses to the authority at the end of the contract duration • The ownership of charging infrastructure beyond the contract duration isn't clearly mentioned • The terms of ownership transfer of charging infrastructure need to be clearly spelt out as the life of charging infrastructure (20 years) is much longer than the life of the contract (16 years)
2	Tender Procedure	The stages involved in the bidder selection process are mentioned here which typically include: • Request for Qualification (RfQ) • Request for Proposal (RfP) from qualified bidders The bid type shall also be outlined i.e. whether it is a • Restricted bid • Open bid • Negotiated bid.	The MCA suggests an open bidding process with RfQ followed by RfP However, the suggested qualification criteria aren't spelt out in the MCA and is left to the authority
3	Tender Timetable	The tender timetable outlines the key dates for • Publishing the tender	The MCA doesn't cover the Request for Proposal (RfP) and hence doesn't have any

		• Opening the tender • Selecting the service provider • Negotiation • Issuing the Letter of Award (LoA) • Signing the service agreement • Delivery schedule	suggested timelines for these activities
4	Legal Requirement and Standards	The National and State level legislations which govern the procurement and operation of the service shall be identified. The following is an indicative list: • Motor Vehicles Act • Central Motor Vehicle Rules • Motor Transport Workers Act • State level in Public Procurement Act, Labour Act etc. Additionally, the legal requirements and standards of various sub-components of the goods and services being procured	The MCA clearly spells out the legal requirements on the following items • Obligation of Operator • Obligation of the Authority • Representation and warranties • Land for Depots • Utilities • Construction and maintenance of the depots • Procurement time lines • Operation and Maintenance of Buses • Safety Requirements • Key Performance Indicators
5	List of Bidder credentials	The credentials of the bidding entities shall be requested covering: • Type of entity (company, Special Purpose Vehicle (SPV), Joint venture etc.) • Location of registration • Brochures, References etc.	The MCA doesn't include RfQ and RfP and hence doesn't cover the bidder credentials, list of supporting documents to be submitted and the method of evaluation
6	Tender Evaluation Criteria	The criteria for evaluating the bidders shall be clearly mentioned. Some key evaluation criteria include: • Financial evaluation • Multi criteria evaluation covering technical and financial evaluation • Environmental impact criteria • Weightages or ranks of various evaluation criteria	Since the electric bus technologies haven't yet matured in India, a Quality-Cost Based Selection (QCBS) which rates bidders through a combination of technical and financial criteria is likely to yield better benefits. Hence a QCBS based tender evaluation is recommended for electric buses
7	Life Cycle Cost (LCC)	LCC analysis helps in understanding the total cost of owning and operating the vehicle over its entire life as opposed to the traditional procurement methods which were capital expenditure-based decisions. In case of electric	MCA emphasises Gross Cost Contract (GCC) based procurement. Hence, the bid will incorporate the LCC of buses by design

		buses this helps the authority factor in the savings in operational expenses delivered through improved energy efficiency of electrification	
8	Financial Conditions	The key financial conditions like must be clearly spelt out covering the following aspects: • Payment timetable (on delivery, every 30 days etc.) • Security deposit • Performance Bank Guarantee • Penalties on payment	The MCA clearly indicates the financial conditions and payment terms including: • Escrow mechanism to create a separate account with three months of payment deposited advance to assure timely payments • Minimum assured km of payment guaranteed to ensure cost recovery within contract period • Penalties for late supply are specified • Payments to the operator/service provider are amortized over the entire life of the contract
9	Vehicle Warranty	Warranties for electric buses typically include warranty for the vehicle, battery, motors etc. to ensure that the vehicle suppliers assure product performance and replacement during the warranty period	A GCC model puts the responsibility for vehicle performance on the operator/ service provider. Therefore, the MCA doesn't recommend any vehicle specific warranties. Given that vehicle manufacturers are part of the bidding entities for electric vehicles, it is assumed that the warranties are adequately covered.
10	Vehicle Availability	The vehicle availability and other Service Level Agreements (SLA) are required to ensure that the contracted services meet the service needs of the authority	The MCA only highlights the importance of vehicle availability but doesn't provide detailed SLAs based on which the operator/ service provider will be evaluated
11	Acceptance Procedure	A clear acceptance procedure needs to mention the baseline certification requirements at which the vehicles are accepted for operation	MCA mandates certification and homologation of vehicles by an appropriate Indian entity
12	Functional Specifications	Functional specifications of the vehicle including its passenger capacity, driver position, safety requirements, access to people with disabilities shall be specified	The MCA doesn't provide any guidance on the functional specifications of electric buses

