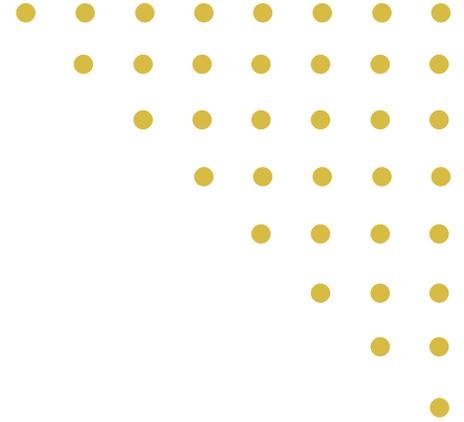


Senior Leadership Program on Public-Private Partnerships (PPP)

Strengthening Audit Oversight of Public Private Partnerships through Case Studies



E Bus Transit Project


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WE ARE HELPING CITIES TO
BUILD A MORE DIGITAL, GREEN
AND SUSTAINABLE FUTURE



Concession Agreement in an e-Bus PPP?



Long-Term Concession Contract

Comprehensive **Design-Build-Finance-Operate-Maintain-Transfer** agreement covering **electric fleet, charging infrastructure, and full operations**



Risk Allocation Framework

Clear definition of responsibilities and payment mechanisms between public authority and private operator



Performance Standards

Measurable metrics ensuring **fleet availability, service quality, and operational excellence**



Sustainability Goals

Supports urban decarbonization objectives and promotes sustainable mobility for growing cities

Core Objectives of an e-Bus Concession Agreement



Reliable Low-Emission Transit

Deliver consistent, environmentally responsible mass transportation that reduces urban air pollution and greenhouse gas emissions

Lifecycle Cost Optimization

Minimize total cost of ownership through efficient fleet management, preventive maintenance, and strategic charging operations

