

Business Models and Contracting Structures for Electric Buses - Practices and Lessons

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Presented by

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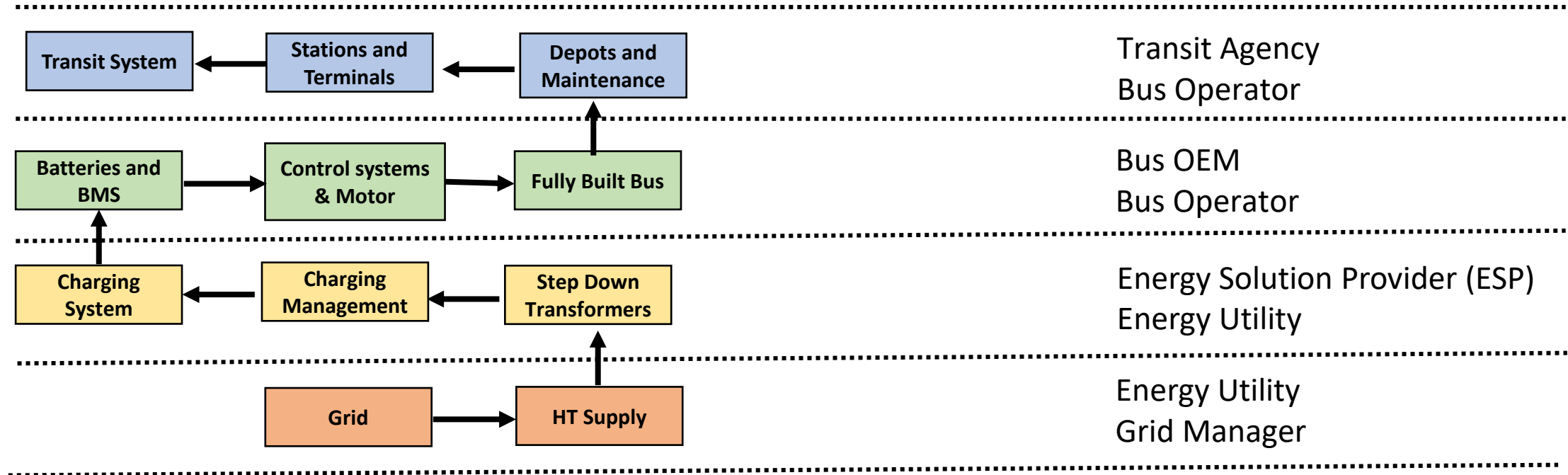
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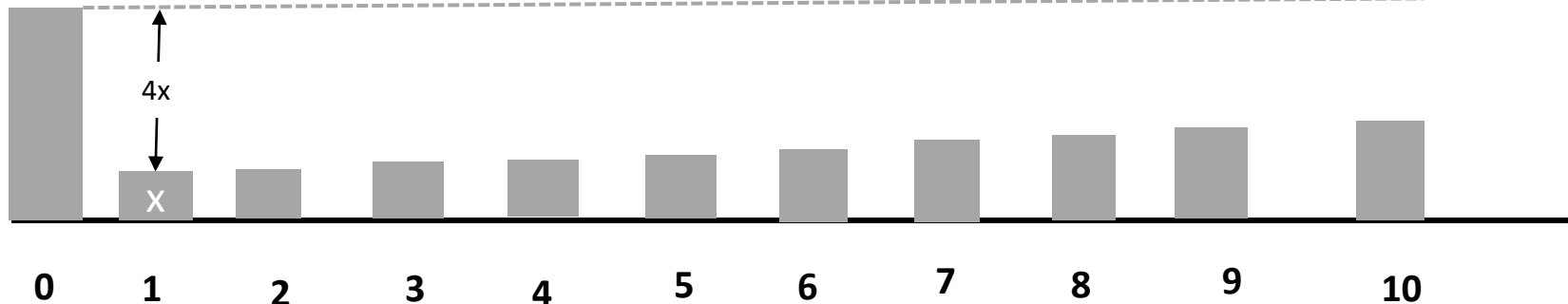


Why is Business Model relevant for E-buses?