		based on the authority's service and operational requirements	
13	Technical Specifications	Technical specifications such as the seating layout, floor height of buses, Intelligent Transport System (ITS) specifications, vehicle dimensions etc. need to be included to meet licensing and operational requirements of e-buses	The MCA specifies that buses need to conform to the Urban Bus Specification (UBS)-II issued by the Ministry of Housing and Urban Affairs (MoHUA) in April, 2013 as the preferred technical specs. While UBS II covers many relevant aspects, it was developed for Internal Combustion Engine (ICE) based buses and doesn't capture many e-bus related specifications like batteries and charging infrastructure
14	After Sales	After sales support for maintenance of vehicles and availability of spares are needed to ensure adequate operations and maintenance support	The GCC mode of procurement puts the onus of ensuring maintenance and after sales support on the operator/ service provider. The MCA also commits to the authority to ensure depot land availability for vehicle maintenance by the operator
15	Training	The GCC operator shall also be mandated to train the in-house staff of the contracting authority on the operations and maintenance of electric buses such that they are trained to take up in-house operations at a later date	MCA details out the content and duration of training to be imparted to the contracting authority

Table 1 identified gaps in the MCA which needs to be addressed during the future revisions of the document. To conclude MCA will only assist at the contract award stage and currently there is a gap for tender stage documents namely, EoI and RFP (if two stage bidding). The next section of the report, hence is prepared to support the cities/STUs for the tender stage by way of guiding towards right mode of procurement and key clauses to be addressed while requesting proposals under outright purchase and gross cost contract model.

3 TOOLKIT FOR E-BUS PROCUREMENT

Based on the learnings from the literature presented above and the experiences from electric bus tenders under FAME I, UITP India has developed a concise toolkit that can act as a ready reckoner for cities in identifying the appropriate business model for electric bus induction and the specific clauses to be included in the procurement exercise. Further, detailed model Request for Proposal (RfP) documents have been prepared for each of these modes of procurement as reference material for electric bus procurement under FAME II.

UITP also attempted to incorporate feedback from OEMs/Operators on learnings from FAME-I tenders and subsidy process to inform the toolkit and model RfP process. While the survey received limited formal responses owing to the industry's reluctance in sharing specific technical details, their inputs were received through discussions during the two electric bus trainings by UITP on 'Planning and procurement of electric buses' conducted in February, 2019 and 'Deployment strategies for electric buses' conducted in July, 2019.

3.1 TOOLKIT FOR ELECTRIC BUS PROCUREMENT

The toolkit for electric bus procurement is intended to provide a framework for multi-criteria decision making involved in identifying the specific clauses to be included within the identified model. While FAME-I saw cities opting for both Gross Cost Contract (GCC) and outright purchase modes of procurement, Government of India (GoI) has allowed only GCC based procurement under the FAME II scheme due to the following key reasons:

- **Spreading investments over the lifecycle of buses**:
  - Outright purchase of electric buses is a Capital Expenditure (CAPEX) intensive procurement method as electric buses have a higher procurement cost compared to conventional buses and the savings are accrued through Operational Expenditure (OPEX) savings through better energy efficiency
  - A GCC based procurement would help in deferring the cost over the lifecycle of the buses thereby reducing the upfront funding needs and building in the OPEX savings into the procurement decision
  - Indian bus agencies have faced lack of access to capital for scaling up their services over the years. Hence, only in cases where funding is available at the beginning of the project is recommended as outright purchase

- **Focussing on service and transferring the technology risk:** The electric bus vehicle technology is evolving rapidly and hence by adopting a GCC based procurement, the STU/ SPV can focus on the service requirements of the service while the contracted operator shall focus on ensuring the vehicle technology meets service requirements
- **Reducing costs through outsourcing staff:** Staff costs typically form 40-50% of the total cost of operation of city bus agencies. A GCC based model would outsource the driver and maintenance staff costs which will reduce costs of operation over the lifecycle of the bus
- **Lack of in-house expertise** on electric bus operations and maintenance within STUs and SPVs which have traditionally managed diesel/ CNG buses is another key constraint for in-house operation of electric buses. GCC model of procurement can rapidly induct skilled staff required to manage electric buses

Therefore, cities going for electric bus (e-bus) procurement under FAME II are adopting GCC model of procurement. Even though FAME II is incentivising GCC based procurement, many Indian STUs have traditionally had experience of predominantly in-house operations. Moving to a GCC mode of operations would require them to plan for change management in staff roles and functions from being an 'operator' delivering service to an 'authority' monitoring the service delivery by the contracted operator. Such STUs need to plan for a transition of staff including new roles for drivers, traffic supervisory staff etc.