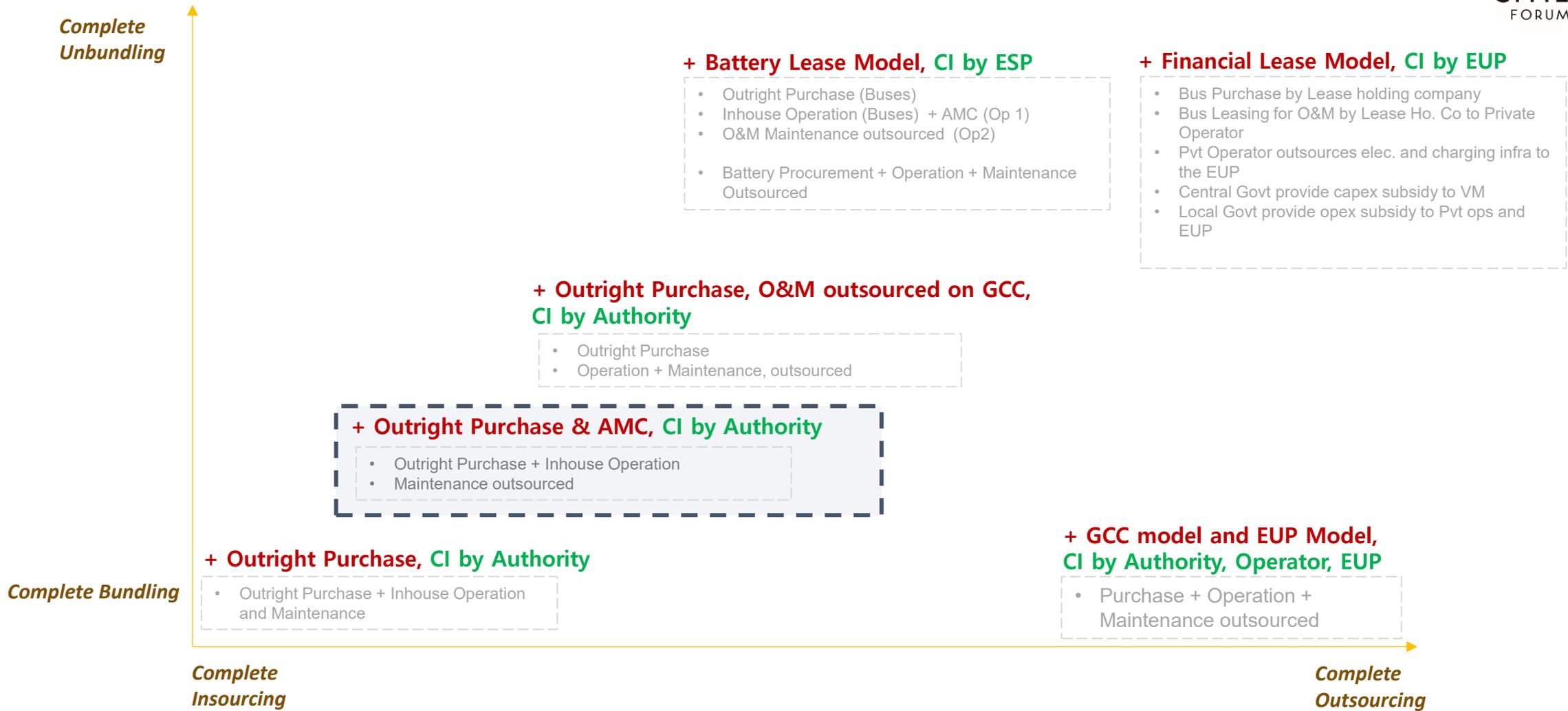
Affordability & Quality

Ensure accessible pricing for all citizens while maintaining high standards of safety, comfort, and service delivery

Transparent Obligations

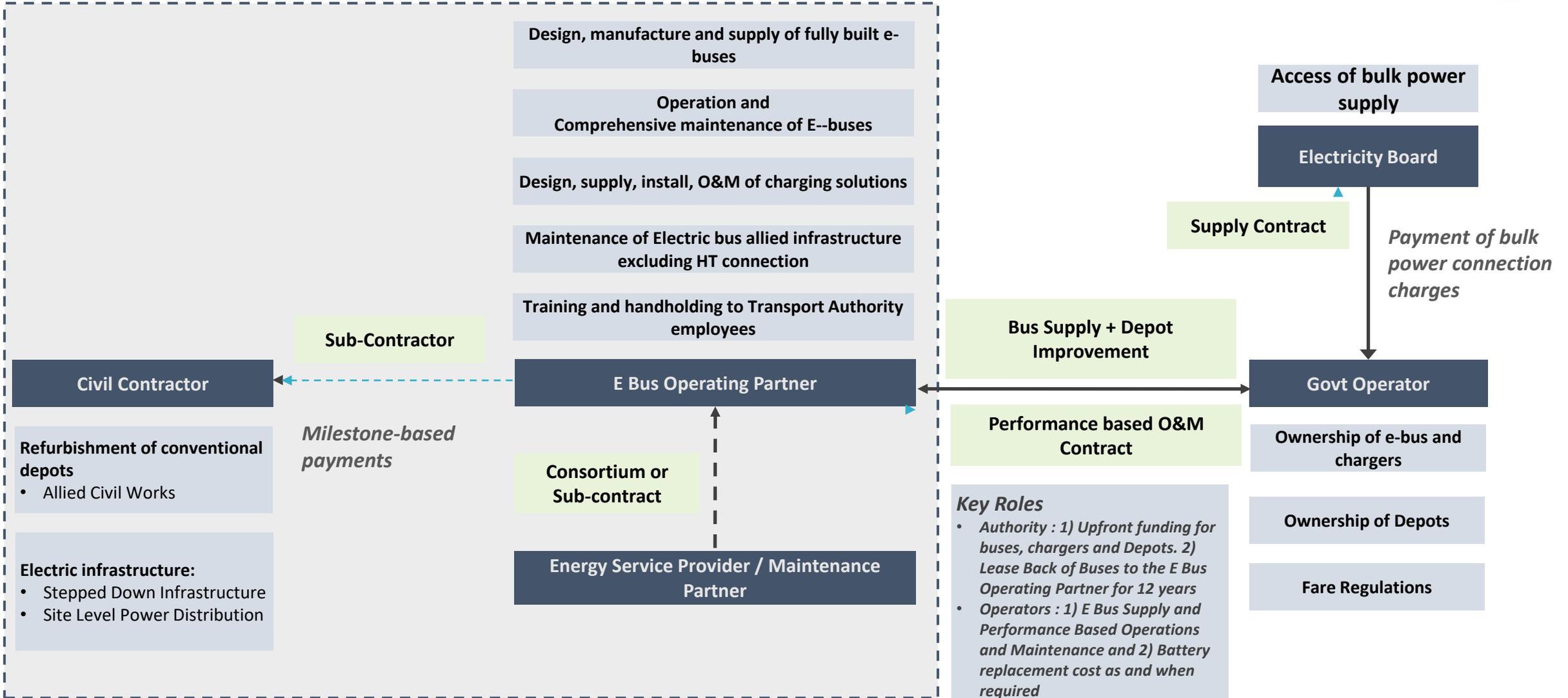
Establish clear, enforceable long-term commitments that protect both public interests and private investment

