UITP ADVANCING PUBLIC TRANSPORT

SHAKTI SUSTAINABLE ENERGY FOUNDATION

REPORT

ELECTRIC BUS PROCUREMENT UNDER FAME-II:

LESSONS LEARNT AND RECOMMENDATIONS FOR PHASE-II

JULY | 2020

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Shakti Sustainable Energy Foundation seeks to facilitate India's transition to asustainable energy future by aiding the design and implementation of policies in the following areas: clean power, energy efficiency, sustainable urban transport, climate change mitigation, and clean energy finance.

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International Association of Public Transport (UITP) is a non-profit organisation headquartered in Belgium with a global network of offices, including in Delhi and Bangalore. UITP is the only worldwide platform for cooperation on public transport, with more than 1,800 members from 100+ countries representing public transport authorities, operators, policy decision-makers, scientific institutions, and the public transport supply and service industry. We undertake research, advocacy, and capacity building initiatives and provide networking platforms to advance public transport systems.

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Contents

Electric bus procurement under FAME-II: The story so far

The transition to electric buses (e-buses) presents the opportunity to convert the maximum passenger-kilometre (km) of travel to zero-emission transport in Indian cities and has the potential to yield a variety of benefits, including improved energy efficiency and air quality, along with longer-term climate change mitigation benefits. Despite these benefits, the financial considerations, such as the higher costs associated with the transition to e-buses, have so far limited the pace of electrification of the bus transport sector. The Government of India (GoI) is working to address this and accelerate e-bus deployment; since 2015, it has been implementing the Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME) subsidy scheme to facilitate this transition. The second phase of the scheme, FAME-II, is currently under way.

In addition to the higher cost of e-buses, the Coronavirus disease (COVID-19) induced financial constraints have caused Indian bus agencies to postpone their plans to pilot and scale up e-buses under FAME-II. However, before the COVID-19 lockdown began in March, many urban and intercity bus agencies had made significant progress in e-bus procurement under the scheme. Department of Heavy Industries (DHI), which administers this scheme, has sanctioned a total of 5,595 e-buses in Phase-I of FAME-II. Out of these, the tenders for about 3,500 buses have been placed, while the procurement process for about 2,450 buses has already been completed and approved for the subsidy by DHI. The contracting and deployment of these buses are likely to be taken up in the second half of 2020 or early 2021, as India recovers from COVID-19, and normal activities resume.

This interim period gives us the opportunity to learn from the procurement efforts carried out so far and incorporate learnings into future e-bus procurement under Phase-II of FAME-II and beyond. This report examines the status of e-bus deployment under FAME-II, presenting the lessons learnt from the procurement carried out thus far under the scheme, and identifies potential measures to improve the financial performance in future rounds of procurement.

1.1 Report objective and data limitations

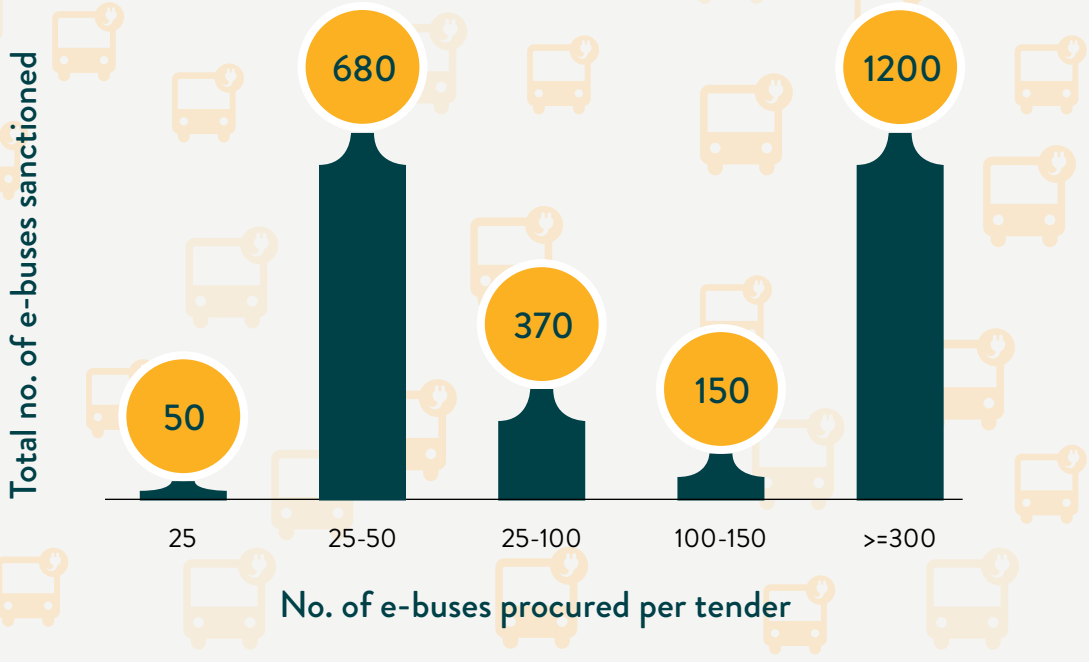
This report is intended to provide insights to policy makers and authorities tendering out e-buses, based on learnings from tenders carried out under FAME-II. We present the summary of data from the latest publicly available FAME-II tenders and feedback collected by UITP India through various secondary data sources and interviews. Annexure 1 presents the comparison of key specifications from the Requests for Proposal (RfPs) and Model Concession Agreements (MCAs) for about 3,500 buses tendered thus far under FAME-II, based on the analysis carried out by our team. The finalised rates per km are also included for cities/ states that have completed the tendering process and got the subsidy sanctioned by DHI. However, cities have been constantly updating their terms of operations and contracts in order to reduce their cost of operations, and, hence, some of the data points may have changed since we collected the data. We may have also missed out on some tender documents from certain cities that floated tenders under FAME-II. Hence, we only present aggregated findings across cities in this report, without comparing each of the terms across agencies. At the same time, some of the cities that Final Report: Electric bus procurement under FAME-II cancelled these earlier tenders and are in the process of re-tendering. Higher than anticipated quotes during initial rounds of tenders and lack of active participation from bidders are the key reasons for such cancellation of tenders.

1.2 Overview of tenders sanctioned for subsidy in FAME-II Phase-I

There are tenders for 2,450 e-buses that have been closed and sanctioned for subsidy by DHI, covering bus agencies across 13 states. This includes 2,270 buses to be deployed in urban services across 30 cities and 180 buses for intercity operations across 4 State Transport Undertakings (STUs). Midi-buses (9m long) were the most preferred model across cities, with 81% of the total buses (i.e. 1,990 buses) opting for this variant, while the rest are standard (12m long) buses. Just three

authorities with large-scale tenders, i.e. Brihan Mumbai Electricity Supply and Transport (BEST), Mumbai (300 e-buses), Janmarg, Ahmedabad (300 e-buses), and Uttar Pradesh (combined procurement of 600 e-buses for deployment across 11 cities), account for about 50% of the total e-buses sanctioned so far. The second-largest category of procurement is cities with smaller tenders, i.e. 25-50 buses per tender, which constitute about 28% (680 buses) of the total sanctioned e-buses. Figure 1 presents the breakup of e-buses sanctioned for subsidy according to the procurement parcel size.

Figure 1: Total e-buses sanctioned vs. e-buses procured per tender



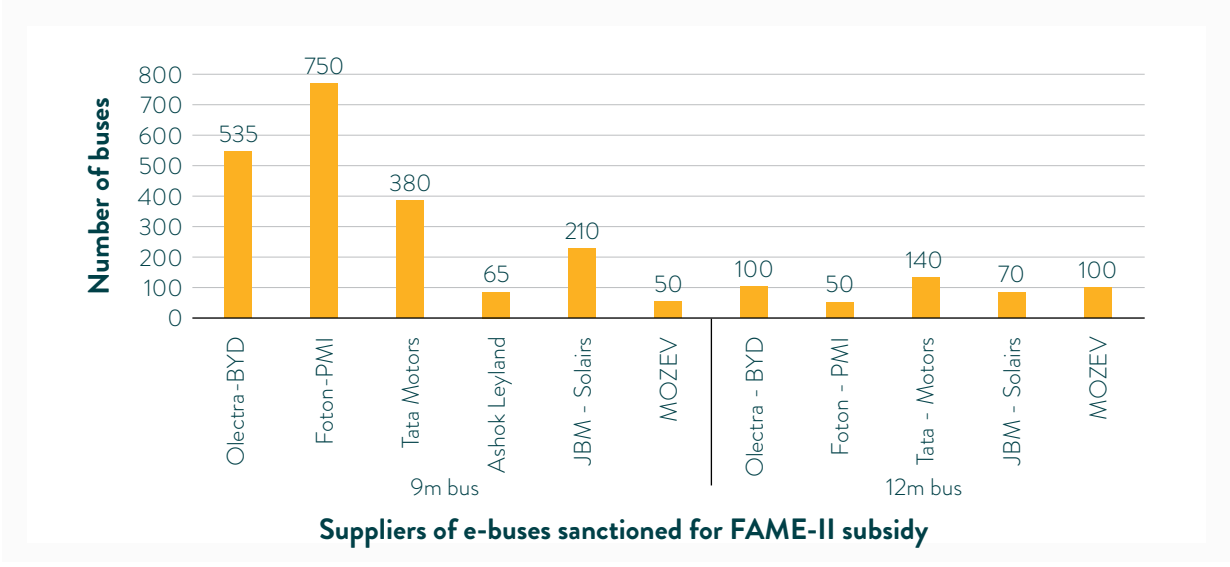
1.3 Suppliers of e-buses sanctioned for subsidy

Many of the bids received across states were submitted by consortiums led by the Original Equipment Manufacturers (OEMs), which will supply the buses. Figure 2 presents a summary of the suppliers identified thus far under FAME-II, segregated by 9m and 12m buses.