Hence, STUs are facing twin challenges of inducting electric buses and at the same time moving from in-house to a GCC based operation. Towards, helping them in this transition, UITP developed a 'Model RfP document' for GCC based procurement that the STUs can use as a reference document to develop RfPs that suit their local context. We have also developed a model RfP document for outright purchase-based procurement of e-buses. Table 2 and Table 3 summarise the salient features of the two documents and the specific issues that the STU/ SPV procuring e-buses shall cover in their RfPs. The draft model RfP document for both modes of procurement are attached as Annexure-I and Annexure-II along with this report.

Table 2 Toolkit for developing Gross Cost Contract (GCC) tender

<table>
<tr><th>No</th><th>Salient features</th><th>Details</th><th>Additional clarifications</th></tr>
<tr><td>1</td><td>Tender Time Table</td><td>A tender timetable shall have the following indicative details:
<table>
<tr><th>S. No.</th><th>Item</th><th>Details</th></tr>
<tr><td>1</td><td>Tender number and date</td><td></td></tr>
<tr><td>2</td><td>Name of the authority floating the tender</td><td></td></tr>
<tr><td>3</td><td>Address of the authority</td><td></td></tr>
<tr><td>4</td><td>Email id and phone no. for contact</td><td></td></tr>
<tr><td>5</td><td>Dates and time of availability of the tender</td><td></td></tr>
<tr><td>6</td><td>Date and time of pre-bid meeting</td><td></td></tr>
<tr><td>7</td><td>Last date and time for the receipt of bids</td><td></td></tr>
<tr><td>8</td><td>Date and time of opening of the technical bid</td><td></td></tr>
<tr><td>9</td><td>Date and time of opening of the financial bid</td><td></td></tr>
</table></td><td>• Bidders are typically provided with a 30 -45 days timeline from the date of issue of tender notification till the last day for submission of bids.
• The pre-bid meeting is typically organized 2 weeks after the tender notification to meet with the prospective bidders and to discuss any specifics of the tender that may need modification</td></tr>
<tr><td>2</td><td>Scope of Work</td><td>The following responsibilities are typically included as a part of the scope of work of the service provider/operator
• Supply of Buses
• Installation of charging Infrastructure
• Deployment of drivers and mechanics</td><td>• Gross Cost Contracts (GCC) allocate the responsibility of operating and maintaining the buses and their allied infrastructure to the contracted operator.
• The ownership of the bus vests with the operator</td></tr>
</table>

<table>
<tr><th>No</th><th>Salient features</th><th>Details</th><th>Additional clarifications</th></tr>
<tr><td></td><td></td><td>• Ensuring cleanliness of the bus
• Operating and maintenance of buses on a daily basis
• Provision of reliable service according to the service timetable for the contracted routes
• Fare collection is typically the responsibility of the contracting authority and not the operator</td><td>• The payments to the operator are based on the number of bus-km of service provided</td></tr>
<tr><td>3</td><td>Quantity and Delivery Schedule</td><td>Indicative Delivery Schedule<table><tr><th>S. No</th><th>Description</th><th>Timeline</th></tr><tr><td>1</td><td>Electrical supply installation and commissioning of charging infrastructure</td><td>3 months from the date of issue of the service agreement</td></tr><tr><td>2</td><td>Delivery of bus (in bulk or in smaller lots of 50 each)</td><td>6 months from the date of issue of service agreement</td></tr></table></td><td>• The quantity and type of bus to be supplied needs to be clearly specified
• A realistic time-frame for shall be proposed for bus deployment</td></tr>
<tr><td>4</td><td>Functional and Technical specification</td><td>• In a GCC arrangement, it is desirable to detail out the functional specifications which impact user experience and external infrastructure to be provided by the authority. This includes mentioning features like:
o Air Conditioning (Yes/ No)
o Floor height of the bus (400mm/1100mm)
o Vehicle capacity including no. of seating and standing passenger capacity</td><td>• Focus on functional specifications: Authorities may define the functional specifications based on the existing diesel/ CNG buses such that there's continuity in passenger experience and infrastructure utilisation
• Vehicle utilisation Vs Battery capacity: It is advisable to specify the vehicle utilisation i.e. the km of range required to be delivered by the bus rather than the battery capacity. Such specification would allow the GCC to be service</td></tr>
</table>