E Buses operations is a collection of systems, requiring multiple stakeholders to work together



Further, E Buses have comparable TCO, but have high upfront costs versus lower operating costs, requiring upfront capital

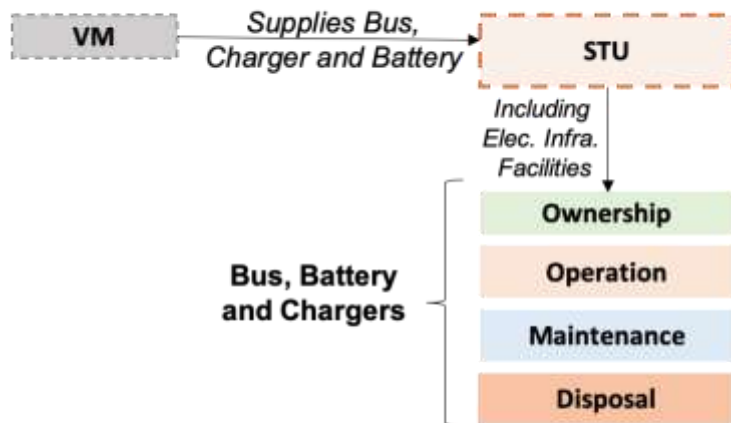


The complexities necessitate a viable, incentivised contractual arrangements, several of which are possible.

India's Experience with E-buses

Business Models in India

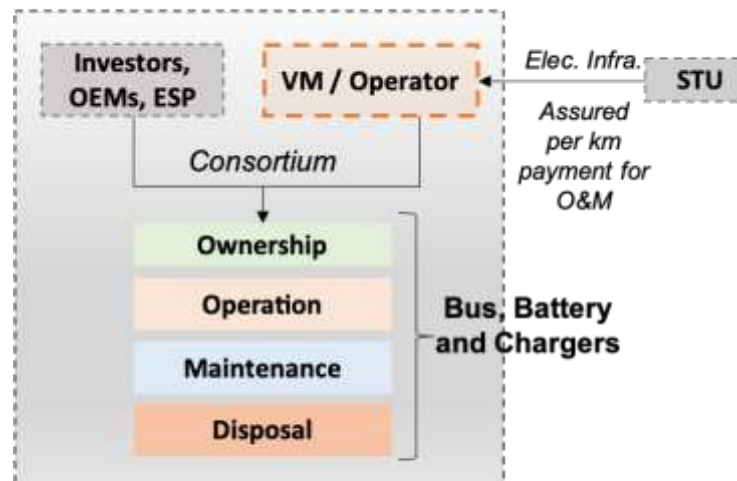
Model 1 **Outright Purchase Model**



Vehicle Manufacturer supplied the bus, battery and chargers to the STU which purchases them and carries out ownership, operation and maintenance using internal resources.

- Adopted by few cities like Kolkata, Indore, Jaipur, Guwahati and Jammu under FAME I.
- Many difficulties in deployment and operations.

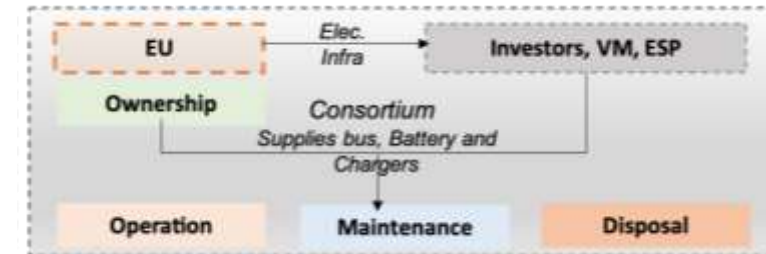
Model 2 **Gross Cost Contract**



Vehicle manufacturer owns, operates and maintains the buses, batteries and charging infrastructure and gets a fixed remuneration from the STUs based on assured km.

- Mandatory Model under FAME II.
- **More than 3000 e-buses have been procured out of which 900 e-buses are operational.**

Model 3 **Utility Provider Led Model**



Energy Utility Company is the key stakeholder who owns the services and goes into an agreement with private parties for operation and maintenance.