PMI Electro Mobility Solutions Pvt. Ltd. (Foton-PMI) is the OEM with the largest number of sanctioned buses- a total of 800, including 750 9m buses, out of which 600 are through the abovementioned large-scale tender in Uttar Pradesh. Rajkot, Bhubaneshwar, and Delhi Metro feeder services, with 50 buses each, comprise the remaining 9m buses to be delivered by Foton-PMI, while the firm has also been selected to supply 50 12m buses in Kolkata New Town.

Olectra-BYD is the second-largest supplier, with 635 buses, including 535 9m and 100 12m buses. These buses will be used in urban services in Surat (150 9m buses), Bhopal & Indore (100 9m buses each), Jabalpur & Ujjain (50 9m buses each), and Silvassa (25 9m buses). Additionally, Olectra-BYD was also selected to supply 50 12m intercity buses in Goa and 60 9m buses in Uttarakhand for hilly terrain use cases (30 each for Dehradun Smart City Ltd. and Uttarakhand State Road Transport Corporation (UKSRTC)).

Figure 2: OEMs selected to supply e-buses sanctioned under FAME-II

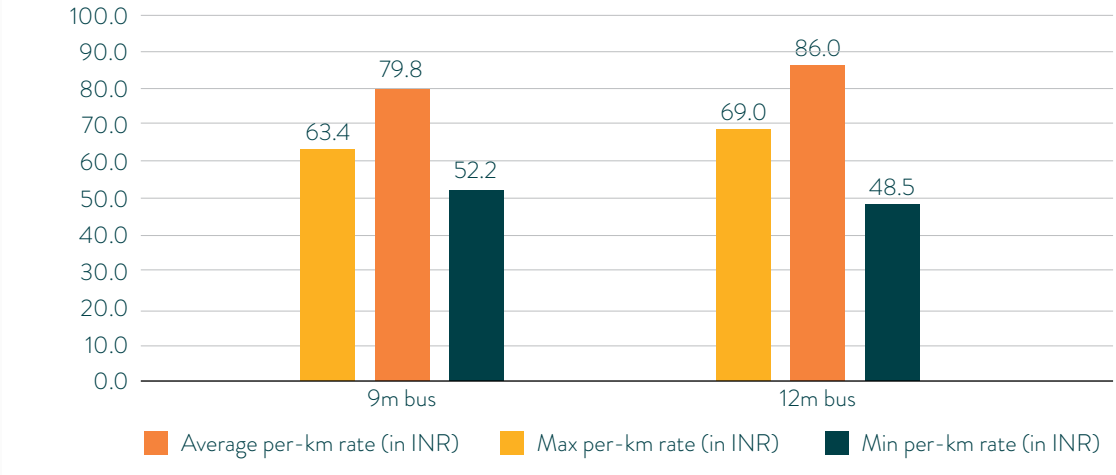


Tata Motors, the third-largest supplier, was selected to supply 520 buses, divided across the following locations: Mumbai (140 12m buses and 160 9m buses), Ahmedabad (120 9m buses), and Jaipur (100 9m buses). JBM-Solaris will supply 280 buses, divided between Ahmedabad (180 9m buses) and Navi Mumbai (70 12m buses and 30 9m buses), whereas Mytrah Mobility (MOZEV) will provide 150 buses in three locations: 50 9m buses to Delhi Metro feeder services and 50 12m buses each for intercity services in Maharashtra and Rajasthan. Ashok Leyland will supply 65 buses, to Gwalior (40 buses) and Patna (25 buses).

1.4 FAME-II e-bus procurement cost

All the FAME-II Phase-I tenders adopted the Gross Cost Contract (GCC) based procurement model, as recommended by the DHI, with the least cost (L1) quote per km of operations as the selection criteria for the winning bidder. Figure 3 presents the price range of the bids finalised thus far. The subsidy available for various bus types is predetermined by the DHI, and, hence, the quoted costs factor in the available subsidy. It should be noted that key cities like Delhi, Bangalore, Pune, and others in Tamil Nadu, which together comprise more than 1,400 tendered e-buses, have not yet finalised their service providers, and, hence, some of the findings presented here may need to be revisited in the future.

Figure 3: Range of L1 bids approved for 9m and 12m buses



1. Variation in quoted costs among different cities and states

Similar to the trend observed in FAME-I, the L1 quotes varied significantly among cities. In the case of 9m buses, the highest quote received was Indian Rupee (INR) 79.8 per km, which was 53% higher than the lowest quote, of INR 52.2. In the case of 12m buses, the difference is starker, with the highest quote of INR 86 per km being 78% higher than the lowest quote, INR 48.5 per km. Despite similar vehicle specifications between cities, such high variation in rates can be attributed to the difference in contractual specifications between different tenders. As can be seen in Annexure 1, items like assured-km of payment to the service provider, responsibility to pay for the electricity/ energy costs, financial obligations such as bid and performance security, and the penalty for non-adherence to Service Level Agreements (SLAs) (which is built into the bid value in many cases), all of which have a significant impact on the bid value, vary widely among cities. Furthermore, bidders also build in the cost of a risk premium on items impacting the bankability of the project, such as termination clauses and the capability and track record of the contracting authority to ensure timely payments, which are beyond the scope of analysis in this report. Cities and states can use Annexure 1 as a resource to compare their tender specifications to those of other contracting authorities that attracted lower rates and make necessary improvements, where applicable.

2. High cost of e-buses compared to internal combustion engine (ICE) buses

The total cost of operating electric buses includes additional costs to be incurred by the contracting authority, in addition to quoted costs on items like electricity (in cities where the contracting authority is responsible), conductors, depot development, contract management, and other administrative expenses. Adding these costs to the quoted cost for the vehicle and driver makes the Total Cost of Ownership (TCO) over the lifecycle of e-bus operations 50-100% higher than that of existing conventional diesel and compressed natural gas (CNG) powered buses in some cities, even after factoring in the available FAME subsidy. At these rates, it is unlikely that cities will adopt e-buses as their preferred choice in cases where the FAME subsidy is unavailable and they can deploy ICE buses instead. However, current GCC rates in many cities are for Bharat Stage (BS) III and IV buses which are reaching the end of their tenure in many cities, and the upcoming tenders are likely to be more expensive, even for ICE buses, due to the current financing costs, higher costs of the vehicle and fuel due to technology upgradation to BS VI buses, and contracting issues that impact both the ICE bus and e-bus cost. Therefore, comparing TCO of existing ICE buses with TCO of e-buses under FAME-II doesn't provide a realistic picture. Instead, cities need to compare the TCO of e-buses with TCO of ICE buses in-case of a new procurement to make the appropriate technology choice. Cities

also need to view the current deployments under FAME-II as a pilot towards large scale transition to e-buses in the future and treat any additional TCO of e-buses as an investment towards better preparedness for the future.

