



CASE OF THE JALANDHAR ELECTRIC TRANSPORT UNDERTAKING (JETU)

Leapfrogging to Electric

An Institutional Framework for All-Electric City Transport Undertakings (E-CTUs) in Small and Medium Cities

Sandeep Gandhi · Prabhnoor Singh · Himani Jain · Krishna Khanna · Udit Narayan Mall · Samradh Singh Chauhan

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About this publication. This report sets out an institutional framework for all-electric city transport undertakings (E-CTUs) and its application in Jalandhar as the Jalandhar Electric Transport Undertaking (JETU). It was prepared for Municipal Corporation Jalandhar and is offered to the Government of Punjab as a template for the state's PM-eBus Sewa cities.

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Cover photograph: bus bays at the Jalandhar Inter-State Bus Terminal. Photographs in this publication: SGArchitects. Case-study figures are reproduced from the sources indicated.

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Abbreviations

ACTSL	Amritsar City Transport Services Limited
AJL	Ahmedabad Janmarg Limited
AMC	Ahmedabad Municipal Corporation
AMTS	Ahmedabad Municipal Transport Service
ASCDCL	Aurangabad Smart City Development Corporation Limited
AUDA	Ahmedabad Urban Development Authority
BDA	Bhubaneswar Development Authority
BEST	Brihanmumbai Electric Supply and Transport
BMC	Bhubaneswar Municipal Corporation
BMS	battery management system
BRT(S)	bus rapid transit (system)
CA	chartered accountant
CCBSS	Chandigarh City Bus Service Society
CEEW	Council on Energy, Environment and Water
CEO	Chief Executive Officer
CESL	Convergence Energy Services Limited
CFO	Chief Financial Officer
CIRT	Central Institute of Road Transport
CMD	Chairman-cum-Managing Director
CNG	compressed natural gas
COO	Chief Operating Officer
CPO	charging point operator
CRUT	Capital Region Urban Transport
CS	Company Secretary
CTU	city transport undertaking (also Chandigarh Transport Undertaking)
DIMTS	Delhi Integrated Multi-Modal Transit System Limited
DISCOM	electricity distribution company
DTC	Delhi Transport Corporation
DTS	Dream Team Sahara
E-CTU	electric (all-electric) city transport undertaking
e-IPT	electric intermediate public transport
ETM	electronic ticketing machine
F&A	finance and accounts
FAME	Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles
GCC	Gross Cost Contract
GM	General Manager
GNCTD	Government of the National Capital Territory of Delhi
GoUP	Government of Uttar Pradesh
HR	human resources
ICE	internal combustion engine
IDFC	Infrastructure Development Finance Company
IPT	intermediate public transport

ISBT	Inter-State Bus Terminal
IT	information technology
ITMS	intelligent transport management system
ITS	intelligent transport systems
JETU	Jalandhar Electric Transport Undertaking
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LCBSL	Ludhiana City Bus Services Limited
LCTSL	Lucknow City Transport Services Limited
MCJ	Municipal Corporation Jalandhar
MIS	management information system
MLA	Member of the Legislative Assembly
MoHUA	Ministry of Housing and Urban Affairs
MSEDCL	Maharashtra State Electricity Distribution Company Limited
MSRTC	Maharashtra State Road Transport Corporation
NCC	Net Cost Contract
NMMT	Navi Mumbai Municipal Transport
O&M	operation and maintenance
OEM	original equipment manufacturer
OSRTC	Odisha State Road Transport Corporation
PBMS	Punjab Bus Metro Society
PCMC	Pimpri Chinchwad Municipal Corporation
PIS	passenger information system
PKDA	Puri Konark Development Authority
PMC	Pune Municipal Corporation
PMIDC	Punjab Municipal Infrastructure Development Company
PMPML	Pune Mahanagar Parivahan Mahamandal Limited
PMU	Programme and Monitoring Unit
PPP	public-private partnership
PSCDCL	Pune Smart City Development Corporation Limited
PSPCL	Punjab State Power Corporation Limited
PTA	public transport agency
RAT	revenue assurance team
RCA	revenue collection agency
RTO	Regional Transport Office
SLA	service-level agreement
SOP	standard operating procedure
SPV	special purpose vehicle
UMTA	Unified Metropolitan Transport Authority
UT	union territory
UTT	unified timetable
VGF	viability gap funding

Executive Summary

India's cities are moving rapidly towards the electrification of public transport, supported by national programmes such as FAME-I, FAME-II and PM-eBus Sewa. Yet adoption has been slower and more uneven than intended. A recurring reason is institutional rather than technological: most city transport undertakings (CTUs) were built around diesel and CNG buses owned and operated in-house, and they lack the specialised structure, skills and financing model that electric buses demand.

This report makes the case for a purpose-built, all-electric city transport undertaking (E-CTU) and sets out a detailed institutional and organisational framework for one. An E-CTU is not simply a conventional CTU that happens to run electric buses. Electric fleets differ on four fundamental fronts — fleet procurement, infrastructure development, operations and maintenance — and these differences cascade into the skills, contracts, data systems and governance the organisation needs. Small and medium cities that have no organised bus service today can leapfrog directly to such an all-electric undertaking.

4 fronts Procurement, infrastructure, operations and maintenance set an E-CTU apart from a conventional CTU	24 staff Lean in-house team for a starter fleet of about 100 e-buses (0.24 staff per bus)	8 concessionaires Outsourced functions under a Gross Cost Contract (GCC) wet lease, monitored by a PMU	5 Punjab cities PM-eBus Sewa cities that can set up E-CTUs: Jalandhar, Ludhiana, Amritsar, Patiala and SAS Nagar
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Key findings

- **Procurement.** Because electric buses cost two to three times as much as their ICE equivalents (the battery alone makes up 50–60% of the cost), the traditional ownership model is impractical for most cities. A Gross Cost Contract (GCC) lease model — preferably a wet lease for new undertakings — transfers capital and technology risk to private operators and OEMs, while the public body retains control of service quality, fares and planning.
- **Infrastructure.** Charging infrastructure becomes a fourth core requirement alongside depots, terminals and stops. It reshapes depot size (typically capped at 100–120 buses to avoid costly new substations), location planning and coordination with the power distribution company.
- **Operations.** Electric buses are range-constrained, so route length, scheduling and charging must be planned together. Integrating e-buses with shared electric intermediate public transport (e-IPT) raises infrastructure utilisation and improves the financial case, especially in smaller cities.
- **Maintenance.** Fewer moving parts mean lower maintenance effort per bus, but wholly new skills, standard operating procedures (SOPs) and continuous up-skilling are required for batteries, motors, software and charging assets.

Building on case studies of ten Indian city bus undertakings — including the two Punjab examples, Amritsar and Ludhiana — the report proposes a four-stream institutional framework: an independent Board of Directors, an in-house public-sector management team, private-sector concessionaires for outsourced functions, and a dedicated Programme and Monitoring Unit (PMU)

for data. For a starter fleet of about 100 buses, a lean in-house team of 24 staff is recommended, organised in three departments (Operations and Planning, Administration, and Finance), with eight concessionaires handling outsourced functions.

Jalandhar has taken up this framework as the **Jalandhar Electric Transport Undertaking (JETU)**, the city's new all-electric undertaking for its 97 PM-eBus Sewa e-buses. The same template can be adopted by the Government of Punjab for all five of the state's PM-eBus Sewa cities — Jalandhar, Ludhiana, Amritsar, Patiala and SAS Nagar (Mohali) — with shared state-level support through the Punjab Bus Metro Society (PBMS) and the Punjab Municipal Infrastructure Development Company (PMIDC).

01

Relevance to Jalandhar

Jalandhar is one of Punjab's largest urban centres and an industrial and commercial hub of the Doaba region, with a population of roughly one million. On the population-band logic set out later in this report (Section 3.3), this places it squarely in the segment where a city's public transport backbone is best built on a combination of organised bus services and shared intermediate public transport (IPT), rather than on a metro or on shared autos alone.

1.1 Why an E-CTU fits Jalandhar

- **Limited organised bus service today.** Like many Punjab cities outside the very largest, Jalandhar has historically depended heavily on shared autos and informal IPT for intra-city travel (**Figure 1**). This is precisely the context that this report identifies as most suited to a fresh, all-electric undertaking, because there is little legacy diesel fleet or workforce to unwind.
- **Smaller-fleet economics.** A starter fleet of around 100 e-buses matches the lean, 24-person, GCC wet-lease model proposed here. Jalandhar avoids the heavy upfront capital of bus ownership and instead pays per kilometre, while a private operator and the original equipment manufacturer (OEM) carry the technology risk.
- **Air quality and climate goals.** Jalandhar experiences seasonal air-quality stress, worsened by regional crop-residue burning and vehicular emissions. Replacing diesel and CNG intra-city trips with electric buses and shared e-IPT directly supports municipal clean-air commitments and Punjab's wider electric-mobility objectives.
- **Integration with shared e-IPT.** Given Jalandhar's reliance on autos and e-rickshaws, the recommendation to integrate shared e-IPT into the undertaking is especially valuable. It lets JETU raise the utilisation of its depots and chargers, improve network density and bring informal operators into a regulated, electrified system.



(a) E-rickshaws waiting for passengers



(b) Shared auto-rickshaws at a city stand

Figure 1 Shared intermediate public transport carries much of Jalandhar's intra-city travel today

Source: SGArchitects

1.2 Building on Punjab's institutional experience

Jalandhar does not start from scratch institutionally. Punjab already operates two relevant city bus undertakings examined in this report — the **Amritsar Metro Bus Service** and **Ludhiana City Bus Services Limited (LCBSL)** — both set up as special purpose vehicles (SPVs) under the **Punjab Bus Metro Society (PBMS)**. JETU can be incorporated through the same proven PBMS route, with its chairman drawn from PBMS, inheriting established templates for board structure, tendering and private-operator supervision while adding the electric-specific roles that this report defines.

In short, the E-CTU framework is not an abstract national template for Jalandhar: it maps onto the city's size, travel patterns, environmental priorities and existing Punjab institutions. The rest of this report presents the framework in full (Chapters 2-4), describes how Jalandhar has taken it up as JETU (Chapter 5) and sets out how Punjab can extend it to its other PM-eBus Sewa cities (Chapter 6). The undertaking is referred to as JETU wherever the Jalandhar-specific entity is meant.

02

Context and the Need for an E-CTU

2.1 Context

City bus services have traditionally involved two principal actors: the urban local body or municipal corporation, and a public transport agency (PTA). PTAs fall broadly into city transport undertakings (CTUs), which are wholly owned and controlled by the municipal corporation (for example, the Delhi Transport Corporation), and city bus companies in which the municipal corporation holds equity (for example, DIMTS, a joint venture in Delhi).