Spectrum of E-bus procurement Models



CI = Charging Infrastructure, EUP: Energy Utility Provider

Own, Lease and Transfer Electric Bus Deployment Model



Summarise functional requirements



Transport Operator's Functional Requirements

- Dimension – 12 m long buses and 10.5 m long bus
- Range – upto 300 km per day to match the typical diesel bus performance
- Charging – Ideally single overnight charging with limited day time charging window
- Air-conditioning – AC buses

-
- Battery – What established type and size of battery could achieve the required range?
 - Charging – What type of charging technology could optimise costs to meet functional requirements?
 - Power – What would the ultimate load on the electricity distribution grid be?
 - Daytime charging – Would daytime top-ups be needed?



Important questions to answer

Structure of an e-Bus Concession Agreement

01

Scope and Definitions

Contract boundaries, technical specifications, and key terminology

03

Design, Construction & Commissioning

Infrastructure development, fleet procurement, and system integration

05

Operations and Maintenance

Service delivery, availability thresholds, and quality management

07

Payment Mechanism

Compensation structure, adjustments, and performance incentives

09

Monitoring, Reporting & KPIs

Performance tracking, data requirements, and accountability systems

02

Conditions Precedent

Pre-commencement requirements including permits, land access, and funding

04

Fleet & Charging Obligations

Technical requirements, performance standards, and maintenance protocols

06

Electricity Supply & Charging

Energy procurement, charging strategy, and grid coordination

08

Environmental & Social Requirements

Sustainability standards, community engagement, and compliance obligations

10

Termination and Handback

Exit conditions, asset transfer protocols, and compensation provisions

Scope of e-Bus PPP Responsibilities

1

Electric Bus Fleet

Complete supply, deployment, and ongoing maintenance of zero-emission buses meeting technical specifications and availability requirements

2

Charging Systems

Installation and operation of depot-based and on-route charging infrastructure, including opportunity charging at strategic locations

3

Depot Facilities

Construction of new depots or comprehensive upgrade of existing facilities to accommodate electric fleet servicing and overnight charging

4

Technology Systems

Intelligent Transportation Systems (ITS), automated fare collection, real-time telematics, and passenger information displays

5

Training & Safety

Comprehensive driver training programs and safety protocols (scope varies based on contract model and operator responsibilities)

Conditions Precedent

Before operations can commence, several critical conditions must be satisfied to ensure the project foundation is solid and risks are appropriately mitigated.

Land & Depot Access

Legal handover of all required land parcels and depot sites with clear title and unrestricted access for construction and operations

Electricity Infrastructure

Confirmed grid connection capacity, signed utility agreements, and all necessary electrical permits secured from relevant authorities

Regulatory Approvals

Complete environmental clearances, construction permits, and compliance certificates from all oversight agencies

Government Funding

Documented commitment and availability of any promised public contributions, subsidies, or viability gap funding

Financial Close

Satisfaction of all lender conditions including security documentation, insurance coverage, and equity funding confirmation

Construction and Commissioning Obligations

1

Fleet Delivery

Procurement and delivery of electric buses meeting all technical specifications

2

Charger Installation

Complete charging infrastructure with testing and certification

3

Grid Integration

Utility coordination and grid reinforcement where required

4

Route Preparation

Interface works ensuring corridor readiness

5

Systems Testing

Comprehensive integration and performance validation

- ❏ **Use Case:** Dar es Salaam eBus Phase 2 implementation highlighted the critical importance of early utility coordination for charging infrastructure. Delays in grid connection approvals created significant project timeline impacts, underscoring the need for proactive engagement with power authorities during the planning phase.