3. Relative costs of 9m and 12m buses

For the sanctioned e-buses, the average L1 quote for 9m buses across urban and inter-city operations is INR 63.3 per km, whereas it is INR 69.0 per km for 12m buses. Hence, on average, 12m buses are only 9% more expensive than 9m buses. Notwithstanding the differences in contractual specifications, the limited difference in costs between different bus length categories indicates that the cost of service delivery over the lifecycle of a bus depends more on Operational Expenditure (OPEX) items such as staff cost, energy cost, maintenance cost, etc. than on the Capital Expenditure (CAPEX) on the bus, charging infrastructure, and other ancillary infrastructure. Cities need to evaluate the cost and benefits of the differently sized buses carefully, for the following reasons:

a) Lower capacity and revenue potential of 9m buses: While the cost of operating 12m buses is only 9% higher, their passenger carrying capacity is at least 25-30% higher than that of 9m buses. As public transport demand is concentrated in the morning and evening peaks, the capacity needs to be maximised to carry as many passengers as possible during these hours. Therefore, 12m buses are likely to provide better payback compared to 9m buses in cases where they can take advantage of the high peak hour demand.

b) Lower range of 9m buses: The battery capacity and, hence, the range offered by 9m buses currently available in the Indian market are about 30% lower than those of 12m buses. As a result, the smaller buses are more likely to require top-up charging during the day to meet the daily vehicle-utilisation targets, leading to loss of trips and, hence, revenue to the authority. This revenue loss is accompanied by lower staff productivity due to day-time charging. As a result, cities will require more 9m buses to provide the same level of service. This is commonly measured as the replacement ratio, i.e. the ratio of the number of e-buses to ICE buses needed to deliver the same service. Therefore, cities need to carefully evaluate the range implications and power availability for opportunity charging for the proposed e-bus routes when deciding on the vehicle specifications.

c) Infrastructure challenges for 12m buses: Infrastructure availability also plays a key role in identifying the appropriate vehicle length. Use cases such as hilly operations, operations in smaller cities, and metro feeder services in metropolitan cities are likely to require buses operate in constrained conditions without adequate Right of Way (RoW) or turning radiuses for 12m buses. In such cases, 9m buses should be selected.

Considering these three factors, 12m e-buses are likely to perform better financially than 9m e-buses, if there is adequate passenger demand and street infrastructure for their operations. Therefore, authorities need to carry out a thorough demand and infrastructure availability assessment to determine the most appropriate bus length for their operations.

Potential procurement improvements for cost reduction

The e-bus TCO needs to be significantly reduced from the current situation of being 50-100% higher than that of ICE buses, in order to ensure the deployed e-buses' sustained operations and scale up deployment across Indian cities. Such a reduction can only be achieved if all the relevant stakeholders involved in e-bus service delivery—e.g. the contracting bus agencies, OEMs, operators, financing institutions, and DHI—work together and develop a roadmap to reduce the cost of e-buses to be procured in the future.

We have identified changes in the terms of procurement set by contract authorities as one of the critical areas of improvement needed to reduce e-bus cost. This section outlines specific aspects identified through our internal analysis and stakeholder consultations that have scope for improvement in upcoming procurement.

2.1 FAME II procurement process

DHI mandated the OPEX procurement model in FAME-II, which resulted in all bus agencies adopting the GCC procurement model for e-buses. The tendering process for bus procurement under GCC involves the cities issuing an RfP, accompanied by an MCA, that outlines the terms of procurement. Interested service providers submit their bids, out of which the least cost, i.e. L1, bidder is selected and contracted. A draft MCA was issued by NITI Aayog, GoI that all the cities were mandated to adopt, after incorporating any necessary changes according to their local needs. Neither DHI nor NITI Aayog issued a model RfP, and, hence, cities have developed their own RfPs, drawing from previous procurement experience and guidance provided in available documents such as the UITP toolkit for e-bus procurement[1,2] and Model RfP for diesel and CNG bus procurement issued by the Ministry of Housing and Urban Affairs (MoHUA)[3].

2.2 Review of FAME II RfPs and MCAs

While the available guiding documents helped ensure some consistency in e-bus tenders across the country, we observed significant variation in certain key clauses of the tenders and MCAs that determine the bidders' willingness to participate, the level of risk associated with the contract, and, the financial quotes likely to be submitted to the contracting agency. The following four categories of terms in the RfPs and MCAs were identified as the key differentiating factors in the FAME II bidding and results observed across India:

I) Eligibility criteria for service providers
II) Contractual obligations for the authority and service provider
III) Payment timelines and penalties
IV) Functional and technical specifications

This section summarises the key variations observed in the RfPs and MCAs of different cities that have completed their procurement process and gotten the corresponding subsidy sanctioned by DHI.

2.2.1 Eligibility criteria for service providers

Encouraging a higher number of bids per tender can potentially lead to reduced costs, due to competition among the bidders. Bidder eligibility criteria can significantly influence the type and number of bids a city attracts and, hence, need to be defined in such a way that they are open enough to encourage competition, while simultaneously ensuring the quality of the participating bidders. The variations observed in different RfPs in terms of service provider eligibility criteria are described below. The qualification criteria needs to be standardised across India in order to develop a pre-qualified pool of service providers through a pan-India empanelment initiative under the FAME II scheme.

[1]https://india.uitp.org/uitp-india-develops-toolkit-support-e-bus-procurement-under-fame-ii
[2]https://www.uitp.org/sites/default/files/Tender%20structure%20Extract.pdf
[3]http://mohua.gov.in/upload/uploadfiles/files/ModelGrossCost.pdf

1. Annual turnover requirements: The turnover requirements varied widely, with some cities not having any minimum turnover requirements, whereas in others, service providers had to have an annual turnover of at least INR 500 crore in order to be eligible to bid on the project, thereby excluding some potential bidders.

2. Types of bidders: The majority of the RfPs allowed operators and OEMs to either bid alone or as a consortium. In most of these cases, consortiums with OEMs (as the leading organisation) and operator partners have won the bids. While a tie-up with an OEM was mandated for all bidders, a tie-up with a financing entity was not mandated by many cities. Some cities have even excluded financial institutions from being the leading organisations in the bids. While mandating the participation of a financing entity in a consortium may restrict the ability of some bidders to participate, allowing financing entities to be the lead bidders could potentially lead to innovative business models that reduce costs.

3. Manufacturing capacity: Some cities set a minimum manufacturing experience requirement, stating that the OEM had to have already manufactured at least 50 e-buses. This prevented some OEMs from participating in the bid, given that e-bus manufacturing is still a fledgling industry in India and not all OEMs have reached that scale. In contrast, some other RfPs did not mandate any minimum e-bus manufacturing capacity, thereby opening up the participation to all OEMs eligible for the FAME subsidy. To safeguard against the risk of non-delivery associated with allowing manufacturers without prior delivery experience, STUs can mandate proof of concept at an appropriate stage during the tendering and contracting process.

4. Operating experience: Given the limited e-bus operating experience in India, many cities have allowed service providers with operating experience with both electric and ICE buses to participate in the e-bus tenders. The fleet size criteria for operating experience ranged from 10 to 100 buses. Given the limited number of private bus operators in India with large fleets, cities with larger fleet size criteria excluded smaller local operators, thereby increasing the procurement cost. At the same time, cities tendering larger fleets of e-buses identified this as the key criteria needed to prove the bidder's ability to deliver the service at the scale expected for the number of FAME-II e-buses sanctioned.

5. Timelines for bid submission and scope for consultation: The timeframe cities allowed for

service providers to submit their bids varied between a minimum of 6 days and a maximum of 38 days. Timelines for bidding should ideally allow for adequate preparatory work for the bidders and consultations with the contracting authorities through pre-bid meetings. Such consultations help fine-tune proposals to suit both the authority and service provider. The short timeframes adopted by some cities could have resulted in suboptimal bids, due to the bidders being unaware of the specific operating conditions or other aspects. Many cities also kept extending the original timelines and/or cancelling the tender/undertaking re-tendering, due to suboptimal bids in the first round. Cities are recommended to plan for a 30 day gap between the date of publishing the RfP and the deadline for bid submission in the future to allow bidders to decide on the quote based on on-ground operations assessment for the selected routes and adequate consultation with the contracting authority-which will result in identifying their optimal bidding price..

2.2.2 Contractual obligations

Clear definition of the obligations of the authority and service provider and their adherence is crucial to an effective long-term partnership in implementing a GCC contract. The following are key findings related to contractual obligations that may have influenced the cost of FAME II bids:

1. Performance bank guarantee amount and duration:

- The majority of cities mandated that 3% of the total estimated project be deposited by the service provider as the performance bank guarantee at the beginning of the contract. The project cost is estimated based on the number of buses, quoted cost per km, and assured-km of operation over the lifecycle of the contract. However, in some cases, the performance bang guarantee was fixed at 5% of the estimated project cost, i.e. 67% higher than the majority benchmark. Furthermore, some cities defined a per-bus performance security value, in the range of INR 30,000- 50,000.

- The duration of the performance security also varied among cities. Many cities mandated that the performance security deposit be made available 120 days beyond the contract duration, while some extended this to 180 days beyond the contract duration.