These agencies are governed by laws and regulations covering their constitution and functions, and their services have historically been delivered with conventional internal combustion engine (ICE) diesel buses and, to a lesser extent, CNG buses. Operations are typically administered through a hierarchy overseen by a transport sub-committee of the municipal council.

The arrival of electric buses changes this picture. E-buses carry very different operations and management requirements across their life cycle and call for new skill sets at every level of the organisation. While the broad institutional arrangement may look similar, the technical and managerial roles in planning, procurement, management and implementation must be deepened with real knowledge of e-bus technology and its dependencies, such as charging infrastructure and batteries.



(a) Two-wheeler traffic on a city arterial



(b) A signalised junction under a flyover

Figure 2 Jalandhar's streets today are dominated by two-wheelers and private vehicles

Source: SGArchitects

2.2 Challenges and impediments

The transition from ICE to electric buses faces two main obstacles. The first is high capital cost: although e-buses enjoy a strong advantage in operating cost, they cost two to three times as much to buy as ICE buses, with the battery alone accounting for 50–60% of the price. The second is complexity: staff accustomed to diesel fleets must adapt to a new technology, which requires additional training, new equipment and revised procedures.

Under the ownership model used for ICE fleets, a corporation owns and operates its buses. For cash-strapped undertakings, a large upfront investment in electric buses under the same model is very difficult to afford. This is the core financial impediment that the framework is designed to overcome.

2.3 The need for a dedicated E-CTU

Despite successive national subsidy schemes, e-bus deployment has been slower and less effective than hoped. A central reason is the absence of a specialised entity within local government that is equipped to handle e-bus adoption, procurement, operation and management at scale.

The proposed answer is an all-electric city transport undertaking (E-CTU): a dedicated body for planning, operating, monitoring and managing public city mobility services, which also accounts for the charging infrastructure used by the public electric-vehicle fleet. This report presents a uniform institutional framework for such an E-CTU that can be applied across India — and, in this report, applied to Jalandhar as JETU.

03

How an E-CTU Differs from a Conventional CTU

An E-CTU can monitor and manage public transport and intermediate public transport — including private-sector charging — making it a one-stop, zero-emission fleet-monitoring institution for a city. It differs from a conventional ICE-based CTU on four main fronts: fleet procurement, infrastructure development, operations and maintenance. **Table 1** summarises where the two kinds of undertaking are alike and where they differ; the sections that follow explain each front.

Table 1 An E-CTU compared with a conventional (ICE-based) CTU

Aspect	Conventional CTU (ICE buses)	E-CTU (all-electric)	Similar or different
Purpose and ownership	Public body owned by the city or state, providing city bus services	Same public mandate and public ownership; also oversees electric IPT and charging in the city	Similar
Governance	Board or municipal transport committee	Independent board that also includes the electricity utility (DISCOM), transport experts and private-sector (CPO/OEM) members	Different
Fleet acquisition	Usually owned outright, especially by large CTUs	Leased under a Gross Cost Contract (GCC), preferably a wet lease	Different
Infrastructure	Depots/workshops, terminals and bus stops	The same three, plus charging infrastructure planned with the DISCOM; depots capped at about 100–120 buses	Different
Planning and operations	Routes and schedules planned largely independently of the vehicle	Routes, schedules, battery size and charging planned together because of range limits	Different
Fare collection and service control	Retained by the undertaking	Retained by the undertaking (fare collection may be outsourced but stays under its control)	Similar
Maintenance	Engine-centred; high routine effort and spares	Battery, motor, software and charger-centred; lower effort per bus, new SOPs and skills	Different
Workforce	Large in-house workforce of drivers, conductors and mechanics	Lean in-house team (about 0.24 staff per bus) with electrical expertise; drivers and O&M provided by concessionaires	Different
Data and monitoring	Limited, often manual	Continuous BMS, ITS and charging data analysed by a dedicated PMU and control room	Different

Source: Study team (SGArchitects and CEEW)

3.1 Fleet procurement

Battery-electric buses remain a relatively new technology for operators, and most CTUs lack in-house expertise. Battery capacity limits range, and charging infrastructure limits the routes that can be served. Systems such as the battery management system (BMS), fire detection and suppression, and intelligent transport systems (ITS) generate continuous data that need analysis. Because the capacity to manage these buses largely sits with OEMs today, success depends on combining the OEM's technical know-how with a private operator's operating experience.

Given e-buses' high upfront cost but lower total cost of ownership, the ownership model is difficult for most CTUs, so a lease model is preferred. Large metropolitan undertakings (Mumbai, Delhi, Kolkata, Bengaluru, Chennai), which run ICE fleets of 2,000–6,500 buses with strong in-house capacity, remain on ownership models because their ICE economics and institutional memory make this efficient. Smaller CTUs (Bhubaneswar, Ahmedabad, Bhopal) tend to operate as asset-light SPVs that depend on concessionaires under public-private partnerships (PPPs).

IN SHORT

For ICE buses in a regular CTU, the ownership model can be better, especially for larger CTUs; for an all-electric or mostly electric fleet, a lease model works better for an E-CTU.

Among lease models, a Net Cost Contract (NCC) is avoided because it cedes too much control over service quality and passenger safety. A Gross Cost Contract (GCC) is preferred: fare collection, service planning and scheduling stay with the undertaking, while the fleet and its operation and maintenance are provided by the contractor (**Table 2**).

Table 2 Comparison of the GCC, NCC and ownership models

Model	Advantages	Disadvantages
GCC	A few contractors with large fleets are easier to manage and monitor; lower capital requirement, as the contractor invests in the fleet; better public control over service and vehicle quality.	Harder to onboard existing auto-rickshaw drivers or local communities, raising the risk of opposition; the overall viability gap funding (VGF) burden is higher than under an NCC.
NCC	Easier to integrate existing auto-rickshaw drivers and communities, lowering opposition; lower VGF burden than a GCC; lower capital requirement, as operators invest in the fleet.	Difficult to monitor many single-fleet operators; hard to account for and disburse operating-cost support; little control over service and vehicle quality; operators may need loan and subsidy support.
Ownership	Full ownership and control; existing staff jobs are retained; straightforward to tender and award.	Very high upfront cost; significant training costs for operations and maintenance staff; heavy dependence on banking partners to finance bus purchases.

Source: Daliah (2024); Konda (2023); study team analysis

Within a GCC, the concessionaire may comprise more than one partner. Revenue collection, passenger services, planning, monitoring and control stay with the undertaking, while e-bus procurement, maintenance, operations and the management of charging equipment sit with the concessionaire. The benefits to the undertaking are clear:

- it avoids the heavy upfront capital needed to procure e-buses and charging infrastructure;
- it transfers technology risk to the private operators and OEMs best placed to manage it;
- it shares financial and operational risk between the undertaking and private operators; and
- it lets the organisation focus on service delivery and passenger experience with fewer operational staff.

GCC leases come in two forms. Under a *wet lease*, the contractor also provides the crew (drivers, usually excluding conductors) and day-to-day operations; under a *dry lease* (also called a hybrid GCC), these stay with the undertaking. Because e-buses need OEM- or contractor-certified driver training, a wet-lease GCC is preferred for new CTUs or SPVs such as JETU. Where e-buses replace an ageing fleet with an existing crew to absorb, a hybrid GCC may be more appropriate.

Both forms can be strengthened with smarter fiscal incentives. A GCC revenue-sharing model, which gives the concessionaire a share of farebox revenue, aligns incentives towards better service, as seen in Sweden and Germany. Additional revenue streams such as first- and last-mile connectivity, on-demand mobility and electric taxi fleets can further ease operations; Shenzhen Bus Group financed the full electrification of its 6,000-bus fleet partly through such streams. As an E-CTU grows, hybrid procurement — owning a portion of the fleet, financed through municipal or green bonds and global climate funds — becomes feasible, as agencies in Dallas and Atlanta in the United States have demonstrated.

3.2 Infrastructure development

Conventional CTUs need depots and workshops, terminals and stations, and bus stops. E-CTUs add a fourth, defining requirement: charging infrastructure, which is woven into operations and service planning. Infrastructure planning therefore moves in step with operational planning, and the physical layout differs too: larger stations may need opportunity charging between schedules and can double as overnight parking with basic servicing facilities.

Depot location also needs a different approach. E-CTUs and urban local bodies must coordinate with the power distribution company (DISCOM) for the upstream (before-the-meter) electrical infrastructure that charging requires. Because new substations carry heavy cost, land and time implications, E-CTU depots are usually capped at around 100–120 buses to avoid triggering them.

After-the-meter costs matter too: a single DC charger rated above 150 kW can cost upwards of ₹30 lakh. One way to offset this is to raise charger utilisation by opening the infrastructure to other commercial and IPT fleet operators during off-peak depot hours,

which also strengthens the case for integrated public and shared IPT operations. Responsibility for energy costs varies by contract: PMPML and NMMT pay for charging electricity separately, while BEST (itself a power utility) includes it in the operator fee (Dhole, 2022).

The shift in electrical load is dramatic. An ICE-only depot draws roughly 30–50 kW; a single slow e-bus charger needs about 80 kW, a fast charger about 150 kW, and a depot of around 90 e-buses may need up to 4 MW of sanctioned load. E-CTUs may also need to provide land for depots and charging.

3.3 Operations

Unlike ICE buses, e-buses are range-constrained, because the energy density of batteries is far lower than that of diesel or CNG, and recharging takes far longer than refuelling. Route length, terrain, charging locations, terminals, depot siting and daily schedules must all be planned together with bus specifications such as battery size and energy consumption. Route planning and scheduling therefore cannot be independent of the buses and the infrastructure — a defining requirement of an E-CTU.

An analysis of 15 Indian and international cities found that a ratio of 0.7 between daily running (km) and battery capacity (kWh) can be met with overnight charging alone; opportunity charging becomes necessary once the ratio exceeds 0.7. Shenzhen (0.7) needs none, while Berlin, Prague and Vienna (above 1.0) use pantograph opportunity charging. Mumbai (0.61) may not need it; Delhi (0.92) does (Dawra et al., 2023).

Operational planning is also central to financial viability. Small fleets push up the infrastructure cost per bus, which can be mitigated by integrating shared electric transit such as e-autos and e-rickshaws. City size matters: cities above 10 million people lean on mass transit; cities of 1–10 million rely on both buses and shared IPT; and cities below 1 million depend mainly on shared IPT within the city and on buses for regional travel. Integrating e-buses with shared e-IPT therefore makes both financial and operational sense — particularly in smaller cities, the very context that fits Jalandhar.