No	Salient features	Details	Additional clarifications
		• The technical specification of buses need not be elaborated in detail. However, it is advisable to provide some of the major specifications as follows: o Type of breaking system o Type of suspension system o Vehicle dimensions o Vehicle utilisation (Range) in single charge (rather than battery capacity) o Charging duration (technology of charger may be left to the operator)	focused and would allow for innovative technology solutions like battery swap and opportunity charging to bid for the service. The authority may then take an informed decision on the most cost competitive solution to fit their functional specifications • **Charging duration Vs technology specifications**: Authorities shall specify the maximum duration for which the vehicle is available for charging rather than preferred charging technology. This would enable the operator/service provider to identify the best available technology to meet the charging time and vehicle utilisation constraints
5	Condition precedent to supply of buses	Conditions precedent sets the base conditions required to commence the contract formally **Condition precedent to the authority:** • The STU/ SPV contracting electric buses shall identify the necessary depot space and hand it over to the operator to develop necessary civil and electrical infrastructure • The STU/ SPV shall also make the necessary electricity infrastructure and power available for the operator to set up charging infrastructure **Conditions precedent to the operator:** • The OEM shall start commencement of supply of vehicles only after installing the charging infrastructure.	• Setting up of electricity and charging infrastructure is essential for bus operations. Hence this activity should be completed before the date of supply of buses, from when the service agreement comes into effect • Providing manpower is also a critical requirement for bus operations and hence would need to be concluded in time to commence operations as scheduled

No	Salient features	Details	Additional clarifications
		• The OEM shall also provide the list of drivers and mechanics staff details prior to commencement of operations	
6	Qualification Criteria	• A consortium of companies shall be allowed to participate to ensure adequate representation from bus manufacturers, operators and charging infrastructure providers as a part of the service providers team • The bus manufacturer shall have experience of supplying electric buses to Indian states/ cities and shall be able to demonstrate the manufacturing capacity of electric buses at the required rate to meet STUs demands • The operator shall have the experience of operating at least 50% of the buses being contracted in urban conditions • Financing entities such as a banks/ equity funds/ Non-Banking finance Corporations (NBFC) shall also be allowed to be part of the consortium	• Letters of support from financing entities and OEMs shall be sought from bidders in cases where they aren't part of the consortium to ensure adequate preparedness for implementing the project • Manufacturers' authorization and support for the maintenance activities shall be sought clearly.
7	Terms of payment	The following contractual obligations shall be clearly outlined in the tender/RfP • **Payment terms –** The payment to the service provider shall be calculated as [Payment] = [Number of service-km operated for a month (KM) x quoted rate/km (in INR) • **Minimum assured km for payment**– The authority shall commit to a minimum assured km of payment (typically on a daily or annual basis) to safeguard the return on investments made by the service provider. The assured-km shall be derived by predicting the minimum service-	• **Predicting assured-km of service**: Adequate care shall be taken to ensure that the current vehicle utilisation isn't given as the assured km of payment for the entire contract duration. The authority shall review past trends of km operated on these routes to predict the likely km of service that is most likely to be provided in the future • **Payment terms for dead-km:** It is further recommended that the assured-km of payment may be delineated into revenue-km and dead-km i.e. km of operation on the route and from