- Increasing the performance security deposit amount and duration increases the financing cost of the project and, consequently, the contract cost, without having any substantial positive impact on the quality of service delivery.

2. Subsidy bank guarantee amount and duration:

- In addition to the performance bank guarantee, DHI has mandated that cities collect a subsidy bank guarantee from the service provider at a value equivalent to the subsidy the service provider is eligible for under FAME-II, and this guarantee is to be secured for a duration of five years.

- Given that the performance bank guarantee already safeguards the project interests, having an additional subsidy guarantee equivalent to the subsidy given increases the project cost for the service provider, without contributing to an improvement in service quality.

3. Payment in the case of contract termination: The MCA issued by NITI Aayog defines the circumstances for Force Majeure, contract termination, and the payment obligations of the contracting authority or service provider at the time of these events in great detail. While the terms of payment in the case of service provider default were retained in local tenders, many cities changed the termination clauses in the case of authority default to relax their payment obligations. This drastically increases the bankability risk of the project for service providers and their financing entities, discouraging some bidders from applying.

4. Depot development and asset transfer: This is one of the contracting authority's main obligations- to develop the necessary civil and electrical infrastructure needed to commence e-bus operations. While some cities have clearly committed to these obligations and identified the depots that will be used for e-bus deployment, about 60% of the contracting authorities have not identified the exact depots for deployment. Lack of clarity on such key obligations increases the project's risk premium for service providers and their financiers, thereby increasing the overall cost. Furthermore, in some cases, authorities have transferred depot development responsibilities to the service providers, either due to lack of existing infrastructure or to benefit from private service

providers' relatively faster pace of execution. This has led to a disproportionate increase in cost per km, since the lifetime of the supporting infrastructure is 20-30 years, which is much longer than the contract tenure of 10-12 years.

5. Statutory taxes: Most of the RfPs and MCAs are silent on the statutory taxes applicable for e-bus service provision and their distribution between the contracting authority and service provider, thereby leaving scope for ambiguity among service providers when incorporating taxes into their cost estimations.

6. Asset ownership at the end of contract tenure lies with the authority in most cases. Given the rapid evolution of e-bus technology and likely availability of better quality models at the end of the 10-12 year contracts, leaving asset ownership with the service provider can potentially reduce the bid values.

7. Third-party Insurance for buses and assets is mandated by most authorities, which adds 2-2.5% to the asset cost per annum. Given that in-house bus operations are exempted from third-party insurance, a similar arrangement for e-buses can contribute to cost reduction in the future. In addition to this, service providers are also obligated to insure the authority-owned assets in the depots, which further increases the quoted cost.

2.2.3 Payment terms and penalties

Payment terms and penalties have a huge impact on the payback period for the service providers investing in e-bus operations. The following are the key payment terms that varied among cities and, hence, could have significantly impacted their costs:

1. Assured-km of payment: This is the minimum-km of service for which the authority commits to paying the service provider and is central to the cost quoted in the bids. Different cities mention their assured-km differently, e.g. based on their expected daily, monthly, or annual vehicle utilisation rates. Annexure 1 normalises these figures into monthly assured-km for each contracting authority. Greater numbers of assured-km ensure higher payback on the investments made by the operators, thereby improving the contract's potential financial performance and resulting in lower bid costs. At the same time, cities need to carefully calculate the assured-km, as the figures apply for the entire duration of the project, i.e. at least 10 years or more. Given the increasing congestion in Indian cities, vehicle utilisation (measured as km per bus per day) has been declining consistently over the years, and, hence, the current vehicle utilisation rates may not be met in the future. On average, the monthly assured-km cities commit to is approximately 6,000 per bus (~200 km per day). However, it varies widely among cities, with Navi Mumbai committing to approx. 6,600 km of assured-km per month, whereas Mumbai has the lowest assured-km, 4,200 km per month, for the midi (9m) buses. As a result, Navi Mumbai attracted per-km quotes of INR 52.2 and INR 69.93 for 9m and 12m buses, respectively, while Mumbai's costs for the same buses are INR 74 and INR 83 per km.

2. Payment periodicity and late payment penalties: The NITI Aayog MCA (NITI-MCA) recommended that payments to the service providers be made every 15 days in order to ensure adequate cash flows. However, some cities increased the interval to 30 days, thereby impacting the service providers' cash flow. More important, cities need to ensure payments as per the timelines they committed to in the contract, in order for the service providers to cover their working capital and back-end loan payments. Many cities have committed to paying an interest rate of 2-3% above bank interest rates for every day of delay in payments, but some have not

made any such commitments. In any case, the ability of the STUs to ensure timely payment is yet to be demonstrated, as they are not used to outsourcing operations and are in poor financial condition, particularly due to the adverse financial implications of the COVID-19 induced demand reduction.

3. Payment for additional-km: The payment terms for cases when service providers cover more km of service per day than their assured-km vary significantly across cities. None of the cities pay for additional-km at assured-km rates for , based on the logic that the assured-km rates cover the service providers' investments, and payment for additional-km is just an incentive to perform better. Hence, the per-km payment for additional-km is in the range of 30-75% of the payment made for assured-km. Some of the cities have not even mentioned the possibility of additional-km in their contracts. Such a high variation among cities can be a significant source of variation in quoted costs.

4. Payment for underutilised-km: Even though every city commits to a minimum assured-km of payment, some cities also made provisions to reduce the per-km payment in the case of underutilised-km, i.e. buses covering fewer km than the assured-km. The payment for the underutilised-km, calculated as the difference between assured-km and actual-km operated, ranges between 35% and 75% of the payment for assured-km. The payment for the actual-km of service provided continues to be at the per-km rate at which the contract is issued. Such a reduction in payment undermines the assured-km of payment committed to by the authority, as the service providers cannot plan for a steady revenue stream. At the same time, incorporating a clause on underutilisation indicates the uncertainty of the authority on the routes of operation and their likelihood to achieve the assured-km of service. This results in an increased risk premium associated with the contract, leading to higher financing costs. Furthermore, the service providers are likely to base their quoted cost per km on the assured-km of payment, after deducting the underutilised-km payment, which further increases the cost.

5. Mechanism for payment revision: The NITI Aayog MCA recommended a formula for annual revision of payment to the service provider that included the Consumer Price Index –Industrial Workers (CPI-IW) and Wholesale Price Index (WPI), which together incorporate the increase in staff cost and other materials needed for operation. Cities in Gujarat, Delhi Metro Rail Corporation (DMRC), and a few others have also included the energy price inflation in the payment revision formula. However, many cities have removed the payment revision mechanism from their MCAs, asking the service providers to quote a flat rate instead for the entire contract tenure. Given the uncertainty in the escalation of various cost items, such lack of payment revision can lead to a higher risk premium being incorporated into the quoted costs, thereby increasing the cost of the bids. Hence, cities are encouraged to adopt a transparent annual revision mechanism that builds trust with the service providers and reduces the costs.

6. Penalties and Service Level Agreements: The majority of cities included fleet availability, punctuality, and reliability in their SLAs, the lack of adherence to which attracts penalties on the performance security value (i.e. 3% - 5% of the project cost). Many cities capped the penalties at 10% of the total payment to be made to the service provider, as recommended in the NITI-MCA. Some cities even reduced the penalty amounts to avoid the likelihood of bidders incorporating these fees into their bids, while others added additional SLAs beyond the ones in the MCA. In contrast, some cities removed the cap on penalties, thereby jeopardising the assured-km of payment calculations by service providers and consequently adding to the cost, due to an increase in the associated risk premium. In many cases, even though the SLAs are mentioned, the method of monitoring them, i.e. manually or using an Intelligent Transport System (ITS), is not clearly mentioned, which is an additional point of uncertainty in penalty calculations.

7. Minimum amount to be maintained in escrow account: While the minimum balance amount to be maintained in the escrow account is defined in the NITI-MCA, some STUs have reduced this amount in their own MCAs. While the STUs made this revision due to their financial limitations, such changes increase the bankability risk of the project for service providers and their financing entities.

2.2.4 Functional and technical specifications

Finally, the following key aspects of the functional and technical specifications of the outsourced services were found to be crucial to determining the cost of service provision:

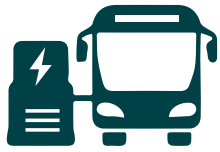
1. Charging strategy: Most of the MCAs are oriented towards overnight e-bus charging at depots, with an aim to maximise daytime e-bus operations, in order to replace ICE buses with similar e-buses. The concept of opportunity charging for e-buses, which eliminates the need for a full-day range battery and thus reduces the battery cost, has not been clearly defined in most of the RfPs and MCAs. Defining such a strategy would require agencies to plan services in advance, which would be a departure from the current operating practice of flexible, ad-hoc bus deployment on any route. Most cities only provide about 30 minutes (min) for opportunity charging, while a few allow up to 75 min for top-up charging. The lack of adequate top-up charging and necessary inspection is an important issue that needs to be addressed in future e-bus RfPs. Wherever possible, the top-up charging times need to be aligned with the staff break times during the day or shift changes to avoid loss of revenue-generating trips. However, such operational considerations have not been adequately covered in the RfPs and MCAs, which is likely to lead to a suboptimal range bus becoming the L1 bidder/service provider, eventually resulting in revenue loss and, ultimately, further increasing the overall cost of e-bus implementation.