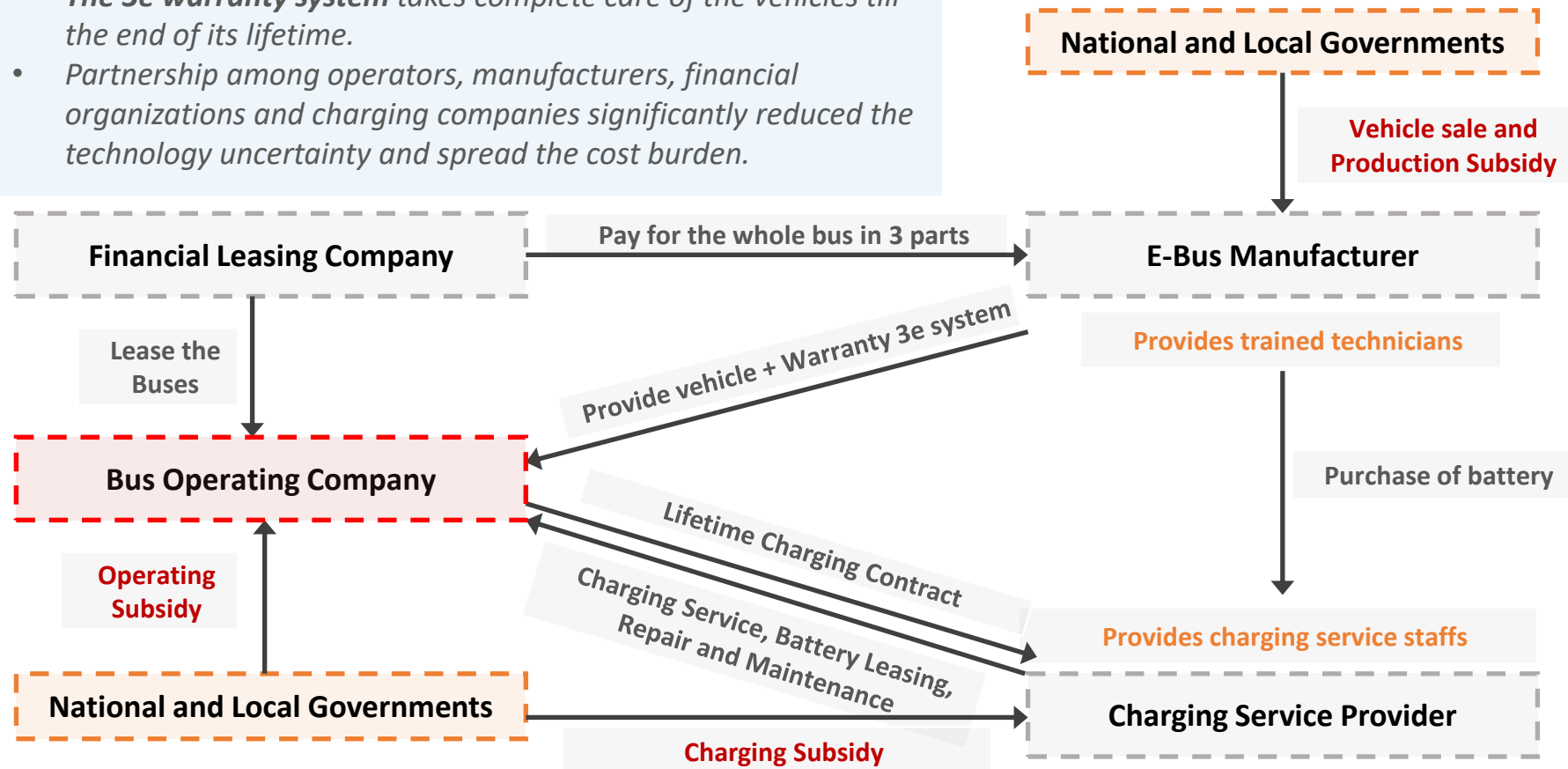
- Experimented by NTPC in Andaman Nicobar. Not replicated further.

Predominant Model in India is Gross Cost Contract (GCC).