No	Salient features	Details	Additional clarifications
		km to be operated on the identified routes based on the time-series trends of utilisation • **Payment for service beyond assured-km**-Given that the assured-km are designed to return the investment to the service providers, payment for any service-km beyond assured-km may be pegged at a lower rate i.e. 0.75 x cost of assured-km • **Payment for non-utilized km** – The total number of non-utilised km out of assured km of payment shall be reviewed on a half yearly basis to identify the km lost due to operator's reasons and other reasons. The authority shall not withhold payments out of assured km if the actual vehicle utilization is below the assured utilization for reasons not attributable to the operator. • **Payment cycle** – With a view to ensure steady cash flow to the service provider it is generally proposed to have a 45-day payment cycle i.e. the service provider shall raise the invoice after every 30 days and the payment shall be released within 15 days from the date of receipt of invoice. • **Performance security deposit** – Generally 5-10% of the contract value is collected as the performance security deposit by the service provider to ensure that they're adequately invested in it • **Liquidated Damages (LD) for late delivery** The service provider shall pay LD that shall be calculated at the rate of 0.3 times the quoted rate/km for the assured km for a day, for each day of delay until fulfilment of the	depot to the terminal of the route. This is to ensure flexibility of re-allocating buses between routes with adequate transparency between the authority and operator on the relative change in service-km to be paid • **Warranty & Annual Maintenance Contract (AMC)** need not be proposed by the authority as the responsibility of operations and maintenance of the buses rest with the operator • **Refurbishment of the entire bus proposed at the end of 5 years** in line with the current diesel/ CNG bus norms to ensure effective service delivery to the commuters.

No	Salient features	Details	Additional clarifications
		Conditions Precedent like delay in supply of buses, delay in setting up of charging infrastructure etc. Further, the LD is subject to a maximum of the performance security deposit. • **Penalties–** Penalties on payment shall be imposed on the service provider in cases of non-adherence to the Service Level Agreements (SLA) • **Payment revision mechanisms** shall also be built into the contract to reflect the increase is personnel and energy costs during the course of operation. Typically, an annual revision in payment is made based on variations in Consumer Price Index (CPI) and Wholesale Price Index (WPI) and a quarterly revision in payment is made based on variations in electricity tariff	
8	Payment Guarantees	• With a view to ensure assured payment to the operator the authority shall maintain a **dedicated Escrow Account** for payments to the e-bus service provider/ operator where a minimum of 3-months of payments shall be maintained in advance	Payments are typically scheduled for every month/ 45 days/ quarter. Bidders are required to raise their invoice for each payment cycle and the authority typically takes a 15-day time to process the payment
9	Insurance and Permits	• Insurance of the vehicles shall be the responsibility of the service provider/ operator • Ensuring stage carriage permits shall be the responsibility of the contracting STU/SPV	--
10.	Ownership of assets	• Cities which procured electric buses under FAME-1 tried out having joint ownership of authority and operator on the buses and charging infrastructure. However, this led to the STU/ SPV losing the core advantage of a GCC operations of not owning the asset. Even the service	• Joint ownership may restrict the Operator's to raise funding from Banks and Financial Institutions.

<table>
<tr><th>No</th><th>Salient features</th><th>Details</th><th>Additional clarifications</th></tr>
<tr><td></td><td></td><td>providers faced difficulties in raising financing due to lack of complete ownership of the asset
• Hence it is advisable to not go for joint ownership. Instead, it is suggested to securitize the CAPEX incentive/subsidy disbursed by FAME or other sources through a bank guarantee for the same amount
• It is also advisable to vest the ownership of assets (buses) post completion of the contract period with the service provider.</td><td></td></tr>
<tr><td>11</td><td>Service Level Agreements</td><td>• Service Level Agreements (SLAs) are intended to ensure the minimum level of service by the operator
• They need to be stated upfront in the tender/ RfP. Penalties are designed into the contract for non-adherence to the agreed SLAs.
• The following are a few indicative list of SLAs. The model RfP document provides a more exhaustive list of indicators that the authority can choose from
<table>
<tr><th>NO</th><th>PARAMETER</th><th>SLA/MONTH</th></tr>
<tr><td>1</td><td>Schedule km vs operated km</td><td>>90 %</td></tr>
<tr><td>2</td><td>Scheduled trips vs operated trip</td><td>>95%</td></tr>
<tr><td>3</td><td>No. of break downs for the first six months</td><td>< 3</td></tr>
<tr><td>4</td><td>Energy efficiency of the bus</td><td>< 1.3 kwh/km*</td></tr>
</table></td><td>• Adequate care shall be taken to only include SLAs which can be measured accurately with limited scope for ambiguity
• Penalties are levied on the service providers for non-adherence to SLAs. They are typically capped at 10% of the total payment
• The method of measuring the SLAs shall be clearly stated in the RfP i.e. whether SLAs will be derived from the Intelligent Transport System (ITS) reports, Management Information System (MIS) reports or through other manual methods</td></tr>
<tr><td>12</td><td>Financial evaluation parameter</td><td>• It is recommended to ask for a disaggregated financial quotation comprising of:</td><td>• A Quality-Cost Based Selection (QCBS) is normally recommended for procurement which rates</td></tr>
</table>