3.4 Maintenance

E-buses need less maintenance and fewer spares than ICE buses, because batteries, motors and electronics require little routine attention and regenerative braking reduces brake wear. However, heavier battery packs increase tyre wear, charging infrastructure needs regular upkeep, and buses need periodic software updates. The skills, staff numbers and protocols all differ from ICE practice.

Lower effort per bus means fewer maintenance staff per bus, but it demands new staffing models, SOPs and facilities, along with continuous up-skilling as the technology evolves — for drivers, technicians and administrative staff alike. E-CTU maintenance protocols fall into three parts: bus maintenance; the availability and maintenance of critical components (motors and batteries); and charging.

3.5 Ingredients of an E-CTU

The specialised needs of an electric fleet are distinct enough that mixing ICE and electric operations — especially during a transition — creates inefficiencies. A dedicated all-electric undertaking is therefore preferred, particularly in smaller cities with little organised bus service. Its essential ingredients are that it:

1. encourages integrated operation of e-buses and shared e-IPT;
2. works on a lease model;
3. is a dedicated body with expertise in procuring and tendering e-buses and charging infrastructure; and
4. is staffed with up-skilled personnel versed in the relevant maintenance SOPs, protocols and procedures.

04

The E-CTU Institutional Framework

Drawing on the operational practices and case studies reviewed (Annexure A), the framework below is designed for a small E-CTU of about 100 buses on a GCC wet-lease model: public-sector ownership with private-sector involvement in delivery. This is the template proposed for JETU.

4.1 In-house and outsourced functions

Functions are first separated into in-house functions, performed by the undertaking's own staff, and outsourced functions, performed by concessionaires (**Table 3**). Planning, administration and finance are kept in-house; under the wet-lease GCC, conductors are also an in-house responsibility, though they may be engaged through the fare-collection concessionaire. Operation and maintenance, infrastructure management and fare collection are outsourced to private vendors.

Table 3 In-house and outsourced functions of the E-CTU

No.	Function	Responsibility
1	Planning	In-house
2	Routing	In-house
3	Scheduling	In-house
4	Provision of conductors	In-house
5	Bus procurement and contracting	In-house
6	Land for terminals, depots/workshops and charging	In-house
7	Operation and maintenance	Outsourced
8	Provision of drivers	Outsourced
9	Infrastructure (depot, terminal and charging) management	Outsourced
10	Fare collection	Outsourced
11	Support staff	Outsourced
12	Legal advisory and consultancy	Outsourced
13	Programme management and monitoring	Outsourced
14	Advertising	Outsourced

Source: Study team (SGArchitects and CEEW)

4.2 The four work-streams

For clarity, the institutional architecture is built from four work-streams:

1. **Board of Directors** — an independent body;
2. **In-house management** — public sector;
3. **Concessionaires and vendors** — private sector; and
4. **Programme and Monitoring Unit (PMU)** — private sector.

4.3 Board of Directors

The board is proposed to include representatives of the state government, the opposition, the urban local body and the traffic police. Because the undertaking is all-electric, a representative of the electricity board or DISCOM is also included. This member helps the E-CTU plan its infrastructure and route operations better, since the location of stations, terminals and depots, and the operation of routes, depend on the available grid capacity. The board will also include at least two external urban transport specialists as advisers, and two members from the private sector, such as charging point operators (CPOs) and OEMs, who bring up-to-date technical insight and help improve the E-CTU's performance. The proposed board composition is:

1. Principal Secretary (State) or a representative;

2. Member of the Legislative Assembly — Leader of the Opposition;
3. Municipal Commissioner;
4. Commissioner of Police (Traffic);
5. Representative of the electricity board or DISCOM;
6. Urban transport specialists, experts or advisers (two); and
7. Private-sector representatives, such as CPOs and OEMs (two).

4.4 In-house management

Based on the division of functions in **Table 3**, the in-house organisation has three levels: apex, executive and departmental.

Apex level. The E-CTU is proposed to be headed by a Chairman, who shall be a representative of the Punjab Bus Metro Society (PBMS).¹ Under the Chairman is a Chief Executive Officer (CEO), who heads the entity and is a full-time board member.

Executive level. The CEO directs the E-CTU, assisted by three senior executives: a Chief Operating Officer (COO), a Company Secretary (CS) and a Chief Financial Officer (CFO). The COO and CFO are full-time board members reporting to the CEO; the CS is a statutory position responsible for coordinating with the Board of Directors and managing company affairs.

Departmental level. For ease of management, the E-CTU's day-to-day activities are distributed across three departments: (1) Operations and Planning; (2) Administration; and (3) Finance. The COO heads the Operations and Planning and the Administration departments, and the CFO heads the Finance Department.

¹ The Punjab Bus Metro Society (PBMS) promotes public transport in the urban areas of Punjab by formulating policies, programmes, rules and regulations for urban transit. It was registered in May 2013 under the Societies Registration Act, 1860 (Act XXI of 1860) to administer Bus Rapid Transit System (BRTS) projects in the state, with the necessary administrative, financial, legal and technical framework, implementation mechanism and resources, and aims to facilitate the development of infrastructure for public and mass transport.

Operations and Planning Department

The functions of this department are demand assessment, route network planning, operational plans and schedules, service-quality standards and benchmarks, and monitoring and control. It is managed by a General Manager (GM-1), who reports to the COO and is assisted by two managers: a Manager (Operations) and a Manager (Planning) (**Figure 3**).

The Manager (Operations) handles scheduling, control, monitoring and quality control, supported by an Assistant Manager (Operations), a Time Keeper and two Infrastructure Inspectors. The operator, IT and programme-monitoring concessionaires also report to the Manager (Operations). The Manager (Planning) handles traffic matters, supported by an Assistant Manager (Traffic); no other traffic staff are recommended.

The in-house staff of this department form an electrical work-stream at management level: managers and assistant managers must be technically skilled, with adequate knowledge of electric mobility — vehicle charging, vehicle specifications and battery requirements — so that they can plan routes, operations, charging stations and their locations well.

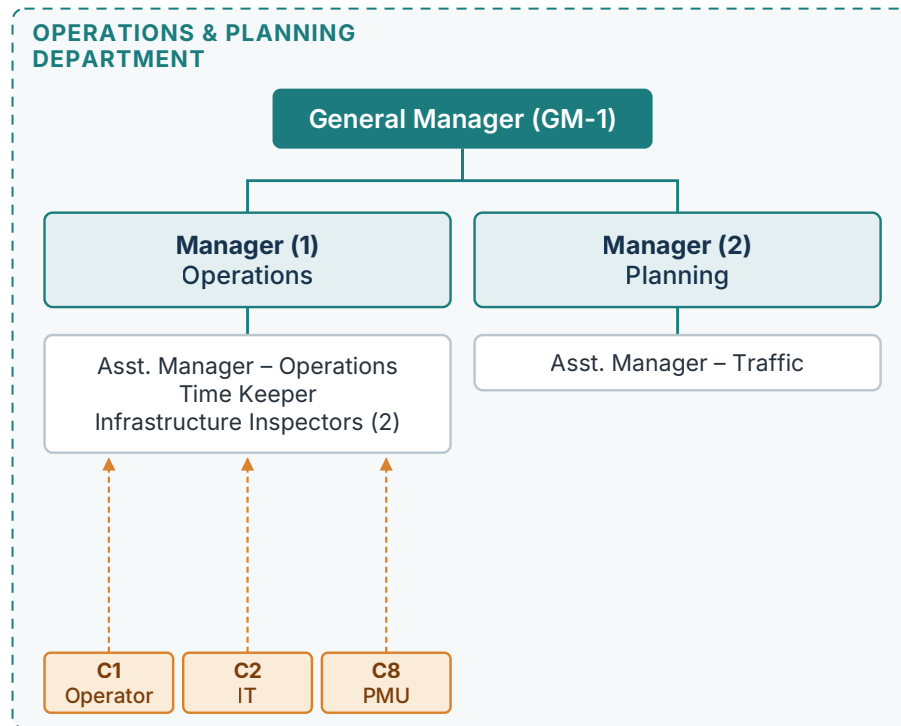


Figure 3 Organisational structure of the Operations and Planning Department
Source: Study team (SGArchitects and CEEW)

Administration Department

The Administration Department is led by a second General Manager (GM-2), who also reports to the COO and is assisted by two managers: a Manager (Human Resources and Development) and a Manager (Administration) (**Figure 4**). The Manager (Administration) manages the administrative affairs of the E-CTU — including grievance handling and the support-staff and legal concessionaires — supported by an Assistant Manager (Administration). The Manager (HR) handles human resources alone, including hiring conductors and building the capacity of in-house staff in electric mobility.

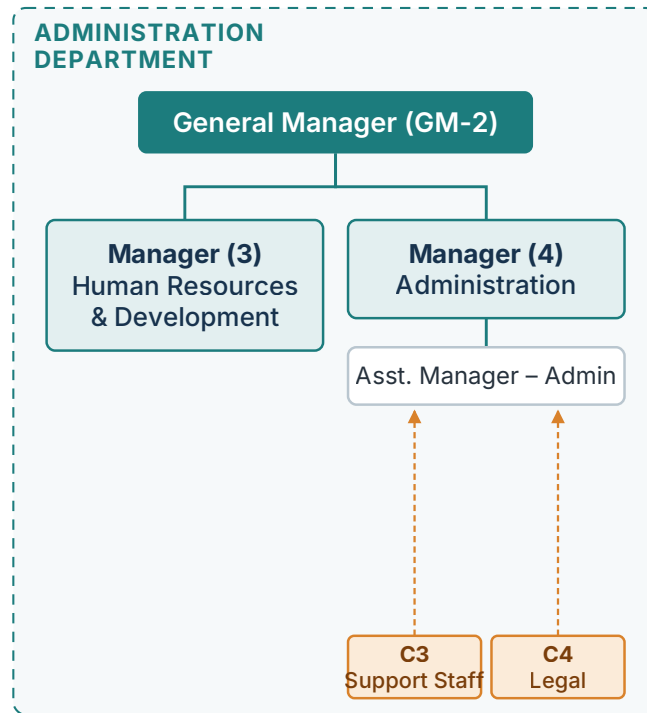


Figure 4 Organisational structure of the Administration Department

Source: Study team (SGArchitects and CEEW)

Finance Department

Financial operations are handled by a separate department administered by a General Manager (GM-3), who reports to the CFO and is supported by two managers: a Manager (Accounts) and a Manager (Procurement and Revenue) (**Figure 5**). The Manager (Procurement and Revenue) oversees fare collection, ticketing and advertising revenue through the assigned concessionaires, supported by an Assistant Manager and two Ticket Inspectors who check fare collection. The Manager (Accounts) handles the salaries of in-house staff and coordinates with the chartered accountant (CA), an outsourced concessionaire, supported by two Accounts Officers.