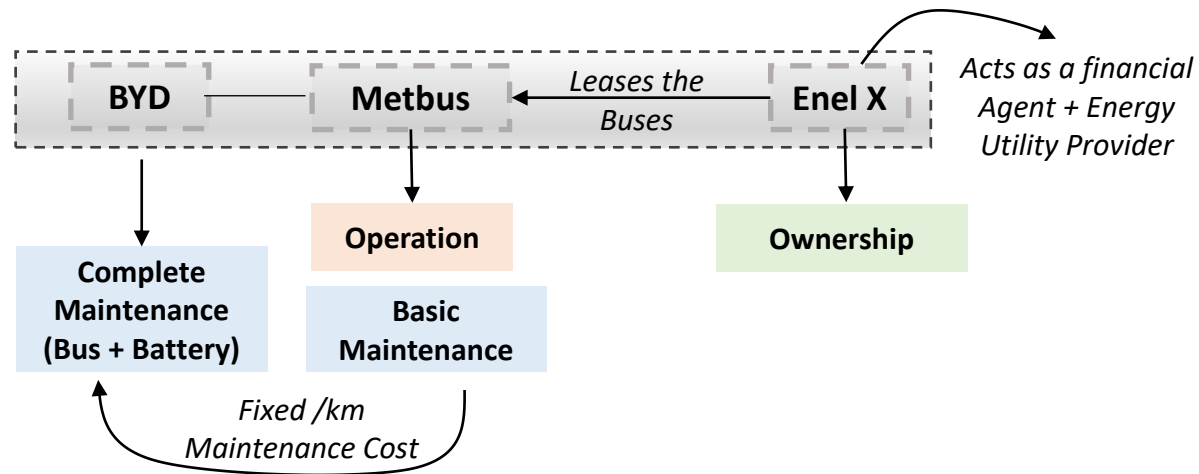
Business Model - Shenzhen

KEY TAKEAWAYS

- *The 3e warranty system takes complete care of the vehicles till the end of its lifetime.*
- *Partnership among operators, manufacturers, financial organizations and charging companies significantly reduced the technology uncertainty and spread the cost burden.*



Business Model – Santiago, Chile

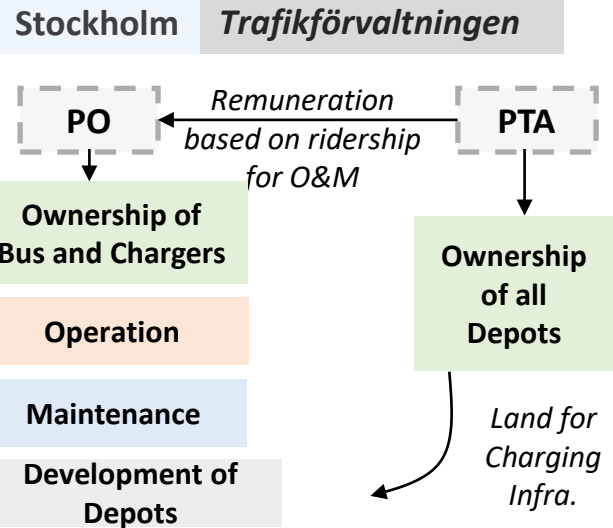


KEY TAKEAWAYS

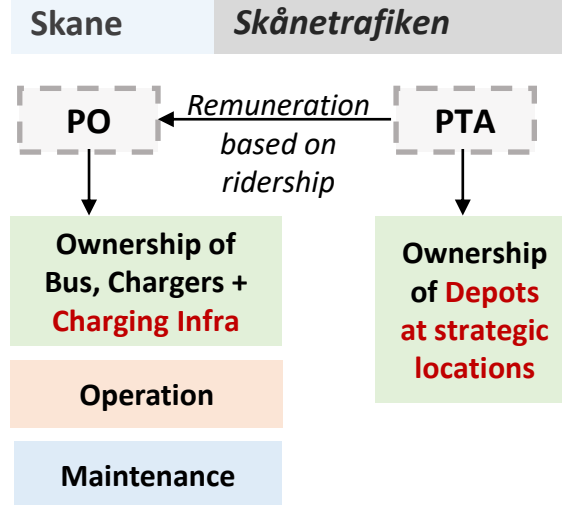
- The new system seeks to split the ownership and operation of assets by having fleet suppliers and bus operators, while the transport authority manages depots.
- Maintenance costs have significantly reduced due to the involvement of manufacturers.