2. Battery capacity requirements: The e-bus battery size needed depends on the charging strategy adopted by the city. In the case of depot-only charging, with 30-minute charging during a shift change, the ideal battery size will be based upon the daily e-bus utilisation.

3. Bus specifications: Many of the city RfPs and MCAs mention Urban Bus Specification (UBS)-II as the reference for bus specifications. Since UBS-II was designed for ICE buses, e-bus related specifications were changed by local authorities. This has resulted in significant variance in bus specifications among cities, which needs to be addressed with a uniform national version of e-bus specifications for different vehicle and charging technologies.

Cities and states contracting e-bus services may review the learnings from the pan-India review presented in this chapter to incorporate relevant changes into their own procurement practices.

Recommendations to improve FAME II e-bus procurement



FAME-II has put strong emphasis on e-bus promotion by allocating 35% of the scheme outlay to e-buses. While the scheme targeted the induction of 5,595 buses in Phase-I, the uptake, as explained in Chapter 1, has not met the set targets. This is due to the limited appetite amongst states and cities for e-bus adoption, due to their higher costs. There is, therefore, an urgent need to address the issues faced by cities and service providers in order to reduce the costs, improve the ease of implementation, and scale up e-bus deployment in the next round of funding. Based on extensive engagement with stakeholders in the states and cities involved thus far in FAME-II, this study identified the following key measures that could have a positive impact on Phase-II:

3.1 Recommended measures to reduce the cost of e-bus deployment

Across various states and cities, the key concern in implementing e-buses has been their higher cost compared to conventional ICE based fleets. Contrary to the public perception of falling electric vehicle prices, there have been higher costs quoted in FAME II bids than in FAME I bids, due to the lower per-bus subsidy offered by DHI and increased awareness amongst operators on the actual cost of operations. In this context, the following measures have been identified to reduce the cost of bids:

- **Harmonise RfPs and MCAs to improve bankability and encourage competition:** It is understood that operating conditions vary across different cities and states, resulting in different technical and functional requirements for e-buses in different regions. However, as explained in Chapter 2, there are many other RfP and MCA terms and conditions that can be tweaked without adversely impacting the project quality or region-specific e-bus deployment. Harmonising these items will ensure a greater level of consistency in procurement, thereby encouraging more bidders per tender and reducing the bid costs through increased competition. At the same time, consistency in terms across cities will improve the perceived bankability of the projects, leading to a reduction in financing costs and, hence, the cost quoted by bidders. We recommend active collaboration between DHI and various STUs to standardise various terms in a mutually beneficial manner.

- **Reduce risk of OPEX contracts:** Our analysis of FAME II bids revealed significant variation in prices quoted in different cities, even for tenders with the same vehicle specifications. This is primarily due to different risk premiums being factored in by bidders in different cities, which can sometimes comprise up to 30% of the actual cost of service provision. The reason for such high risk premiums is the perceived inability of the state/city to make timely payments, along with the lack of long-term bankability of the contract. DHI needs to urgently address this to ensure the sustainability of all FAME II contracts. To this end, the following measures should be implemented:

    - **Establish loan guarantee mechanism:** A national or state level guarantee mechanism for the loans taken out by service providers for their fleet procurement and infrastructure development investments will improve the bankability of the project.

    - **Reduce bank guarantee requirements for operators:** The performance security/bank guarantee specified for service providers is currently fixed for the entire contract tenure, while the cost of the assets depreciates every year. In some cases, the performance bank guarantee is required in addition to the subsidy guarantee for the contract duration. Hence, an annual reduction in the performance security that is consistent with the asset depreciation rate can help reduce financing costs for operators.

    - Furthermore, cities can merge the required subsidy and performance bank guarantees and thus reduce the overall financing needs of service providers for the guarantees, without adversely impacting the sustainability of the project.

- **Improve predictability of payments to operators:** Two key measures need to be taken to ensure return on investment for operators:
    - **Guarantee mechanism for timely payments:** While most cities are establishing escrow accounts as recommended in the NITI-MCA, the timeliness of payments is yet to be proven and is not always guaranteed in the city MCAs. Therefore, any additional guarantee mechanism for payment will help build investor confidence. For example, a performance bank guarantee or Letter of Credit (LC) mechanism can be undertaken by the contracting authorities.
    - **Cap on penalties for non-adherence to SLAs:** Gross-Cost Contracts usually have penalty mechanisms for non-adherence to SLAs concerning service delivery, such as vehicle availability, punctuality, and cleanliness. These are typically capped at 10% of the payment to assure a minimum of 90% payment to service providers. However, some FAME II tenders do not have a cap on these penalties, thereby increasing the revenue risk for the service providers. This penalty risk is built into the quoted cost of operations, leading to an overall increase in costs. In order to address this, SLA based penalty percentages or a cap on penalty percentages should be defined.
    - **Payment for assured-km of operation:** Many cities have included provisions for deducting a portion of the payment for assured-km of service if service providers are unable to complete the committed assured-km. This undermines the objective of mentioning assured-km in the contract and increases the risk of underpayment to service providers. Hence, it is recommended that cities strictly adhere to assured-km of payment and limit deductions for underutilised-km, thereby making the contracts more transparent for all stakeholders. The cities can be asked to justify the reasoning behind their assured-km calculations, based on their current state of operations, and, where possible, they should not deduct payments for underutilised-km when the reduced service is due to reasons beyond the control of the service provider.
- **Provision of civil and electrical infrastructure:** The NITI-MCA places the obligation for the development of depots and other supporting infrastructure with the contracting authority. This requires the authority to establish the necessary civil and electrical infrastructure for bus maintenance, charging, and operations management, as explained in the **'Bus Depot Design Guidelines'**. In some cases, authorities have transferred these responsibilities to the service providers, either due to a lack of existing infrastructure or in order to benefit from the private service providers' relatively faster pace of execution, which significantly increases the per-km cost of the bids. Hence, it is recommended that authorities ensure the installation and operational readiness of civil and electrical infrastructure before the start of the contract.

3.2 Recommended measures to improve readiness of states and cities for e-bus deployment

Given that e-buses are still in their nascent stage of deployment, many states and cities are underprepared to ensure their successful implementation. The following actions are recommended to improve their readiness for implementation:

- **Provide technical support to selected cities in project planning ahead of the tender:** It is recommended that cities identify the depots and routes of operation for the proposed e-bus deployment upfront, so that both the contracting authority and service providers are clear on the likely costs involved in fleet deployment, infrastructure development, and expected operational conditions. The lack of such an implementation plan can lead to the associated uncertainty and risk being built into the cost of the contract. e-bus deployment planning requires specialised skillsets to factor in items such as charging time and location, depot layout planning, revised scheduling to meet battery range constraints, etc. Many cities lack the technical expertise for such planning and would benefit from technical support from DHI and other organisations. UITP has developed a framework for depot and route selection that has been used by Bengaluru Metropolitan Transport Corporation (BMTC) and can be built upon and provided as guidance to other cities.

- **Evaluate cities' readiness during the city selection phase:** The first round of e-bus funding under FAME-II saw many cities tendering out only 50 buses each or even fewer, in some cases. Many of these cities (e.g. Madurai, Kakinada, Solapur, & Ujjain) are not ready for e-bus deployment, due to issues such as lack of supporting infrastructure and limited experience with city bus service provision. In such cases, the additional cost of power and depot infrastructure development can become a significant barrier to successful implementation of the contract, thus threatening its viability. It is recommended that DHI evaluate cities based on their readiness before sanctioning e-buses. Key criteria in such an evaluation could include prior experience in e-bus deployment/operations and bus operations under the GCC model, financial commitments to e-bus deployment beyond the subsidy scheme, etc.

- **Extend tendering and contracting timelines:** One of the key constraints faced by cities in e-bus planning and procurement has been the short timelines allowed by DHI. This includes the time given to cities to submit the EoI to qualify for the subsidy, as well as time to complete the tendering and contracting process. As a result, cities did not have sufficient time to plan their deployment strategies and have adequate consultations with the industry and electricity distribution companies (DISCOMs). This led to multiple rounds of extensions and cancellations of tenders and re-tendering, ultimately leading to further delays in e-bus procurement. It is therefore recommended to have more lenient timelines in the next round to improve city preparedness.