The finance staff, especially the managers and assistant managers handling procurement and revenue, also form an electrical work-stream. They must be technically skilled, with adequate knowledge of maintenance SOPs, protocols and procedures; the procurement of charging equipment; battery management; and e-bus specifications and spare parts.

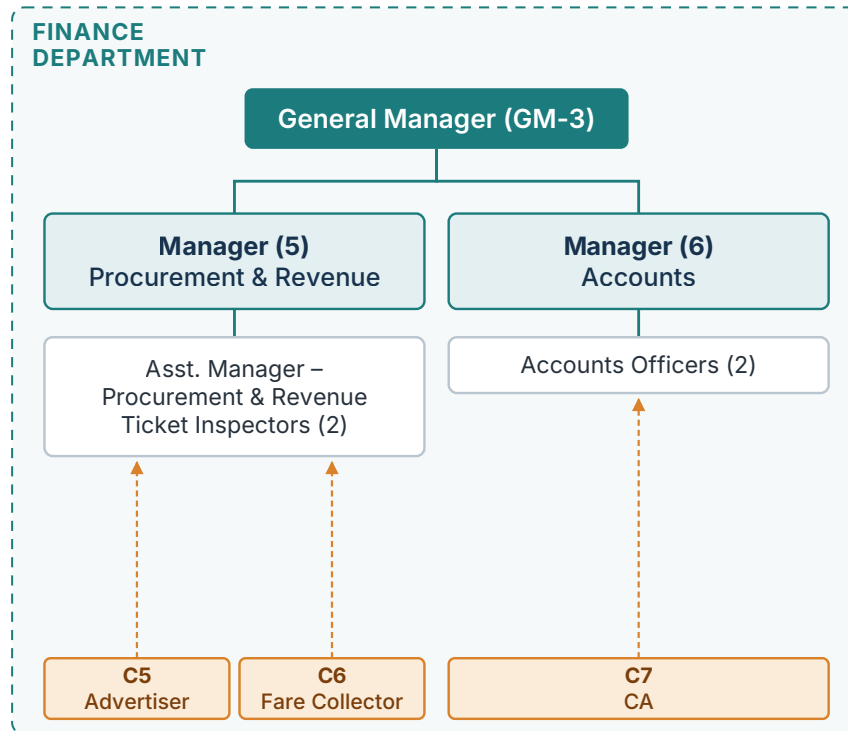


Figure 5 Organisational structure of the Finance Department
Source: Study team (SGArchitects and CEEW)

4.5 Manpower requirement, roles and responsibilities

On this basis, the study team recommends a total in-house strength of **24 staff** to run the E-CTU, a ratio of 0.24 staff per bus for a minimum fleet of 100 buses. **Table 4** lists the in-house positions by level, with their roles, responsibilities and reporting lines. In addition, three contracted vehicles are proposed: one for the CEO, one for the ticket inspectors and one for the E-CTU's internal movements.

Table 4 In-house manpower of the E-CTU: positions, reporting and responsibilities (fleet of about 100 buses)

Position	Reports to	No.	Key roles and responsibilities
Apex and executive level (4)			
Chief Executive Officer (CEO)	Chairman / Board	1	Heads the E-CTU as a full-time board member; directs the organisation, assisted by the COO, CS and CFO
Chief Operating Officer (COO)	CEO	1	Full-time board member; heads the Operations and Planning and the Administration departments
Company Secretary (CS)	CEO	1	Statutory position; coordinates with the Board of Directors and manages company affairs
Chief Financial Officer (CFO)	CEO	1	Full-time board member; heads the Finance Department
Operations and Planning Department (8)			
General Manager (GM-1)	COO	1	Demand assessment, route network planning, operational plans and schedules, service-quality standards, monitoring and control
Manager (1) – Operations	GM-1	1	Scheduling, control, monitoring and quality control; supervises the operator (C1), IT (C2) and PMU (C8) concessionaires
Assistant Manager – Operations	Manager (1)	1	Supports day-to-day scheduling, monitoring and control
Time Keeper	Asst. Manager – Operations	1	Records and checks departures, arrivals and schedule adherence
Infrastructure Inspectors	Asst. Manager – Operations	2	Inspect depots, terminals, stops and charging infrastructure
Manager (2) – Planning	GM-1	1	Traffic and network planning; route and charging-location planning
Assistant Manager – Traffic	Manager (2)	1	Supports traffic and planning activities
Administration Department (4)			
General Manager (GM-2)	COO	1	Heads administration and human resources
Manager (3) – Human Resources and Development	GM-2	1	Human resources, including hiring conductors and building in-house capacity in electric mobility
Manager (4) – Administration	GM-2	1	Administrative affairs and grievance handling; supervises the support-staff (C3) and legal (C4) concessionaires
Assistant Manager – Administration	Manager (4)	1	Supports administration and concessionaire management
Finance Department (8)			
General Manager (GM-3)	CFO	1	Heads financial operations
Manager (5) – Procurement and Revenue	GM-3	1	Fare collection, ticketing and advertising revenue; procurement; supervises the advertiser (C5) and fare-collection (C6) concessionaires
Assistant Manager – Procurement and Revenue	Manager (5)	1	

Position	Reports to	No.	Key roles and responsibilities
			Supports procurement and revenue management
Ticket Inspectors	Asst. Manager – Procurement and Revenue	2	Check fare collection and ticketing on board and at terminals
Manager (6) – Accounts	GM-3	1	Salaries of in-house staff; coordination with the chartered accountant (C7)
Accounts Officers	Manager (6)	2	Accounting support
Total in-house staff		24	Excludes the Chairman (from PBMS) and the Board of Directors

Source: Study team (SGArchitects and CEEW)

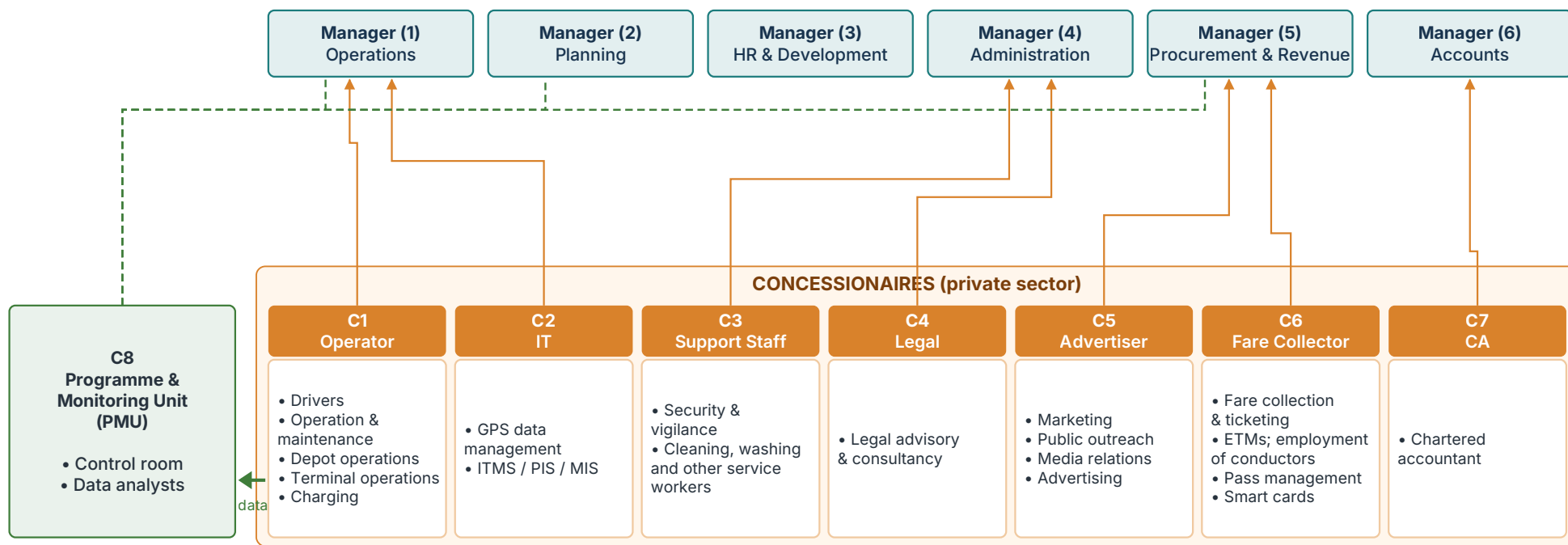
4.6 Concessionaires and the Programme and Monitoring Unit

Eight concessionaires deliver the outsourced functions (**Table 5**). Of these, the programme and monitoring vendor (C8) runs the Programme and Monitoring Unit (PMU), which collects data from the other seven concessionaires, analyses and monitors it, and reports to the concerned managers (**Figure 6**). The PMU is staffed with skilled data analysts with technical knowledge of electrification, and sets up a control room with access to the depots, terminals and charging locations to monitor e-vehicle operations in the city.

Table 5 Concessionaires of the E-CTU and their scope

Code	Concessionaire	Scope of work	Reports to
C1	Operator	Drivers; operation and maintenance; depot and terminal operations; charging	Manager (1) – Operations
C2	IT	GPS data management; ITMS, passenger information system (PIS) and management information system (MIS)	Manager (1) – Operations
C3	Support staff	Security and vigilance; cleaning, washing and other service workers	Manager (4) – Administration
C4	Legal	Legal advisory and consultancy	Manager (4) – Administration
C5	Advertiser	Marketing, public outreach, media relations and advertising	Manager (5) – Procurement and Revenue
C6	Fare collector	Fare collection and ticketing; electronic ticketing machines (ETMs) and employment of conductors; pass management; smart cards	Manager (5) – Procurement and Revenue
C7	Chartered accountant (CA)	Accounts and audit support	Manager (6) – Accounts
C8	Programme and monitoring	PMU control room and data analysts; collects and analyses data from C1–C7	Managers (1), (2) and (5)

Source: Study team (SGArchitects and CEEW)



Solid amber arrows: reporting line of each concessionaire · Dashed green lines: PMU data reporting to managers

Figure 6 Concessionaire management and data-reporting mechanism

Source: Study team (SGArchitects and CEEW)

4.7 The proposed institutional framework

Figure 7 brings these elements together: the hierarchy of in-house staff, the departments that perform the E-CTU's functions, and the reporting links of the concessionaires to those departments.