Fleet & Charging Infrastructure Specifications



Battery Capacity & Range

Minimum energy storage requirements ensuring buses can complete full daily service schedules without mid-day charging, typically 250-350 kWh supporting 200-300 km range



Charging Strategy

Selection of optimal charging approach: overnight depot charging (50-150 kW), fast charging (150-350 kW), or opportunity charging at terminals (350-600 kW)



Energy Efficiency

Maximum energy consumption targets in kWh per kilometer, considering route topology, passenger load, and climate conditions



Spare Fleet Ratio

Additional buses beyond service requirement (typically 5-10 percent) to maintain availability during maintenance cycles and unplanned repairs



Battery Warranties

Comprehensive guarantees covering capacity degradation thresholds and complete replacement schedules aligned with 8-10 year lifecycle expectations

Payment Mechanisms for e-Bus PPPs

Compensation structures must balance operator viability with public value, incorporating performance incentives and risk-appropriate adjustments.

Availability Payments

Fixed monthly compensation based on percentage of contracted fleet available for service, ensuring baseline revenue stability

Per-Kilometer Service Fees

Variable payments tied to actual distance operated, aligning compensation with service delivery volume

Energy Consumption Adjustments

Pass-through or shared mechanisms for electricity costs, protecting against utility price volatility

Performance Bonuses

Incentive payments for exceeding availability, reliability, or customer satisfaction targets

Performance Deductions

Financial penalties for falling below contracted service levels or safety standards

Qualifying Disruptions

Compensation for delays or issues caused by government actions or events outside operator control

Revenue Collection Models: Gross Cost vs. Net Cost

Gross Cost Contract (GCC)

- Authority retains all fare revenue and ridership risk
- Operator compensated per kilometer or availability
- No demand risk transferred to private sector
- Enables integrated fare policy across transit network
- Simplifies climate finance structuring for e-Bus

📄 **Example:** Lagos Bus operations have increasingly shifted toward GCC models to reduce financial distress of operators and improve system sustainability.

Net Cost Contract (NCC)

- Operator collects and retains fare revenue
- Full ridership and revenue risk borne by operator
- May include minimum revenue guarantees
- Requires sophisticated demand forecasting
- Higher risk premium increases costs

📄 **Example:** Early Indian bus PPPs utilized NCC structures but largely shifted away due to high revenue volatility and operator financial distress. Singapore and Hong Kong has established NCC Contracts

Hybrid Revenue Models for e-Bus PPPs

Innovative approaches combine elements of different payment structures to optimize risk allocation and create performance incentives.

1

Shared Revenue Contracts

Authority collects base fare revenue while operator receives variable incentive payments based on ridership growth targets, encouraging service quality improvements

 **Use Case:** Johannesburg's Rea Vaya system employs performance incentives tied to ridership metrics

2

Gross Cost + Ancillary Revenue Rights

Operator compensated through traditional availability/kilometer payments plus rights to commercial activities including advertising, station branding, and retail concessions

 **Use Case:** Lagos is exploring advertising revenue streams to improve operator viability

3

Availability + Energy Efficiency Bonus

Base payments for fleet availability supplemented by incentives for achieving below-target energy consumption levels, promoting operational efficiency and cost savings

 **Use Case:** Cairo's e-Bus model under development includes energy performance KPIs

Risk Allocation in e-Bus PPPs

Private Sector Risks

- Fleet performance and reliability
- Battery degradation and lifecycle
- Charger uptime and maintenance
- Operational efficiency
- Staff management
- Technology obsolescence

Public Sector Risks

- Fare policy and adjustments
- Corridor infrastructure readiness
- Traffic management and priority
- Regulatory changes
- Political and policy stability
- Integration with broader network

Shared Risks

- Energy pricing and tariff changes
- Electricity supply interruptions
- Force majeure events
- Technology evolution
- Climate impacts on operations
- Demand fluctuations

Effective risk allocation assigns each risk to the party best able to manage and mitigate it, ensuring appropriate compensation and creating incentives for proactive risk management.