- **Focus on select cities with sufficient capacity for implementation:** Concentrating the e-bus subsidy programme in a few cities is likely to help e-bus deployment achieve economies of scale, rather than dividing implementation into small parcels across many cities. This will ensure that cities with the necessary technical and financial capacity to create the upfront infrastructure and ensure the sustainability of operations are selected. Therefore, we recommend that DHI focus on a limited set of states/ cities in Phase-II. DHI should consider developing model cities with large-scale e-bus implementation and giving other cities the opportunity to learn from their experiences.

- **Improve the operator ecosystem:** India has a limited number of private operators who have the capacity to bid for FAME II supported tenders and implement a technology- and financing-intensive exercise such as e-buses. This is resulting in OEMs with limited operational expertise leading many bids, which may not be the most sustainable operating model to scale up e-bus deployment. It is recommended that DHI, in partnership with the cities and states, make efforts to attract more operators through more favourable terms for them.

- **Create a pool of pre-qualified service providers:** The variations in service provider eligibility criteria, which led to the inadvertent disqualification of some bidders, need to be avoided by creating a pan-India pool of empanelled qualified service providers under the FAME II scheme.

3.3 Exploring alternative procurement and incentive models

STUs are accustomed to the outright purchase procurement model and in-house ICE bus operations. FAME-II presented the challenge of transitioning to an outsourced form of operations, along with the technology transition to e-buses. This led to some states with strong STUs not showing great enthusiasm for FAME-II. The following measures can be taken to help address their concerns:

- **Allowing CAPEX based funding for STUs:** Many STUs prefer outright purchase of e-buses and charging infrastructure, as purchasing buses gives them more flexibility in operations compared to GCC operations, which involve regular negotiation with operators, even on changes in service plans. In the current OPEX based model, substantial time and effort is spent on managing the GCC, which reduces the focus on technical and operational issues associated with the implementation of e-buses and their supporting infrastructure. At the same time, the poor financial health of some STUs is leading to service providers factoring their revenue risks into the quoted costs, thereby increasing the overall project cost. Hence, the **CAPEX procurement model could also be considered in the next round of the FAME II subsidy** for e-buses. However, adequate technology risk mitigation measures, such as vehicle and battery warranties, adequate maintenance support from OEMs, etc., need to be built into such contracts to ensure their long-term sustainability.

- **Ensuring states' and cities' commitment to provision of consistent Viability Gap Funding (VGF) to bus agencies:** Successful execution of a GCC contract over its entire lifecycle requires timely payments from the authority to the operators. However, the poor financial health of Indian bus agencies, coupled with the higher cost of e-buses, results in their lack of financial capacity to pay the operators in a timely manner. Therefore, DHI should mandate that states and cities commit to consistent VGF for e-buses as a prerequisite to receiving the CAPEX subsidy offered by the GoI. This will ensure the sustainability of the project and de-risk the contract for operators and their financiers.

- **Allowing private bus operators to avail of FAME II funding:** Private bus operators providing premium services, given their higher rate of returns, are more likely than urban government bus agencies to implement e-buses, even if they cost more. Therefore, allowing them to avail of

FAME II funding can potentially unlock a bigger e-bus market compared to the current govt. only funding. Adequate measures to ensure public access to the infrastructure developed by these private operators can be built into the funding mechanism.

- **Recognising the crucial role of DISCOMs:** DISCOMs are a key stakeholder in e-bus implementation, as they need to provide the necessary power infrastructure for charging and ensure high-quality power supply during operations. However, they have not been adequately engaged in the e-bus implementation efforts thus far. It is recommended that part of FAME II charging infrastructure funding be allocated to the development of supporting power infrastructure for buses.

3.4 Performance monitoring and evaluation

DHI has already created the necessary ecosystem for a national e-bus performance evaluation framework by mandating that all STUs and cities receiving the FAME II subsidy create an online platform for performance monitoring. However, there is a lack of guidance from DHI on the specific performance monitoring and evaluation methods to be adopted. UITP has prepared a framework for e-bus performance monitoring and evaluation, building upon the current performance monitoring practices for ICE buses. This framework can help cities improve their operational strategies and will give DHI a guidance framework for tracking the performance of e-buses deployed under FAME-II. These performance indicators need to be included in the tendering stage and built into the contract, to ensure data collection and sharing at a later stage. When adopted by cities and DHI, the framework will facilitate performance monitoring of the deployed e-buses, and both actors can use the learnings to inform future procurement, financial incentives, and business models. These indicators will also aid cities in learning about and scaling up e-bus operations.

3.5 Concluding remarks

This study involved a comprehensive review of e-bus procurement undertaken under FAME-II, quantifying the variation in costs and identifying the procurement specifications that lead to such variations. These findings were used to develop specific pragmatic recommendations to improve future rounds of procurement by reducing the cost of e-buses, in order to accelerate their adoption in cities. eElectric mobility involves rapidly evolving technology, and it is always a continuous learning process to identify the best technology, procurement, and financing strategies for a given context. However, certain issues, such as efficient planning, reliable contracting, and performance monitoring, are key to the success of any bus system and will consequently need to be adopted by agencies covered under FAME-II as well. We would like to reiterate our commitment to scaling up e-buses in India in order to improve the nation's energy efficiency and emissions performance and our keenness to continue partnering with DHI, authorities, and operators to ensure the success of the FAME II scheme and the rapid scale-up of e-buses across India.

Annexure 1: FAME-II e-bus tender procurement specifications

Table 1, Page 1½

City	Mumbai	Bangalore	Ahmedabad	Surat	Rajkot	Goa (Intercity)	Navi Mumbai	Nagpur	Patna	Bhopal (B)/Indore(I)	Jabalpur(J)/ Ujjain(U)	Gwalior
Buses tendered (by length)	200(9m) 140(12m)	300 (12 m)	300 (9m)	150 (9m)	50 (9m)	50 (12m)	30 (9m) 70 (12m)	40 (9m)	15 (9m) 10 (12m)	B=100 (9m&12m) I=100 (9m&12m)	J=50 (9m&12m) U=50 (9m&12m)	40 (9m)
Contracted rate per km (INR)	9m- 74.0 12m- 83.0	NA	54.9	55.26	53.91	78.87	9m- 52.2 12m- 69.9	NA	79.83	B= 64.8 I= 63.9	J= 67.23 U= 68.4	69.96
Contract duration (years)	10	10	10	10	10	10	12	10	7	10	10	10
Assured-km/ month	9m: 4,200 12m: 4,750	6,560	5,850	5,850	5,850	6,700	9m: 5,700 12m: 6,600	5,700	6,000	6,100	6,100	6,100
Time given for bid submission (days)	14	9	9	28	25	9	36	42	6	28/ 30	19	16
Floor height (mm)	400/650/900	400	900±10	900 ± 10	900 ± 10	900	9m: 400-900 12m: 400	650-900	not mentioned	900	900	900
Bus length	9m, 12m	12m	9m	9m	9m	12m	9m, 12m	9m	9m, 12m	9m, 12m	9m, 12m	9m
Air-Conditioning?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Passenger capacity (D= Driver, W=Wheel chair)	9m: Seats = 24+W+D 12m: Seats = 35+W+D	Total= 42 Seats= 29+D+W	Total= 42 Seats= (24-27)+D+W	Total= 42 Seats= (24-27)+D+W	Total= 42 Seats= (24-27)+D+W	Not mentioned	9m: Seats 25+D 12m: Seats 30+D	Total= 40 Seats= 25+D+W	Seats = 40+ D	9m: Total 42, Seats= 31+D 12m: Total 60, Seats= 35+W+D	9m: Total 42, Seats= 31+D 12m: Total 60, Seats= 35+W+D	9m: Total 42, Seats= 27+D+W
Time for charging (Overnight/ specific duration mentioned?)	Overnight	Overnight/ Charging time < 4 hours.	Overnight	Overnight	Overnight	Not mentioned	Overnight	Overnight	Overnight	Overnight	Overnight	Overnight
Vehicle range on single charge (km)	120	225	220	220	220	225	240	160-200	150	9m: 240 12m: 225	9m: 240 12m: 225	200
Battery capacity	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned
Energy consumption up to which STU will pay, if any? (KWH/km)	Not mentioned	≤ 1.4	Not mentioned	1	1	Not mentioned	Not mentioned	Not mentioned	9m: 0.8-0.95 12m: 1.4-1.5	Not mentioned	Not mentioned	Not mentioned
Opportunity charging (Time allowed in minutes)	30	Not mentioned	75	75	75	Not mentioned	Not mentioned	Not mentioned	75	30	30	30
Number of depots	5	3	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	1	Not mentioned	Not mentioned	1
Rate Quote with or w/o electricity?	with electricity	w/o electricity	with electricity	with electricity	with electricity	with electricity	with electricity	with electricity	with electricity	with electricity	with electricity	with electricity
Minimum payment (Tm: Assured monthly bus-km X No. Of buses operated Ta: Actual bus-km operated by all Buses R: Rates applicable)	Total payment = Ta x R + 0.50 x (Tm – Ta) x R	Total payment = Ta x R + 0.70 x (Tm – Ta) x R	(Payment made for bus km operated) +(Annual assured payment amount for unutilised km= (0.50 x (Tm – Ta) x R)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (0.50 x (Tm – Ta) x R)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (0.50 x (Tm – Ta) x R)	Not mentioned	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (0.75 x (Tm – Ta) xR)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (0.75 x (Tm – Ta) x R)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (0.75 x (Tm – Ta) xR)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (0.40 x (Tm – Ta) xR)
Payment for additional km	Total payment = Tm x R + 0.70 x (Ta – Tm) x R	Total payment = Tm x R + 0.85 x (Ta – 1.1*Tm) x R	Total payment = Tm x R + 0.50 x (Ta – Tm) x R	Total payment = Tm x R + 0.50 x (Ta – Tm) x R	Total payment = Tm x R + 0.50 x (Ta – Tm) x R	Not mentioned	Total payment = Tm x R + 0.75 x (Ta – Tm) x R	Total payment = Tm x R + 0.75 x (Ta – Tm) x R	Not mentioned	Total payment = Tm x R + 0.75 x (Ta – Tm) x R	Total payment = Tm x R + 0.75 x (Ta – Tm) x R	Total payment = Tm x R + 0.60 x (Ta – Tm) x R
Deduction for under-utilised fleet	Same as minimum payment.	Minimum Fleet availability= 95%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Minimum Fleet availability = 94%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Minimum Fleet availability = 94%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Minimum Fleet availability = 94%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Not mentioned	Not mentioned	Minimum Fleet availability = 95%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Not mentioned	Minimum Fleet availability = 96%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Minimum Fleet availability = 96%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Minimum Fleet availability = 96%: Same as minimum payment otherwise payment will be restricted to actual fleet available