Business Model – Sweden Cities

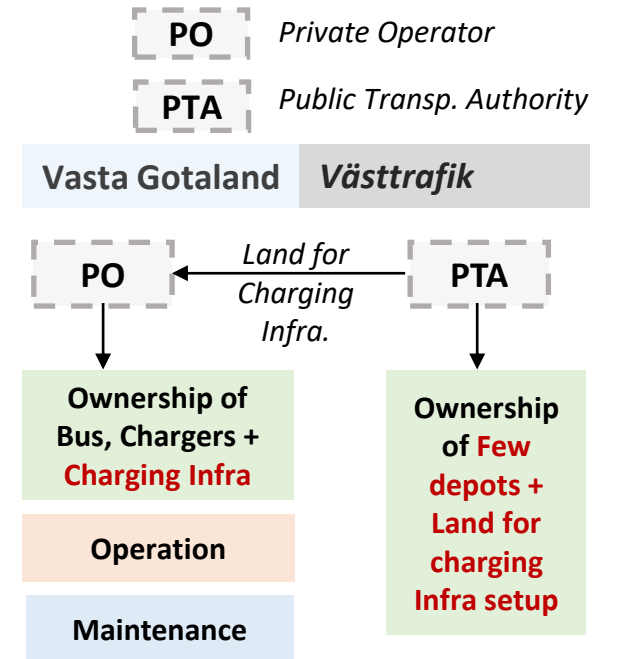
SWEDEN Region Stockholm, Region Skåne and Region Västra Götaland



Note: Charging facilities are available only at depots



Note: Charging facilities are operated and maintained by the operator itself.



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KEY TAKEAWAYS

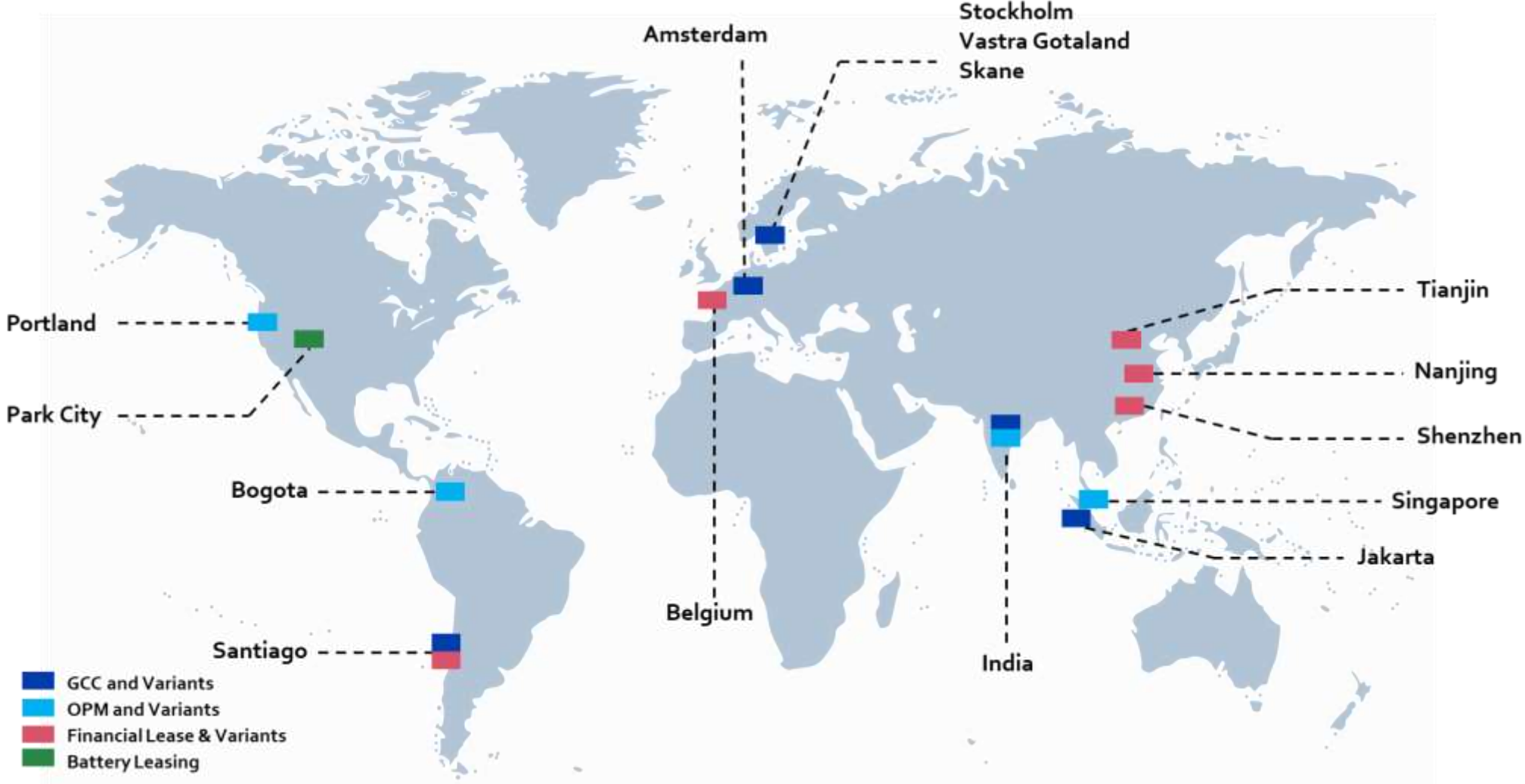
Variety of models in the same country.