No	Salient features	Details	Additional clarifications
		○ Capital cost of buses (CAPEX_Bus) ○ Capital cost of charging infrastructure (CAPEX_Infra) ○ Refurbishment cost of buses during the contract tenure (REFURBISHMENT) ○ Cost of setting up of transformers/other electrical infrastructure at the depot ○ Operational expenditure (OPEX) ○ Salvage value at the end of life of the contract • Cost per km shall be taken as the bidding parameter for evaluation • The financial quote shall be calculated using the formula: Cost per km = (CAPEX_Bus+ CAPEX_Infra + Refurbishment + OPEX+ Electrical infrastructure–Salvage value)/ Total assured km of service over the life of contract)	bidders on both technical and financial parameters to identify the bidder with the best score across parameters. • However, given the nascent nature of electric bus technology with no proven technical competence among Indian bidders, authorities have limited means for technical evaluation. • Hence, a least cost (L1) based evaluation is the best available alternative for electric buses

Table 3 Toolkit for finalizing outright purchase RfP

<table>
<tr><th>No</th><th>Description</th><th>Details</th><th>Additional clarifications</th></tr>
<tr><td>1</td><td>Tender Time Table</td><td>A tender timetable shall have the following indicative details:
<table>
<tr><th>S. No.</th><th>Item</th><th>Details</th></tr>
<tr><td>1</td><td>Tender number and date</td><td></td></tr>
<tr><td>2</td><td>Name of the authority floating the tender</td><td></td></tr>
<tr><td>3</td><td>Address of the authority</td><td></td></tr>
<tr><td>4</td><td>Email id and phone no. for contact</td><td></td></tr>
<tr><td>5</td><td>Dates and time of availability of the tender</td><td></td></tr>
<tr><td>6</td><td>Date and time of pre-bid meeting</td><td></td></tr>
<tr><td>7</td><td>Last date and time for the receipt of bids</td><td></td></tr>
<tr><td>8</td><td>Date and time of opening of the technical bid</td><td></td></tr>
<tr><td>9</td><td>Date and time of opening of the financial bid</td><td></td></tr>
</table></td><td>• Bidders are typically provided with a 30 -45 day timeline from the date of issue of tender notification till the last day for submission of bids.
• The pre-bid meeting is typically organized 2 weeks after the tender notification to meet with the prospective bidders and to discuss any specifics of the tender that may need modification</td></tr>
<tr><td>2</td><td>Scope of Work</td><td>• Supply of Buses
• Installation of chargers and charging infrastructure
• Comprehensive warranty</td><td>• It is suggested to include both the purchase of electric bus and setting up of charging infrastructure as a joint contract because many of the electric bus</td></tr>
</table>

<table>
<tr><th>No</th><th>Description</th><th>Details</th><th>Additional clarifications</th></tr>
<tr><td></td><td></td><td></td><td>OEMs have chargers specific to their own vehicle type
• This is in contrast to an outright purchase contract for conventional buses which typically covers only the supply of buses while fuels stations are set up by the STU/ SPV
• Commission and trial run phase for a period of at least 6 months is suggested to be included before giving the final acceptance for the supply of buses
• A comprehensive Annual Maintenance Contract (AMC) for a minimum 5 years and extendable beyond that shall also be made part of the contract
• Warranty for replacement for battery shall be a minimum of 5 years</td></tr>
<tr><td>3</td><td>Quantity and delivery Schedule</td><td>Indicative Delivery Schedule<table><tr><th>No</th><th>Description</th><th>Time line</th></tr><tr><td>1</td><td>First lot of buses and chargers (eg. 50 bus and their chargers)</td><td>3 months from the date of issue of purchase order</td></tr><tr><td>2</td><td>Supply installation, commissioning of charging infrastructure in identified areas</td><td>6 months from the date of issue of purchase order</td></tr></table></td><td>• The quantity and type of bus to be supplied needs to be clearly specified
• Realistic time frame for deployment shall be proposed
• Supply and installation of charging infrastructure shall precede the delivery of each lot of bus</td></tr>
</table>