Electric Bus Procurement under FAME-II: Lessons Learnt and Recommendations for Phase-II

City	Mumbai	Bangalore	Ahmedabad	Surat	Rajkot	Goa (Intercity)	Navi Mumbai	Nagpur	Patna	Bhopal (B)/Indore(I)	Jabalpur(J)/ Ujjain(U)	Gwalior
Escalation mechanism for payment (PK= Per km rate provided in the Letter of Award issued to the Operator/Successful Bidder Monthly CPI= Consumer price index for particular month when price variation is applicable Base CPI= Consumer price index of bid end date Monthly MW= Minimum wages for skilled category at particular month Base MW= Minimum wages at the time of bid end date Ref. ET: Reference electricity tariff applicable for charging of electric buses as on the date of submission of statement Base ET: Base Electricity tariff applicable for charging of electric buses 7 days prior to last date of Bid submission Ref. CPI-IW: Reference consumer price index for industrial worker 15 days prior to revision date Base CPI-IW: Base consumer price index for industrial worker 15 days prior to bid due date Ref. WPI= Reference wholesale price index 15 days prior to revision date Base WPI= Base wholesale price index 15 days prior to bid due date	Revised rate= PK + (Change in electricity rate/0.90)+PK*((Monthly CPI-Base CPI)/Base CPI))*0.05+PK*(((Monthly MW-Base MW)/Base MW)*0.15	First 2 years= Nil, 3rd year onwards= 1% of basic quoted rate	Revised rate = PK * {1 + [(10% * (Ref. ET –Base ET)/ Base ET) + (10% * (Ref. CPI-IW –Base CPI-IW / Base CPI-IW) + (30% *(40% *(Ref. WPI –Base WPI / Base WPI)))]}	Revised rate = PK * [1 + (20% * (Ref. CPI-IW –Base CPI-IW / Base CPI-IW))+ (30% *(40% * (Ref. WPI –Base WPI / Base WPI)))]	Revised rate = PK * [1 + (20% * (Ref. CPI-IW –Base CPI-IW / Base CPI-IW))+ (30% *(40% *(Ref. WPI –Base WPI / Base WPI)))]	Not mentioned	(a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref.CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref.WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref.CPI IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref.WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]	Revised rate = PK * [1 + (20% * (Ref. CPI-IW –Base CPI-IW / Base CPI-IW))+ (30% *(40% * (Ref.WPI –Base WPI / Base WPI)))	(a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref.CPI IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]	Revised rate = PK*[1 + [45%*((Ref.ET – Base ET)/Base ET)) + [1.2 * 35% *((Ref. WPI– Base WPI)/Base WPI))	Revised rate = PK*[1 + [45%*((Ref.ET – Base ET)/Base ET)) + [1.2 * 35% *((Ref.WPI– Base WPI)/Base WPI))	Revised rate = PK*[1 + [45%*((Ref.ET – Base ET)/Base ET)) + [1.2 * 35% *((Ref. WPI– Base WPI)/ Base WPI))
Maximum penalty due to SLA non-adherence	Not mentioned	5% of the project cost	1% of the performance security	1% of the performance security	1% of the performance security	Not mentioned	0.1% of the performance security	10% of the project cost	0.1% of the performance security	Not mentioned	Not mentioned	5% of monthly invoice
Payment cycle (15/ 30/ 45/ 60 days)	30 days	30 days	15 days	15 days	15 days	Not mentioned	15 days	15 days	15 days	15 days	15 days	15 days
Annual escalation of electricity charges (Yes/No)	Yes	No	Yes	Yes	Yes	Not mentioned	Yes	Yes	Yes	Yes	Yes	Yes
Electricity payment (Authority/Operator)	Operator	Authority	Operator	Authority	Authority	Not mentioned	Authority	Authority	Authority	Operator	Operator	Operator
Performance Bank Guarantee (PBG) amount	50,000/bus	50,000/bus	3% of total project cost	3% of total project cost	3% of total project cost	INR 1,00,000/ bus	INR 50,000/bus	3% of total project cost	3% of total project cost	5% of total project cost	5% of total project cost	3% of total project cost
PBG validity (same for the entire duration or changes over time?)	Full contract period plus 365 days (same)	Full contract (same)	Full contract period plus 120 days (same)	Full contract period plus 60 days (same)	Full contract period plus 60 days (same)	Full contract period plus 180 days (10% reduction per annum)	Full contract period plus 90days (8.33% reduction per annum)	Full contract period plus 180 days (same)	Full contract period plus 120 days (10% reduction per annum)	Full contract period plus 180 days (same)	Full contract period plus 180 days (same)	Full contract period plus 180 days (same)
Bid security deposit (INR)	0.50 crore	4.5 crore	2 crore	1.5 crore	0.65 crore	0.10 crore	0.50 crore	0.30 crore	9m bus: 0.15 crore 12 m bus: 0.10 crore-	0.50 crore	0.25 crore	0.25 crore
Routes specified?	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes

Electric Bus Procurement under FAME-II: Lessons Learnt and Recommendations for Phase-II