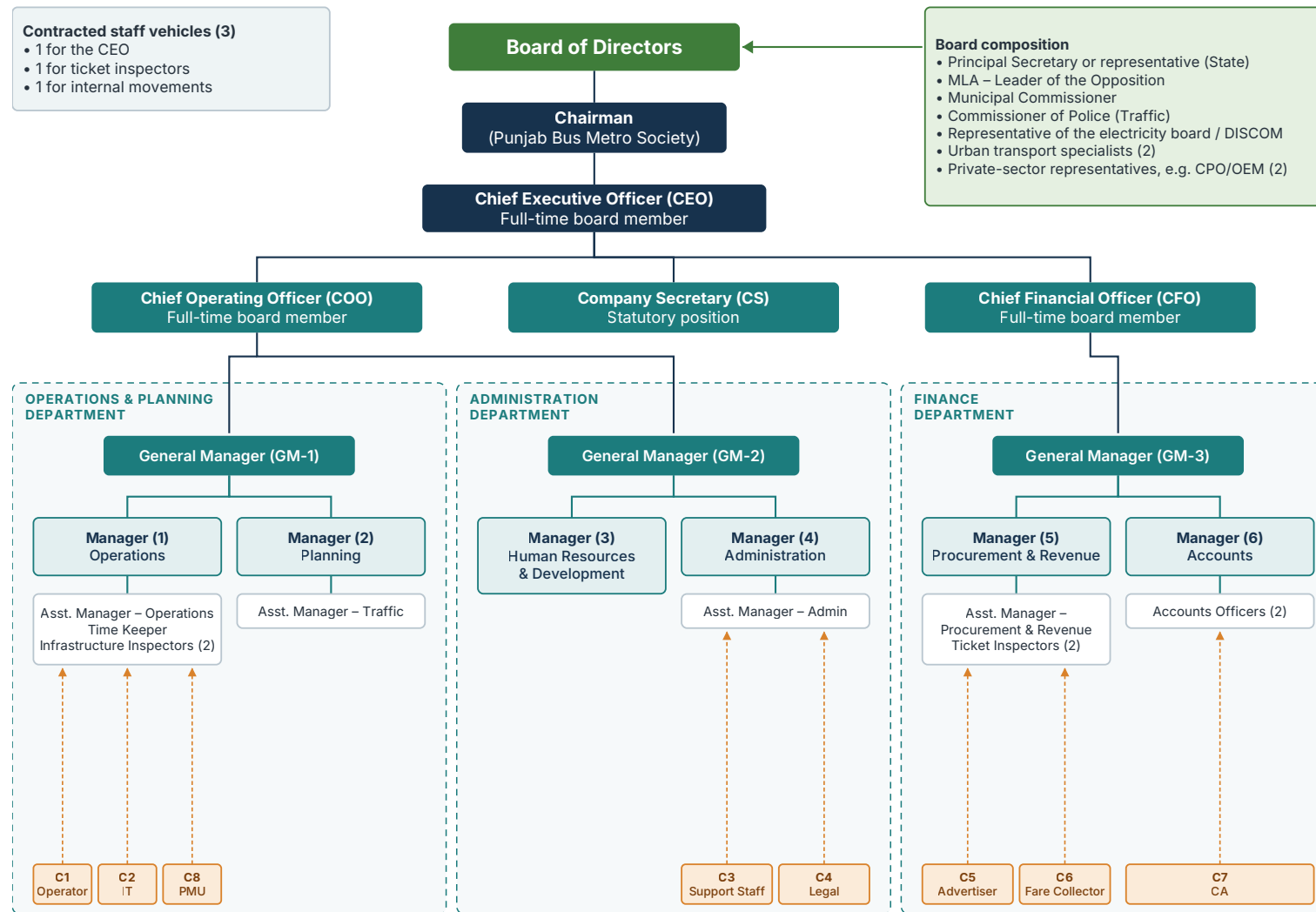


Figure 7 Proposed organisational structure of the E-CTU

Source: Study team (SGArchitects and CEEW)

05

JETU: Jalandhar Adopts the E-CTU

Jalandhar is one of four Punjab cities sanctioned electric buses under the PM-eBus Sewa scheme, with an allocation of 97 e-buses (Babushahi, 2025). Like most cities in the scheme, it is launching an organised, large-scale city bus service for the first time — exactly the situation in which a fresh, all-electric undertaking is most appropriate.

Municipal Corporation Jalandhar took up the E-CTU approach set out in this report and proposed the name **Jalandhar Electric Transport Undertaking (JETU)** for its new, all-electric undertaking. JETU thus becomes the first application of the E-CTU framework in Punjab, and a working model for other small and medium cities.



(a) Signing the Memorandum



(b) Exchange of the signed documents

Figure 8 Signing of a Memorandum of Understanding between Jalandhar Smart City Limited, SGArchitects and CEEW

Source: SGArchitects

5.1 JETU at a glance

Table 6 JETU at a glance

Element	JETU
Undertaking	Jalandhar Electric Transport Undertaking (JETU), an all-electric city transport undertaking
Fleet	97 e-buses under PM-eBus Sewa, with Central assistance for operations on a per-kilometre basis
Contract model	Gross Cost Contract (GCC) wet lease, with tendering aggregated nationally by CESL under the scheme
Institutional route	SPV under the Punjab Bus Metro Society (PBMS), with its Chairman drawn from PBMS
Board	Independent board including a PSPCL (DISCOM) representative, transport specialists and private-sector members
In-house team	24 staff in three departments: Operations and Planning, Administration, and Finance
Outsourced functions	Eight concessionaires (C1–C8), monitored through a PMU and control room
Depots	Two e-bus depots: Lamba Pind Chowk workshop site (about 2.5 acres) and the MCJ site in Central Town (about 1.9 acres)
Terminal	Jalandhar ISBT, with bus bays and opportunity charging for JETU routes
Network	12 proposed routes with a total route length of about 172 km

Source: Municipal Corporation Jalandhar (2024); Babushahi (2025); MoHUA (2023); CEEW and SGArchitects (forthcoming); this report

5.2 Infrastructure under way

Municipal Corporation Jalandhar has identified land for two e-bus depots, prepared civil and electrical estimates for them, and worked with the Punjab State Power Corporation Limited (PSPCL) on the behind-the-meter electrical infrastructure needed for charging (Municipal Corporation Jalandhar, 2024). Construction of depot facilities is in progress (**Figure 9**). Bays at the Jalandhar Inter-State Bus Terminal (ISBT) will serve JETU's buses and host opportunity charging for several routes (**Figure 10**).



Figure 9 E-bus depot facilities under construction in Jalandhar

Source: SGArchitects



(a) Bays used today by regional buses



(b) Open bay area at the terminal

Figure 10 Bus bays at the Jalandhar ISBT that will be used by JETU buses

Source: SGArchitects

5.3 Steps to operationalise JETU

Applying the framework in Chapter 4, the following steps take JETU from decision to operation:

1. **Incorporate JETU** as an SPV under PBMS and notify its board, including a PSPCL representative, two urban transport specialists and two private-sector members.
2. **Appoint the core team** — the CEO, COO, CS and CFO — and then the three departments, building up to the 24 in-house positions in **Table 4**.

3. **Put the concessionaires in place:** the operator (C1) through the GCC wet lease, and the IT, support-staff, legal, advertising, fare-collection, CA and PMU concessionaires (C2-C8) through JETU's own tenders.
4. **Commission the PMU and control room** before services begin, so that operations, charging and fare data are monitored from day one.
5. **Plan the integration of shared e-IPT** with the bus network and open depot charging to IPT fleets in off-peak hours to raise utilisation.
6. **Train staff** in electric-bus operations, battery management and charging SOPs, and keep up-skilling as the technology evolves.

Scaling E-CTUs Across Punjab

The E-CTU framework was developed to be replicable. Punjab is well placed to apply it at once: five of its cities are receiving electric buses under PM-eBus Sewa (**Table 7**), and for most of them this fleet will be the first sizeable organised city bus service. Setting up an E-CTU in each city — on a common template, with shared state-level support — would give every city the dedicated, electrically skilled institution that this report shows e-bus services need.

Table 7 Punjab’s PM-eBus Sewa cities and a suggested E-CTU route for each

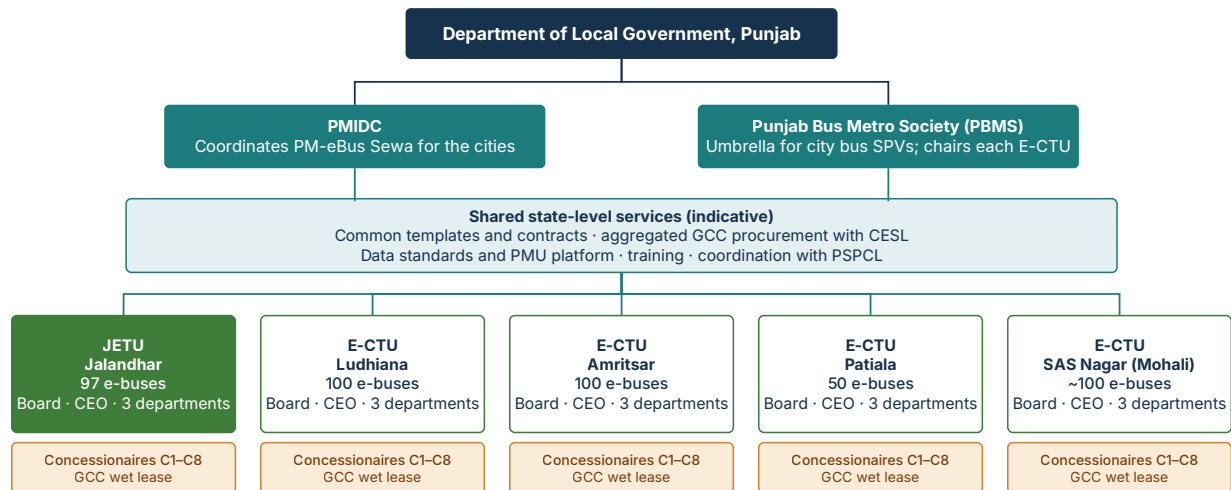
City	E-buses	Existing city bus institution	Suggested E-CTU route (indicative)
Jalandhar	97	None	JETU — new SPV under PBMS (this report)
Ludhiana	100	Ludhiana City Bus Services Limited (LCBSL), an SPV under PBMS	Reconstitute LCBSL as an E-CTU by adding the electric-specific board members, roles and PMU
Amritsar	100	Amritsar City Transport Services Limited (ACTSL), an SPV under PBMS	Reconstitute ACTSL as an E-CTU in the same way
Patiala	50	None	New E-CTU under PBMS, with a leaner in-house team suited to a 50-bus fleet
SAS Nagar (Mohali)	About 100	None	New E-CTU under PBMS for the Mohali cluster

Source: Babushahi (2025); The Tribune (2025); Annexure A; study team analysis

6.1 A pathway for the Government of Punjab

- 1. Adopt the E-CTU framework as the state template.** The Department of Local Government can adopt this report’s framework — the four work-streams, the board composition, the 24-person in-house structure and the eight concessionaires — as the standard model for city bus undertakings in PM-eBus Sewa cities.
- 2. Use PBMS as the common institutional route.** As proposed for JETU, each city’s E-CTU can be an SPV under PBMS, with its Chairman drawn from PBMS. Where SPVs already exist (LCBSL in Ludhiana and ACTSL in Amritsar), they can be reconstituted as E-CTUs rather than duplicated.
- 3. Size each team to its fleet.** The 24-person structure is designed for a fleet of about 100 buses. Smaller fleets such as Patiala’s can combine roles, while growing fleets add capacity mainly through concessionaires rather than in-house staff.