Electricity Supply and Charging Management



Power Procurement

Clear definition of responsible party for electricity contracting, typically authority direct or operator pass-through model



Charging Strategy

Detailed scheduling protocols optimizing for grid constraints, time-of-use tariffs, and operational requirements



Backup Systems

Contingency arrangements for grid failures including diesel generators or battery energy storage systems



Smart Charging

Real-time energy management and monitoring systems enabling demand response and cost optimization

 **Use Case:** Kigali's grid constraints necessitated development of structured charging windows to manage peak loads. The system coordinates with utility operators to shift charging to off-peak periods, reducing both costs and grid stress while maintaining fleet availability.

Environmental & Social Obligations

IFC Performance Standards

Compliance with International Finance Corporation environmental and social framework including labor rights, community health, and biodiversity protection

Battery Lifecycle Management

Comprehensive disposal and recycling protocols ensuring responsible handling of hazardous materials and circular economy principles

Noise & Air Quality

Strict monitoring and enforcement of emission thresholds, noise levels, and ambient air quality standards

Community Engagement

Proactive stakeholder consultation processes and accessible grievance redress mechanisms throughout project lifecycle

Monitoring, Reporting and Key Performance Indicators

1

Fleet Availability

Percentage of contracted buses operationally ready each day, tracked against 90-95 percent targets with automated reporting

2

Charger Availability

Uptime metrics for all charging infrastructure ensuring 98+ percent availability to prevent service disruptions

3

Energy Efficiency

Actual consumption in kWh per kilometer compared to contractual benchmarks, identifying optimization opportunities

4

Headway Adherence

On-time performance and service frequency compliance maintaining passenger confidence and system reliability

5

Real-Time ITS Data

Continuous telematics feeds enabling proactive management and performance verification

 **Use Case:** Dar es Salaam leverages ITS-based bus scheduling and real-time tracking systems for comprehensive performance evaluation, enabling data-driven decision making and accountability.

Change in Law & Technology Adaptation

E-Bus contracts must anticipate regulatory evolution and technological advancement over multi-decade concession periods.

→ EV Policy Changes

Structured procedures for addressing new electric vehicle regulations, safety standards, or performance requirements including cost allocation mechanisms

→ Battery Technology Upgrades

Provisions requiring or enabling adoption of improved battery chemistries offering better performance, safety, or lifecycle economics

→ Cost-Sharing Formulas

Pre-agreed frameworks for distributing financial burden of mandated technology transitions between authority and operator

→ Charging Standards Evolution

Criteria and funding mechanisms for adopting new charging protocols ensuring long-term infrastructure compatibility

Compensation and Relief Events

Contracts must establish clear mechanisms for addressing delays or disruptions beyond operator control, protecting project viability while ensuring accountability.

Utility Delays

Grid connection approval delays or inadequate electricity supply impacting charging operations

Relief: Schedule extension + documented cost recovery including carrying costs

Government-Caused Infrastructure Delays

Failure to deliver land access, permits, or corridor readiness per agreed timeline

Relief: Time extension + compensation for idle resources and lost revenue opportunity

Force Majeure Events

Natural disasters, pandemics, war, or other unforeseeable circumstances preventing performance

Relief: Suspension of obligations during event + potential termination rights if prolonged

All compensation models require specific triggering criteria, documentation requirements, and caps to prevent abuse while ensuring genuine relief for qualifying disruptions.

Termination & Handback

Termination Grounds

- **Operator Default:** Sustained non-performance, safety violations, or breach of material obligations after cure period
- **Authority Default:** Failure to make payments or provide required support per contract terms
- **Insolvency:** Bankruptcy or financial collapse of operator
- **Force Majeure:** Extended force majeure making contract performance impossible or impractical
- **Voluntary Termination:** Authority option to terminate for convenience with full compensation

Handback Requirements

Termination Payments

Outstanding senior debt + capped equity return based on termination cause

Asset Transfer

Complete handover of buses, chargers, and depot facilities to authority or successor operator

Condition Standards

Minimum State of Health (SOH) requirements for batteries (typically >70 percent capacity) and equipment functionality certification

Knowledge Transfer

Documentation, training, and operational data ensuring seamless service continuity



Key Takeaways

Comprehensive Risk Framework

E-Bus concession agreements must carefully balance technology risks, operational performance requirements, and financial sustainability across decades-long contracts

GCC & Hybrid Models

Gross Cost Contracts and hybrid revenue models offer the strongest foundation for financial sustainability, particularly in emerging markets with uncertain ridership