Table 2, Page 1½

City	Bhubaneshwar	Jaipur	RSRTC (Rajasthan Intercity)	Dehradun	UKSRTC (Uttarakhand Intercity)	Uttar Pradesh+ (P1/P2/P3/P4)	Kolkata New Town	DTC (Delhi)	DMRC North cluster (Delhi)	DMRC East Cluster (Delhi)	Tamil Nadu: (8 Cities Intercity)*
Buses tendered	50 (9m)	100 (9m)	50 (12m)	08 (9m) 22 (12m)	15 (9m) 35 (12m)	600 (9m) (4 packages)	100(9m) 50(12m)	300 (12m)	50 (9m)	50 (9m)	525 (9m & 12m)*
Contracted rate per km (INR)	60.22	66.5	53.7	66.78	62.1	62.55	86	NA	64.5	64.5	NA
Contract duration (years)	10	10	10	10	10	10	10	12	10	10	16 years
Assured-km/ month	6,600	6,000	18,000	5,400	6,000	5,250	5,000	5,000	4,785	4,785	Vellore=3,125/Salem, Tiruchirappalli, Madurai= 3,750/ Coimbatore, Erode, Tiruppur= 4,100/ Thanjavur= 3,400
Time given for bid submission (days)	25	10	18	13	11	38	9m: 11 12m: 21	23	34	20	27
Floor height (mm)	900	900	1100-1200	400/650	9m: 650 12m: 400	400-900	Not mentioned	400	Not mentioned	Not mentioned	600-900
Bus length	12m	9m	12m	9m, 12m	9m, 12m	9m	9m, 12m	12m	9m	9m	9m, 12m
Air-Conditioning?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not mentioned	Not mentioned	Yes
Passenger capacity (D= Driver, W=Wheel chair, Co.D= Co-driver)	Total= 42 Seats= 31+D	Seats= (30-34)+ D	Seats= 43+D+Co.D	9m: Seats= 26-30 12m: Seats= 40	9m: Total= 35, Seats= 37+D 12m: Total 50, Seats= 35+W+D	Not mentioned	9m: Seats= 30+D 12m: Seats= 40+D	Seats= 35	9m: Seats= 23-34	9m: Seats= 23-34	9m: Total= 52, Seats= 32+D 12m: Total= 70, Seating= 40+D
Time for charging (Overnight/specific duration mentioned?)	Overnight	Overnight	Overnight	Overnight	Overnight	Not mentioned	Overnight	Overnight	Not mentioned	Not mentioned	Overnight
Vehicle range on single charge (km)	260 km	250 km	300 km	9m: 200 km 12m: 200-250 km	9m: 160 km 12m: 200 km	180 km	150 km	140 km	Not mentioned	Not mentioned	Not mentioned
Battery capacity	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned	320-370 kWh
Energy consumption up to which STU will pay, if any? (KWH/km)	≤1.2	1.75	Not mentioned	Not mentioned	Not mentioned	Not mentioned	9m: 0.8-0.95 12m: 1.4-1.5	Not mentioned	Not mentioned	Not mentioned	Not mentioned
Opportunity charging (Time allowed in minutes)	30 minutes	90 minutes	Not mentioned	Not mentioned	Not mentioned	45-60 minutes	Not mentioned	60 minutes	Not mentioned	Not mentioned	120 minutes
Number of depots	Not mentioned	4	9	1	Not mentioned	1/city	5- 9m 3- 12m	3	1	1	4
Rate Quote with or w/o electricity?	with electricity	with electricity	with electricity	with electricity	with electricity	with electricity	with electricity	with electricity	Not mentioned	Not mentioned	with electricity
Minimum payment (Tm: Assured monthly bus-km X No. Of buses operated Ta: Actual bus-km operated by all Buses R: Rates applicable)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (0.35 x (Tm – Ta) x R)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (Tm – Ta) x R)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km= (0.75 x (Tm – Ta) x R)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km)	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km)	Not mentioned	Not mentioned	(Payment made for bus km operated) + (Annual assured payment amount for unutilised km)
Payment of additional km	Total payment = Tm x R + 0.65 x (Ta – Tm) x R	Not mentioned	Total payment = Tm x R + 0.75 x (Ta – Tm) x R	Total payment = Tm x R + 0.30 x (Ta – Tm) x R	Total payment = Tm x R + 0.75 x (Ta – Tm) x R	Total payment = Tm x R + 0.75 x (Ta – Tm) x R	Total payment = Tm x R + 0.30 x (Ta – Tm) x R	Not mentioned	Not mentioned	Not mentioned	Not mentioned
Deduction for under-utilised fleet	Minimum Fleet availability = 100%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Not mentioned	Not mentioned	Minimum Fleet availability = 94%: Same as minimum payment otherwise payment will be restricted to actual fleet available	Not mentioned	Same as minimum payment	Not mentioned	Not mentioned	Not mentioned	Not mentioned	Not mentioned

Electric Bus Procurement under FAME-II: Lessons Learnt and Recommendations for Phase-II

City	Bhubaneshwar	Jaipur	RSRTC (Rajasthan Intercity)	Dehradun	UKSRTC (Uttarakhand Intercity)	Uttar Pradesh+ (P1/P2/P3/P4)	Kolkata New Town	DTC (Delhi)	DMRC North cluster (Delhi)	DMRC East Cluster (Delhi)	Tamil Nadu: (8 Cities Intercity)*
Escalation mechanism for payment (PK= Per km rate provided in the Letter of Award issued to the Operator/Successful Bidder Ref. ET: Reference electricity tariff applicable for charging of electric buses as on the date of submission of statement Base ET: Base Electricity tariff applicable for charging of electric buses 7 days prior to last date of Bid submission Ref. CPI-IW: Reference consumer price index for industrial worker 15 days prior to revision date Base CPI-IW: Base consumer price index for industrial worker 15 days prior to bid due date Ref. WPI= Reference wholesale price index 15 days prior to revision date Base WPI= Base wholesale price index 15 days prior to bid due date	(a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]	(a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref. CPI- IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref. CPI- IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]	(a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]	Revised rate = PK*[1+ (15%*((Ref. WPI – Base WPI)/W-base)) +(15%* x{(Ref. CPI-IW – Base CPI-IW)/ Base CPI-IW)]	((a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]	Revised rate=PK{1+[.25*((Ref. CPI-IW –Base CPI-IW)/Base CPI-IW))+.15*((Ref. ET-Base ET)/Base ET))+(.15*(Ref. WPI –Base WPI)/Base WPI)*.4*.45)]}	(a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]	(a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]	Not mentioned	Not mentioned	(a) For the 1st revision after COD: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20% * (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the base index date)/ price per kWh of electricity on the base index date) / 100)] (b) For subsequent revisions: Revised rate = PK * [1 + (20% * (Ref. CPI-IW – Base CPI-IW/ Base CPI-IW)) + (0.60%(40% * (Ref. WPI- Base WPI/ Base WPI)) + (20%* (price per kWh of electricity on the date of submission of the statement - price per kWh of electricity on the preceding fee revision date)/ price per kWh of electricity on the preceding fee revision date) / 100)]
Maximum penalty due to SLA non-adherence.	Not mentioned	0.1% of the performance security	0.1% of the performance security	0.1% of the performance security	0.1% of the performance security	0.1% of the performance security	0.1% of the performance security	0.1% of the performance security subjected to revision (@5% every 2 years	Not mentioned	Not mentioned	0.1 % of the performance security
Payment cycle (15/ 30/ 45/ 60 days)	15 days	15 days	30 days	15 days	15 days	15 days	15 days	15 days	Not mentioned	Not mentioned	15 days
Annual escalation of electricity charges (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not mentioned	Not mentioned	Yes
Electricity payment (Authority/Operator)	Operator	Operator	Authority	Operator	Authority	Operator	Authority	Operator			Operator
Performance Bank Guarantee (PBG) amount	5% of total project cost.	INR 8.75 crore	5% of total project cost.	5% of total project cost.	INR 2,00,000/bus	3% of operational cost/year	3% of total project cost.	3% of operational cost/ year	Not mentioned	Not mentioned	3% of total project cost.
PBG validity (same for the entire duration or changes over time?)	Full contract period plus 180 days (same)	Full contract period plus 120 days (same)	Full contract period plus 180 days (same)	Full contract period (same)	Full contract period plus 180 days(same)	Full contract period + 120 days (increases after 3rd, 5th, 7th & 9th year as PS is linked to operational cost)	Full contract period (10% reduction per annum)	Full contract period (increases as PS is linked to operational cost)	Not mentioned	Not mentioned	Full contract period (same)
Bid security deposit (INR)	0.25 crore	3.5 crore	1.5 crore	0.67 crore	0.50 crore	0.25 crore	9m: 1 crore 12m: 0.50 crore	6 crore	0.50 crore	0.50 crore	0.05 crore
Routes specified?	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes

Electric Bus Procurement under FAME-II: Lessons Learnt and Recommendations for Phase-II

Abbreviations:

NA : Not Available
PS : Performance Security
O&M : Operation & Maintenance
kWh : kilowatt-hour
RSRTC : Rajasthan State Road Transport Corporation
DTC : Delhi Transport Corporation

+Uttar Pradesh

- Package 1 (P1) = Agra + Aligarh =100+25= 125 (9m) buses
- Package 2 (P2) = Bareilly + Ghaziabad + Meerut + Moradabad = 25+50+50+25= 150 (9m) buses
- Package 3 (P3) = Lucknow + Varanasi = 100+50= 150 (9m) buses
- P4-Package 4 = Jhansi + Kanpur + Prayagraj = 25+100+50= 175 (9m) buses

*Coimbatore, Tiruchirappalli, Madurai= 100 buses each; Vellore, Salem, Erode, Tiruppur= 50 buses each; Thanjavur= 25 buses

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