4. **Share what is common.** PMIDC and PBMS can provide state-level services to all five E-CTUs: standard contract and tender documents, coordination with CESL's aggregated procurement, common data standards and a shared PMU platform, joint training programmes and coordination with PSPCL (**Figure 11**).
5. **Give the DISCOM a seat at every table.** A PSPCL representative on each E-CTU board will help align depot and charging plans with grid capacity across the five cities.
6. **Integrate e-IPT from the start.** Each E-CTU can plan for shared e-IPT feeders and open its depot chargers to IPT fleets, improving both ridership and the financial case.



Bus numbers: PM-eBus Sewa allocations as reported (Babushahi, 2025; The Tribune, 2025). JETU is the first city E-CTU.

Figure 11 An indicative state-and-city structure for E-CTUs in Punjab

Source: Study team (SGArchitects and CEEW)

JETU shows that a city can move from the idea of an E-CTU to a named, functioning institution. Extending the model to Ludhiana, Amritsar, Patiala and SAS Nagar would give Punjab a consistent, electric-ready institutional base for the roughly 450 e-buses arriving under PM-eBus Sewa, and for the larger fleets these cities will need in the years ahead.



Annexure A: Case Studies

The framework draws on the institutional arrangements of ten Indian city bus undertakings. The two Punjab cases, which are most relevant to Jalandhar, are summarised first.

A.1 Amritsar Metro Bus Service

The Government of Punjab, through the Punjab Bus Metro Society (PBMS), implemented a Bus Rapid Transit System (BRTS) for Amritsar. PBMS engaged UMTC for the design, approvals, tendering and project management consultancy for the Amritsar Metro Bus Service.

In the institutional arrangement, PBMS was the central body responsible for fast-tracking decisions and financing the project. A Unified Metropolitan Transport Authority (UMTA) was then set up to formulate policies on land use, transport fares and coordination. For execution, operation and maintenance, an SPV — Amritsar City Transport Services Limited (ACTSL) — was formed under the Companies Act, 1956, in December 2006. The board structure of ACTSL is shown in **Table 8**.

Table 8 Board structure of ACTSL

No.	Official (by virtue of post)	Designation
1	Deputy Commissioner, Amritsar	Chairman
2	Senior Superintendent of Police	Member
3	Commissioner, Municipal Corporation Amritsar	CEO
4	District Transport Officer	Member
5	General Manager, Punjab Roadways	Member

ACTSL initially focused on procuring and operating buses funded under JNNURM in 2009 for city operations. As part of the Amritsar Metro Bus Service, the SPV became responsible for:

1. planning, regulation and operational control — network and route planning, service planning and scheduling, service-quality standards, monitoring and control, and the integration of feeder and other transit services with BRT services;

2. data acquisition and processing — contracting services for the acquisition, communication, warehousing and processing of data for planning, monitoring and control;
3. contracting fleet operators for trunk and feeder operations in a transparent manner, and contracting station management and revenue collection (on-board and off-board), with any necessary equipment owned and maintained by the private sector;
4. project planning and management, and coordination of road maintenance;
5. human resource management, legal and company affairs, administration and grievance handling; and
6. supervising financial services, preferably through a separate agency.

The SPV also handled marketing of the BRT, building public awareness and support, selecting technologies and advising the UMTA on fixing and revising tariffs. Operation and maintenance were later to be outsourced to a private entity. The functions of each body are shown in **Table 9** and **Figure 12**.

Table 9 Agencies involved in the Amritsar Metro Bus Service and their functions

No.	Agency	Status	Functions
1	Unified Metropolitan Transport Authority (UMTA)	Existing	Policy (land use, transport fares etc.) and co-ordination
2	Punjab Bus Metro Society (PBMS)	Existing	Central body for fast-track decision-making and financing of BRT projects in the state
3	Amritsar City Transport Services Limited (ACTSL)	Existing	SPV for execution, operation and maintenance of the BRT project
4	Private sector	Proposed	Operation and maintenance of various out-sourced activities

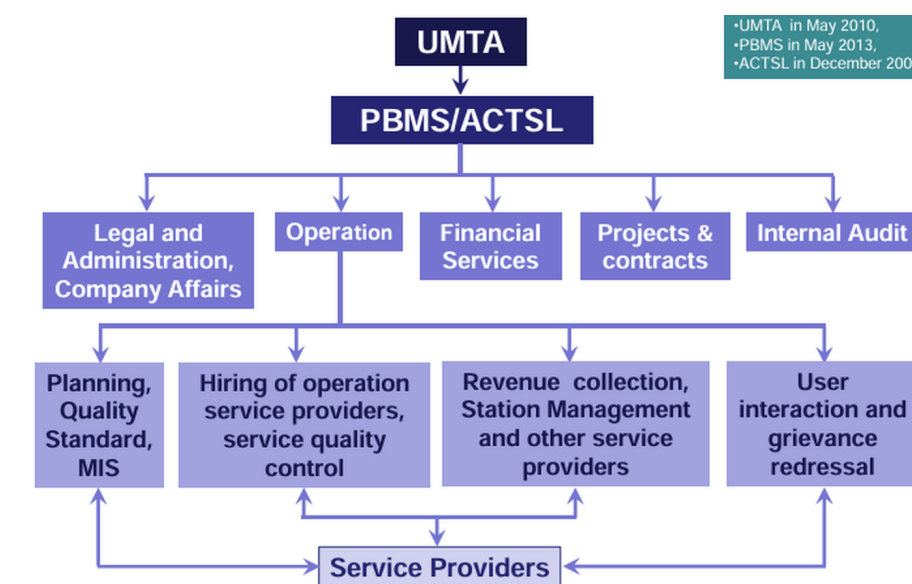


Figure 12 Institutional arrangement of the Amritsar Metro Bus Service (ACTSL)

Source: Punjab Bus Metro Society; study team compilation

A.2 Ludhiana City Bus Services Limited (LCBSL)

Ludhiana City Bus Services Limited (LCBSL) was created to improve urban transport in Ludhiana. It is an unlisted public limited company, incorporated on 15 January 2007 as an SPV under the Companies Act, 1956, under the Punjab Bus Metro Society. Its board structure is shown in **Table 10**.

Table 10 Board structure of LCBSL

No.	Official (by virtue of post)	Designation
1	Deputy Commissioner, Ludhiana	Chairman
2	Senior Superintendent of Police	Member
3	Commissioner, Municipal Corporation Ludhiana	CEO
4	District Transport Officer	Member
5	General Manager, Punjab Roadways	Member

Bus fares, one of LCBSL's key revenue sources, were set by the state government. LCBSL hired a private company to operate and maintain the buses. The Municipal Corporation of Ludhiana provided 83 buses, which ran on only three designated routes. The institutional arrangement in Ludhiana thus consists of an SPV, LCBSL, which supervises the operation and maintenance of buses by a private operator (**Table 11**).

Table 11 Agencies involved in the Ludhiana city bus service and their functions

No.	Agency	Status	Functions
1	Punjab Bus Metro Society (PBMS)	Existing	Central body for fast-track decision-making, financing and revenue (bus fares)
2	Ludhiana City Bus Services Limited (LCBSL)	Existing	SPV supervising the operation and maintenance of 83 buses on three routes
3	Private operator	Existing	Operation and maintenance

A.3 Chandigarh city bus service

City bus operations in Chandigarh are run by the Chandigarh Transport Undertaking (CTU) and the Chandigarh City Bus Service Society (CCBSS) (**Figure 13**). The CTU came into existence in 1966 to provide bus services within the city, its suburban areas and adjoining states.

The CTU functions under the supervision of the Secretary Transport, Chandigarh Administration. The Director Transport carries out day-to-day management, assisted by four General Managers, works managers and other staff. The roles of key officials are listed in **Table 12**. Staffing requirements vary depending on whether services are operated in-house or contracted out.

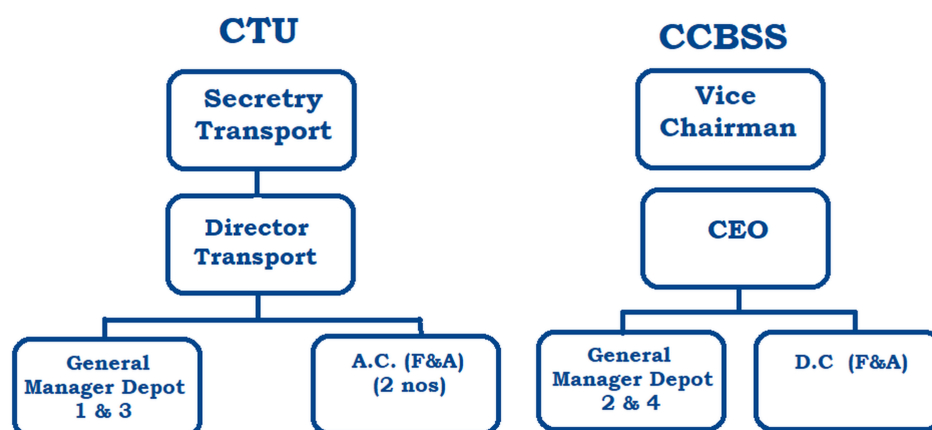


Figure 13 Organisational structure of the Chandigarh city bus service

Source: Chandigarh Transport Undertaking; study team compilation

Table 12 Roles and responsibilities of key CTU and CCBSS officials

Official	Roles and responsibilities
Director Transport, UT Chandigarh / CEO, CCBSS	Head of the department and appointing authority
General Manager / Project Manager	Heads the office for each depot and its attached workshop; submits proposals to the Director Transport on operational matters and performs other duties assigned by the Director Transport
Traffic Manager	Timetables, operation of buses and checking of buses on routes
Assistant Divisional Manager	In charge of workshops; responsible for workshop maintenance and for the repair and fitness of buses before they ply on routes
Duty Inspector	Schedules the duties of the crew (drivers and conductors)
Station Supervisor	Responsible for ISBT-17/43 and the overall control of buses at the bus stand
Assistant Controller (F&A), Head Office	In charge of the accounts section, audit party and cash branches; drawing and disbursing authority; store purchases and provision of spare parts for bus maintenance
Assistant Controller (F&A)	Purchase of IT products and computer cells; tendering of bus-stop shops; managing expenditure; revenue and receipts from bus operations
Superintendent	In charge of the establishment section (policy matters, recruitment and all posts in the CTU)
Deputy Controller (F&A)	In charge of the accounts section, audit party and cash branches; assists the Director in financial matters for CCBSS

In sum, the city bus service in Chandigarh comprises a public transport agency (the CTU), supported by CCBSS (a society) for policies, programmes, rules and regulations on urban transit, and the private sector for outsourced services (**Table 13**).