No	Description	Details	Additional clarifications
4	Specifications	• The specification of buses and chargers are to be specified in adequate detail • Some of the major specifications to be detailed are: o Air-conditioning (AC/ Non-AC) o Floor height (400 mm/ 1100 mm etc.) o No. of seating and standee passenger capacity o Type of breaking and suspension system o Type of charger (AC/DC charging) o No of charger's required o Charger protocol for standardization o Charger communication protocol – Combined Charging System (CCS)/ CHArge de MOve (CHAdeMO) o Battery technology o Range in single charge o Duration of charging o Charging method (Overnight charging, battery swap, opportunity charging)- o Energy consumption (KWH/km)	• **Focus on functional specifications**: Authorities may define the functional specifications based on the existing diesel/ CNG buses such that there's continuity in passenger experience and infrastructure utilisation • **Range Vs Battery capacity**: It is advisable to specify the Range i.e. the km of distance in a single charge rather than the battery capacity. Further the specifications like duration of charging and the frequency of charging would allow the authorities to evaluate the technology against functional requirements. This would allow innovative technology solutions like battery swap and opportunity charging to bid for the service. The authority may then take an informed decision on the most cost competitive solution to fit their functional specifications
5	Condition precedent to supply of buses	Conditions precedent sets the base conditions required to commence the contract formally **Condition precedent to the authority:**	• Setting up of charging and electricity infrastructure is essential for bus operations. Hence this activity should be completed before the date of supply of buses.

No	Description	Details	Additional clarifications
		• The STU/ SPV purchasing electric buses shall identify the necessary depot space and make the necessary electricity infrastructure and power available for the operator to set up charging infrastructure **Conditions precedent to the operator:** • The OEM shall start commencement of supply of vehicles only after installing the charging infrastructure	
6	Qualification criteria	• No consortium proposed • Only OEM to bid • The OEM should have experience of supplied at least 50% of the quantity of buses sought in the tender • The OEM should have a tie up with a local reputed service provider for providing comprehensive AMC for a period of 5 years	• Insistence of an agreement with a reputed local service provider for AMC is mandatory to ensure smooth operations
7	Major contractual obligations	• **Warranty** - The warranty for the battery and charging infrastructure shall be for a minimum of 5 years and all other parts shall be as per standard industry practice • **Comprehensive AMC for 5 years** – All preventive maintenance and docking needs to be provided by the OEM and the cost towards the same shall be a part of the overall quote for procurement • **Availability of spares –** The OEM shall be committed to supplying spares within 24-48 hours	• As battery and chargers forms major cost of the bus cost warranty for the same is sought for 5 years • Further as there is no proper Technical Know How it is always better to go for comprehensive AMC for the entire 5 years • Performance security may be sought for 10%. Post completion of supply and commission & trial run 50% is proposed to be refunded to facilitate better cash flow for the OEM

No	Description	Details	Additional clarifications
		of order. Three months of predicted spares need to be stored locally • **Performance security deposit**–10% of the contract value shall be deposited as performance security • **Validity period of performance security**– 50% of the performance security deposited shall be refunded after trial and commission run period of 6 months, balance 50% post project completion period • **Liquidated Damages (LD)** –The OEM shall pay LD on delay in delivery that shall be calculated at the rate of 0.75% of the price of delayed goods for each week of delay up to a maximum of the performance security deposited by the OEM	
8	Training and Capacity Building	• Training and capacity building of the STU/ SPV staff is essential in outright purchase procurement • Training shall be provided for the identified electric bus drivers and mechanics of the STU/SPV within the first 3 months • Drivers will be trained on the additional features of electric buses while mechanics will be trained on maintenance of buses and charging infrastructure • Training shall be carried out in the OEM's premises • All cost towards the training and capacity building shall be borne by the OEM	• As the day to day operations and maintenance are to be managed by STU, training is an essential part of the procurement exercise • The initial set of trained manpower shall later train the remaining staff on electric bus driving and maintenance practices
9	Insurance and Permits	• Shall be the responsibility of the STU	--