Technical Specifications Matter

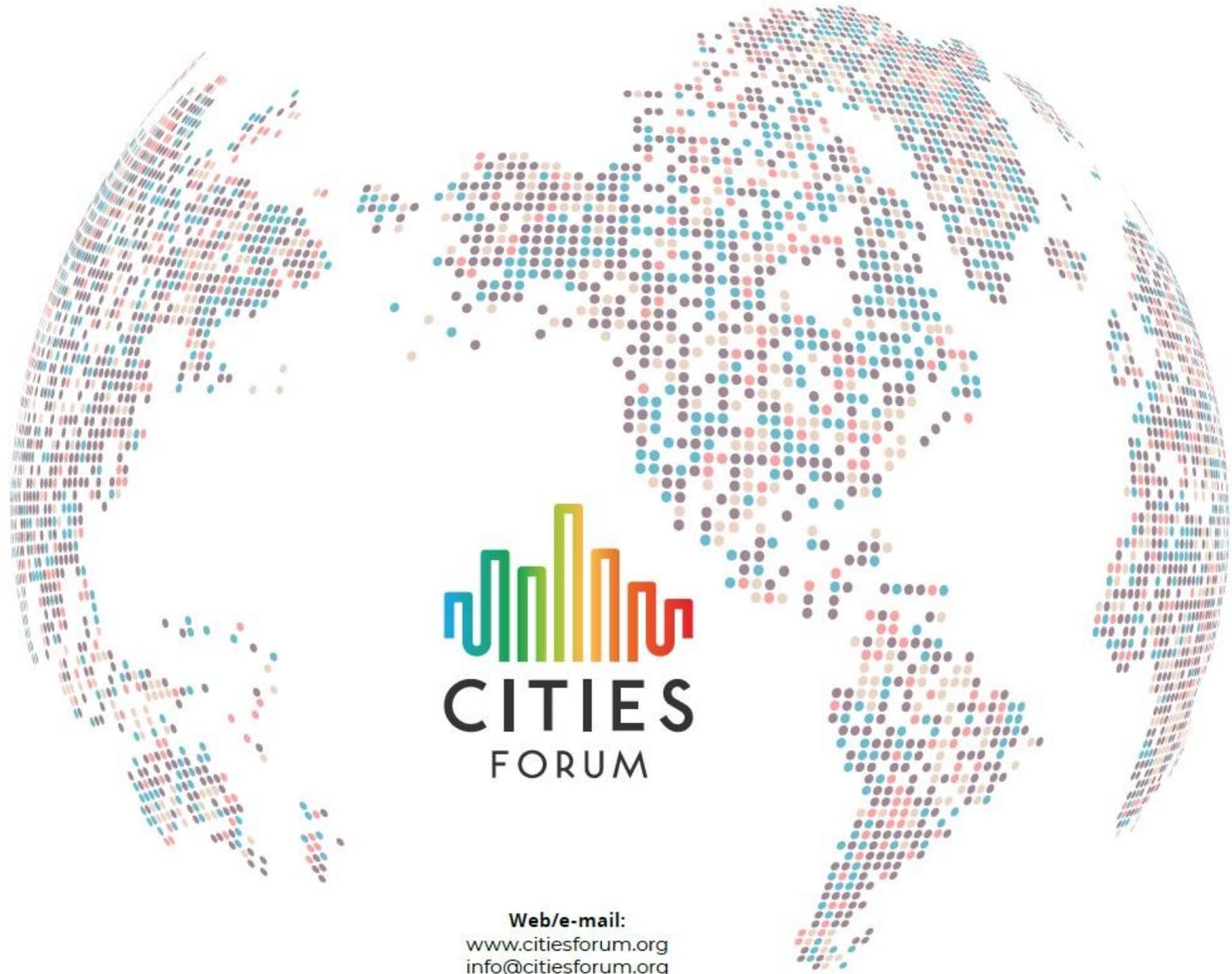
Clear provisions governing energy management, battery performance, and fleet lifecycle are essential to prevent disputes and ensure long-term viability

India Use case Lessons

Early e-Bus implementations across India offer invaluable insights on grid coordination challenges, operational KPI design, and fare integration strategies

Transparency Ensures Success

Explicit risk allocation, robust monitoring systems, and fair termination provisions create the foundation for resilient, sustainable e-Bus systems



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