Table 13 Agencies involved in the Chandigarh city bus service and their functions

No.	Agency	Status	Functions
1	CCBSS	Existing	Central body for fast-track decision-making and financing
2	CTU	Existing	Public transport agency for operation and maintenance of buses
3	Private sector	Existing	Outsourced services

A.4 Bhubaneswar city bus service (Mo Bus)

The city bus service began as a PPP between Capital Region Urban Transport (CRUT) and Dream Team Sahara (DTS) to operate bus services in Bhubaneswar and Puri. The SPV was later given a larger role, providing public transport not only in the city but also in its hinterland, including Bhubaneswar, Cuttack and Puri. CRUT rolled out its new buses under the brand name Mo Bus on 6 November 2018 to provide reliable and safe transport connecting neighbourhoods. The company's equity holders are the Bhubaneswar Municipal Corporation (BMC, 40%), the Bhubaneswar Development Authority (BDA, 40%), the Odisha State Road Transport Corporation (OSRTC, 10%), the Puri Konark Development Authority (PKDA, 5%) and Puri Municipality (5%). The staff hierarchy and responsibilities are listed in **Table 14** and shown in **Figure 14**.

Table 14 Roles and responsibilities of CRUT staff

Position	Roles and responsibilities
General Manager (Operations)	Monitoring bus operations, including planning and scheduling, maintenance, ITS, revenue assurance and depot management
Manager (Planning and Scheduling)	Monitoring day-to-day operations, route planning and scheduling, and preparing new schedules
Manager (Maintenance)	Daily bus maintenance and preventive maintenance
Manager (Revenue Assurance Team, RAT)	Revenue assurance and checking revenue leakages in bus operations
Supervisor (RAT)	Conducting and supervising revenue assurance checks
Inspectors (RAT)	Field duty for revenue assurance, including ticket checking
Depot Manager	Ensuring a direct link between CRUT and on-ground operations; monitoring bus operators and the revenue collection agency (RCA) on the ground
Depot Officer / Traffic Officer	Monitoring bus operators and the RCA on the ground; reports to the Depot Manager
Assistant Manager (Maintenance)	Link between on-ground maintenance and the head office; following up on maintenance activities
Supervisor (Maintenance)	Random inspection of buses before they leave the depot, as per service-level agreement (SLA) guidelines; ensuring buses leave on schedule; checking the availability of technical staff
Supervisor (ETM)	CRUT representative monitoring ETM-related operations at the depots

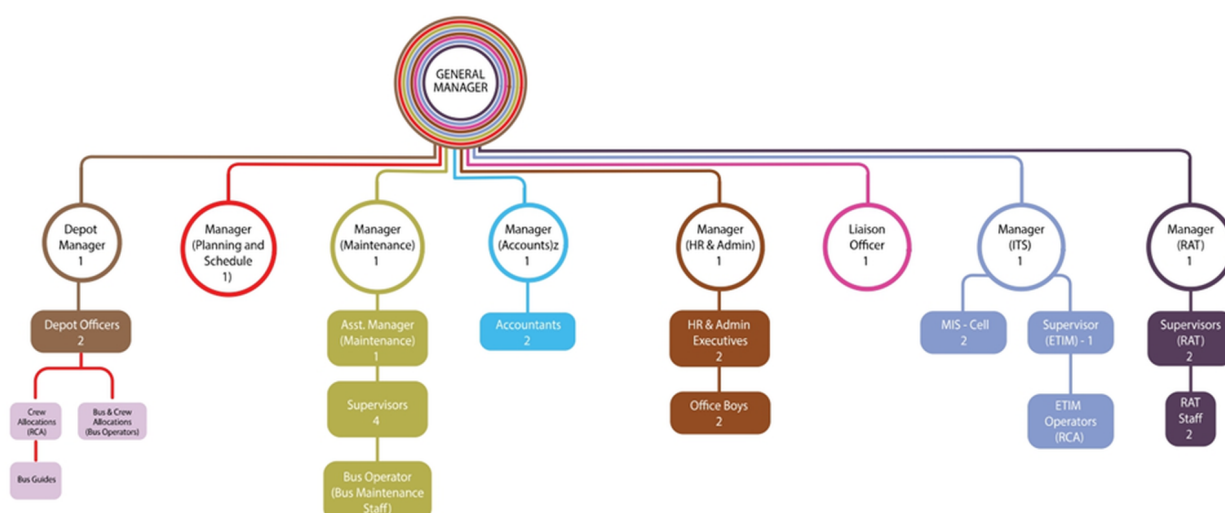


Figure 14 Organisational structure of the Bhubaneswar city bus service (CRUT)

Source: CRUT; study team compilation

In sum, the city bus service in Bhubaneswar is run by an SPV (CRUT with DTS), supervised and supported by the urban local bodies, which formulate policies, programmes, rules and regulations for urban transit (**Table 15**).

Table 15 Agencies involved in the Bhubaneswar city bus service and their functions

No.	Agency	Status	Functions
1	Stakeholders: BMC, BDA, OSRTC, PKDA and Puri Municipality	Existing	Decision-making and financing
2	DTS	Existing	Part of the SPV, for operation and maintenance of buses
3	CRUT	Existing	Part of the SPV, monitoring operations including ETM-related operations

Besides the detailed desk research on these four city bus services, the study team reviewed several other organisations that operate city bus services. The salient features of their institutional arrangements follow.

A.5 Lucknow City Transport Services Limited (LCTSL)

1. At the city level, LCTSL is responsible for the operation and maintenance of public buses.
2. The Regional Transport Office (RTO) issues route-based permits to public and private buses and approves their fare lists.
3. The RTO reports to the Office of the Transport Commissioner, Government of Uttar Pradesh (GoUP), under the Uttar Pradesh Transport Department.
4. LCTSL reports to the Urban Transport Directorate, GoUP. The Traffic Directorate, a unit of the Uttar Pradesh Police, is responsible for traffic regulation and management.

5. The Traffic Directorate is a state-level organisation that has divided the state into six traffic zones.
6. The traffic police report to the RTO, Lucknow.
7. Decisions proposed by LCTSL for public buses need the approval of the Office of the Transport Commissioner, GoUP.

A.6 Pune Mahanagar Parivahan Mahamandal Limited (PMPML)

PMPML, which provides city bus services in the Pune and Pimpri-Chinchwad region, inducted 150 e-buses through a GCC model for an operating period of 10 years. The e-bus services began with financial support from the Pune Smart City Development Corporation Limited (PSCDCL) under the Smart Cities Mission. Under the contract, PMPML prepares bus schedules, monitors electricity consumption and collects fares. The private partner owns, operates and maintains the buses and hires the drivers. PMPML provided land with high-voltage electrical connections to the operators for depot civil works and charging infrastructure. The respective scope of PMPML and the private operator is shown in **Figure 15**.

Scope of PMPML	Power supply	PMPML will make 22 kVA power supply line available at designated depots.		
	Rate paid to the operator (without electricity)	9m: INR40.32/km (USD0.85/mi) 12m: INR58.50/km (USD1.23/mi) ⁱ	INR67.40/km (USD1.42/mi)	INR63.95/km (USD1.36/mi)
	Depots and land availability	Land for charging, parking, and bus maintenance spaces provided at Nigdi and Bhekrai Nagar depots.	Land for charging, parking, and bus maintenance spaces provided at Baner, Wagholi, Charholi, and Pimple Saudagar depots.	Land for charging, parking, and bus maintenance spaces provided at Pune station and Wakad/Bhosari depots.
	Bus routes	Provide routes to be undertaken by operator and formulate operational plan to ensure that distance travelled by contracted fleet matches the daily minimum average guaranteed run established in the RFP.		
Scope of Operator	Buses	Buses supplied by the operator shall conform to all Central Motor Vehicle Rules (CMVR) technical specifications and requirements as notified by DHI, Government of Maharashtra, and other authorities.		
	Charging cost	Charges for additional energy consumption above predetermined limits shall be borne by the operator.		
	Depots	Cost and responsibilities of depot construction, operations, and maintenance are borne by the operator. City administration is responsible for allocating land at designated depots.		
	Bank guarantee	The operator shall agree to submit a bank guarantee of an amount equal to the subsidy transferred to the operator.		

Source: PMC, PMPML, and PSCDCL; RMI and RMI India analysis

Figure 15 Scope of work of PMPML and the private operator

Source: PMC, PMPML and PSCDCL; RMI and RMI India analysis (RMI, 2022)

Other institutions involved with PMPML were:

1. the Pune Municipal Corporation (PMC), the Pimpri Chinchwad Municipal Corporation (PCMC) and PSCDCL, which worked in partnership with PMPML;
2. the Central Institute of Road Transport (CIRT);
3. Ernst & Young (EY), which provided technical support to the working group; and
4. the Maharashtra State Electricity Distribution Company Limited (MSEDCL), which participated and provided technical inputs.

A.7 Delhi Transport Corporation (DTC)

1. The overall management of the corporation vests in a Board of Directors of eight official and ten non-official directors, including four directors with expertise in transport.
2. The Chairman-cum-Managing Director (CMD) is the chief executive, assisted in day-to-day work by the Chief General Manager (Operations), the Chief General Manager (Personnel), the Chief Accounts Officer and Financial Adviser, the Chief Vigilance Officer (vigilance and security), regional managers and depot managers.
3. The corporation has 34 depots with sufficient parking capacity, which handle the operation and maintenance of buses.
4. Each Depot Manager has subordinate officers in the mechanical, traffic and accounts wings. DTC has seven regions, each headed by a Regional Manager with four to six depots under their administrative control.
5. The most important department is the Traffic Department, which is “responsible for making policies of traffic matters, e.g. concessional/free passes, fares, tickets, special hire, schedule and planning of city routes, private bus operations, special arrangements for various national/religious functions, permits for city/interstate operation, bus stops/ bus queue shelters, etc.”
6. Routes are designed not on the basis of a study or survey of demand on a particular route, but from the department’s experience. Route design is a dynamic process based on experiment and trial.