No	Description	Details	Additional clarifications

10	Progressive payment terms- suggestive can be customized	• A progressive payment structure may be considered for electric buses rather than the lumpsum payment method typically adopted for outright purchase contracts. This is to ensure OEMs ownership in the successful implementation of the project given the limited experience of Indian STUs & SPVs in implementing electric buses
		• The following payment timeline is suggested
		  • Upon supply and issuance of acceptance certificate by the authority - 30% of the contract amount.
		  (note: if multiple mile stones for supply of buses are prescribed for buses then the 30% shall be apportioned appropriately)
		  • Upon successful installation and commissioning of charging infrastructure and supplying of allied chargers as per requirement – 20 % of the contract amount
		  • upon successful commissioning and trial run for 6 months of bus operation and meeting the desired SLA - 30% of the contract amount
		  • Balance 20% of contract amount shall be released in 28 equal quarterly installments upon meeting desired SLA as prescribed by the authority
			Progressive payment terms can help factor-in the technological risk in an outright purchase model

<table>
<tr><th>No</th><th>Description</th><th>Details</th><th>Additional clarifications</th></tr>
<tr><td>11</td><td>Service Level during 5 years AMC period</td><td>• The following are a few indicative lists of SLAs. The model RfP document provides a more exhaustive list of indicators that the authority can choose from
<table>
<tr><th>NO</th><th>Indicator for level of service</th><th>Target</th></tr>
<tr><td>1</td><td>% of scheduled km operated</td><td>>90 %</td></tr>
<tr><td>2</td><td>% scheduled trips operated</td><td>>95%</td></tr>
<tr><td>3</td><td>No. of breakdowns in the first 6 months</td><td>< 3</td></tr>
<tr><td>4</td><td>Energy efficiency of buses</td><td>< 1.3 kwh/km</td></tr>
</table></td><td>• Adequate care shall be taken to only include SLAs which can be measured accurately with limited scope for ambiguity
• Penalties are levied on the service providers for non-adherence to SLAs. They are typically capped at 10% of the total payment
• The method of measuring the SLAs shall be clearly stated in the RfP i.e. whether SLAs will be derived from the Intelligent Transport System (ITS) reports, Management Information System (MIS) reports or through other manual methods</td></tr>
<tr><td>12</td><td>Financial valuation parameter</td><td>• The total of Capital expenditure cost for buses and charging infrastructure along with the cost for AMC shall be considered for financial evaluation</td><td>• A least cost (L1) based evaluation is the best available financial evaluation method for electric buses</td></tr>
</table>

4 CONCLUSIONS AND WAY FORWARD

Electric bus implementation has been initiated through the FAME I scheme and has now picked up momentum through FAME II and various State level initiatives focussed on promoting clean mobility technologies. Given the ambitious goals set by the GoI and various states and the limited technical and financial capabilities towards achieving these goals, it is important that various stakeholders come together to help address the challenges.

Towards this objective, the current project worked on creating an enabling ecosystem for electric buses in India through the following measures

- **Fiscal incentives**: Providing inputs to Government of India (GoI) on the design of FAME II scheme i.e. sharing international best practices, key findings from FAME I and feedback from STUs, operators and OEMs on specific inputs to the subsidy design
- **Technical inputs for procurement**: Providing insights to public transport agencies on their planning, procurement and deployment strategies to ensure smooth roll out and evaluation of e-buses through review of previous procurement methods, model tender documents and a toolkit for selection of the appropriate procurement method

As cities get selected for FAME II subsidy and they initiate procurement, the following are a few aspects that need to be taken care of to support efficient implementation of the scheme:

- **Performance evaluation of e-buses**: The ongoing e-bus operations in cities funded under FAME I need to be evaluated thoroughly to understand the key functional and operational management aspects of electric buses. This will help provide valuable learnings for the next round of deployment through FAME II
- **Defining a data-sharing protocol for FAME II**: FAME II guidelines have already mandated data sharing on key performance attributes for buses to be deployed under FAME II. The specific metrics to be captured and the protocol for data sharing between various stakeholders need to be defined before the operations are commissioned
- **Identifying context specific deployment strategies**: Deploying electric buses would involve defining a series of context specific measures to be taken up by the local authority contracting these services. This will include identifying the appropriate

vehicle and charging infrastructure technology to meet operational and financial constraints, identifying depots and routes for deployment, integrating service planning needs of e-bus operations and charging into the overall city bus operations and the mechanisms to ensure adequate viability gap funding.

- **Knowledge sharing and capacity building programs**: As STUs and cities gain experience in e-bus deployment and operations, there should be adequate venues for them to exchange knowledge and learn from each other's experiences. Simultaneously capacity building programs aimed at helping them understand the latest trends in e-bus technologies, planning, procurement and management will ensure sustainability of their operations and a further scale up

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