A.8 Delhi Integrated Multi-Modal Transit System Limited (DIMTS)

1. DIMTS is an independent agency acting as an integrated mechanism (IM).
2. It is responsible for the bid management process, the monitoring and management of private stage-carriage bus operations, the preparation of a unified timetable (UTT), the monitoring of service-level standards and other key aspects.
3. DIMTS was set up as an SPV, a joint venture of the Government of the National Capital Territory of Delhi (GNCTD) and the Infrastructure Development Finance Company (IDFC).
4. DIMTS aggregated Delhi’s existing 657 bus routes into 17 clusters, with a private entity selected for each cluster through competitive bidding. The selected companies (not individuals or cooperatives) provide stage-carriage services under a suitable contractual structure.
5. The contracts are designed to ensure universality, uniformity and compliance with prescribed performance standards. Each cluster combines viable and unviable routes and has 200–250 private buses.
6. A distinctive feature is the operator’s revenue model, a gross cost model: all ticket revenue goes to the government, and operators are paid a pre-defined cost per contracted bus-km, as quoted in their tenders.
7. Operators also receive a share of off-board revenue, as decided by DIMTS, from tickets issued by DIMTS, special passes and advertising on buses.

8. All buses run under the 'Delhi Transit' brand, with an integrated ticketing system valid across the Delhi transit network.
9. Operators must meet performance standards on (a) safety, (b) punctuality, (c) other customer-service parameters, (d) vehicle condition and (e) operational practices.
10. Performance is measured using objective data generated by ITS.

A.9 Aurangabad Smart City Development Corporation Limited (ASCDCL)

1. In 2018, ASCDCL used grants received under the Smart Cities Mission to reintroduce the city bus service.
2. ASCDCL entered into a GCC with the Maharashtra State Road Transport Corporation (MSRTC) as its operating partner for 100 buses.
3. ASCDCL is responsible for bus procurement, implementation, setting fares and collecting revenue from ticket sales and advertising.
4. MSRTC is responsible for operation and maintenance, hiring crew and staff for operations, ticketing and allocating space for city buses in its existing depots in Aurangabad.
5. The partners decide routes and schedules together, but ASCDCL takes the final decision.
6. MSRTC is paid its actual expenses on producing invoices detailing the cost of operating and maintaining the buses and of using its depot space.
7. ASCDCL can use MSRTC depots on payment of charges, without investing in new infrastructure, and has access to MSRTC's detailed SOPs on bus service planning, management, operations, maintenance, accident policy, and industrial and labour codes.
8. MSRTC has been able to deploy its surplus workforce on Aurangabad's city bus operations and receives the actual cost of operations.

A.10 Ahmedabad Janmarg Limited (AJL)

Ahmedabad Janmarg Limited (AJL), a company of the Ahmedabad Municipal Corporation (AMC) created under the Companies Act, manages BRTS operations in Ahmedabad and coordinates operations jointly with the Ahmedabad Municipal Transport Service (AMTS). Its principal stakeholders are (a) the Ahmedabad Municipal Corporation, (b) the Ahmedabad Urban Development Authority (AUDA) and (c) the Government of Gujarat. The SPV's board consists of the following directors:

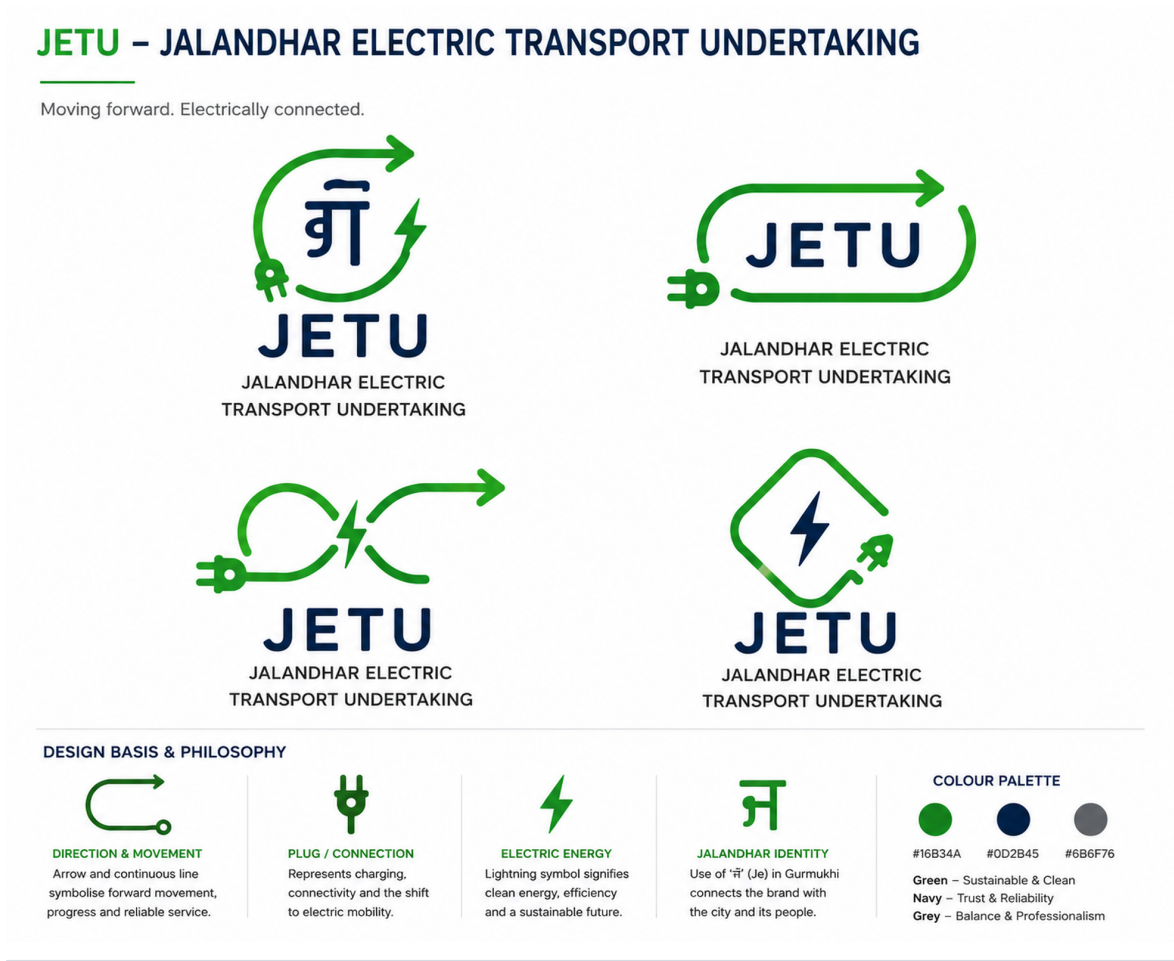
1. Municipal Commissioner, AMC (Chairman);
2. Mayor;
3. Chairman, Standing Committee;
4. Leader of the Opposition;
5. Deputy Commissioner (BRTS), AMC;
6. Chairman, AMTS;
7. Additional Commissioner of Police (Traffic);
8. Chairman/CEO, AUDA;
9. Director (Urban Transport), Ministry of Urban Development, Government of India;

10. one Member of the Legislative Assembly representing the AMC area;
11. Principal Secretary, Urban Development Department, or a representative;
12. Principal Secretary, Department of Finance, or a representative;
13. two urban transport specialists; and
14. two directors from the private sector (with a contribution to capital).

B

Annexure B: JETU Logo Concepts

The four brand-identity concepts below were developed for the Jalandhar Electric Transport Undertaking and are reproduced from the JETU logo-concepts sheet for the Governing Board’s reference (Figure 16). All the marks share a green and navy palette, so any choice fits a single brand family. The Board may pick a primary mark and, where useful, a secondary mark — for example, a roundel for formal use and a square icon for digital use.



Bibliography

- Babushahi. (2025, February 16). *Ludhiana, Amritsar, Jalandhar and Patiala to get 347 e-buses*. <https://www.babushahi.com/view-news.php?id=199387>
- CEEW and SGArchitects. (forthcoming). *Driving Punjab's urban mobility towards e-buses: Recommendations for Jalandhar*. Council on Energy, Environment and Water and SGArchitects, New Delhi.
- Daliah, D. (2024, February 24). *Net Cost Contract or Gross Cost Contract: Which one to opt for procuring electric buses?* LinkedIn.
- Dawra, M., Patel, R., & Bhatia, S. (2023, February). *How should Indian cities plan their charging infrastructure and electric bus operations?* WRI India. <https://wri-india.org/perspectives/how-should-indian-cities-plan-their-charging-infrastructure-and-electric-bus>
- Dhole, A. (2022, September 9). *Lessons about charging infrastructure from electric bus operations in Maharashtra*. The International Council on Clean Transportation. <https://theicct.org/?p=22119>
- Konda, C. (2023, February 7). *How India can effectively electrify public transportation*. Institute for Energy Economics and Financial Analysis. <https://ieefa.org/resources/how-india-can-effectively-electrify-public-transportation>
- Ministry of Housing and Urban Affairs (MoHUA). (2023). *PM-eBus Sewa: Guidelines, Part I*. Government of India. <https://mohua.gov.in/upload/uploadfiles/files/PM-eBus-Sewa-Guidelines-Part-I.pdf>
- Municipal Corporation Jalandhar. (2024). *Jalandhar e-Bus Sewa* [Presentation on PM-eBus Sewa preparation: routes, depots, and civil and electrical estimates]. Municipal Corporation Jalandhar.
- Press Information Bureau. (2023, August 16). *PM-eBus Sewa* [Cabinet decision factsheet]. Government of India. <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2023/aug/doc2023824243601.pdf>
- RMI. (2022). *Pioneering electric buses in Pune*. RMI and RMI India. https://rmi.org/wp-content/uploads/2022/04/pioneering_electric_buses_in_pune.pdf
- The Tribune. (2025, April 27). *Mohali to get 100 electric buses soon*. <https://www.tribuneindia.com/news/chandigarh/mohali-to-get-100-electric-buses-soon>



Many small and medium Indian cities are launching public bus services for the first time under PM-eBus Sewa. This report shows how they can leapfrog directly to an all-electric city transport undertaking (E-CTU) — setting out its institutional framework, organisational structure, manpower and responsibilities — and how Jalandhar has taken up the model as JETU, a template for Punjab's other PM-eBus Sewa cities.

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