Comparative Matrix – International Case Cities

| S.No. | Activity | Preferred | | | | |
|--------------------------------|---|---------------------|---------------------|-----------|--------|-----------------|
| | | China | Chile | Sweden | | |
| | | Shenzhen | Santiago | Stockholm | Scania | Västra Götaland |
| E-buses | | | | | | |
| 1 | Ownership of buses | FC | FC | PO | PO | PO |
| 2 | Funding For Procurement | FC | FC | PO | PO | G |
| 3 | Supply of Buses | VM (Through Lessee) | VM | ND | ND | ND |
| 4 | Bus Operational Services | G + PO | G + PO | PO | PO | PO |
| 5 | Bus Maintenance Services | G + PO | VM | PO | PO | PO |
| Battery | | | | | | |
| 1 | Ownership of Battery | PO | FC | PO | PO | PO |
| 2 | Supply of Batteries | VM (Through Lessor) | VM (Through Lessor) | ND | ND | ND |
| 3 | Regular Maintenance of Battery | PO | VM | PO | PO | PO |
| 4 | Systematic tracking of Battery Usage | ND | ND | ND | ND | ND |
| 5 | Replacement of Battery | PO | ND | ND | ND | ND |
| 6 | Disposal and Recycling of battery | VM | ND | ND | ND | ND |
| Charging Infrastructure | | | | | | |
| 1 | Ownership of Charging Infra. | CSP (Gets Rent) | FC | G | G + PO | G + PO |
| 2 | Land Acquisition for Charging Infra. | G | ND | G | G | G |
| 3 | Supply of Chargers | VM (Through ESP) | VM (Through ESP) | ND | ND | ND |
| 4 | Charging Infrastructure Construction | CSP | FC | PO | PO | PO |
| 5 | Charging Infra. Service Provisions | CSP | FC | PO | PO | PO |
| 6 | Charging Infra. Management | CSP | FC | PO | PO | PO |
| 7 | Electricity Provision for Charging Infra. | G | ND | ND | ND | ND |
| Staff Requirement | | | | | | |
| 1 | Staff needed for Operation | VM | VM | ND | ND | ND |
| 2 | Staff Needed for Maintenance | VM | VM | ND | ND | ND |

| Legend | |
|---------------------------|--------|
| Government | G |
| Finance Company | FC |
| Private Parties | PO |
| Charging Service Provider | CSP |
| Partnership | G + PO |
| Vehicle Manufacturer | VM |
| Not Discussed | ND |

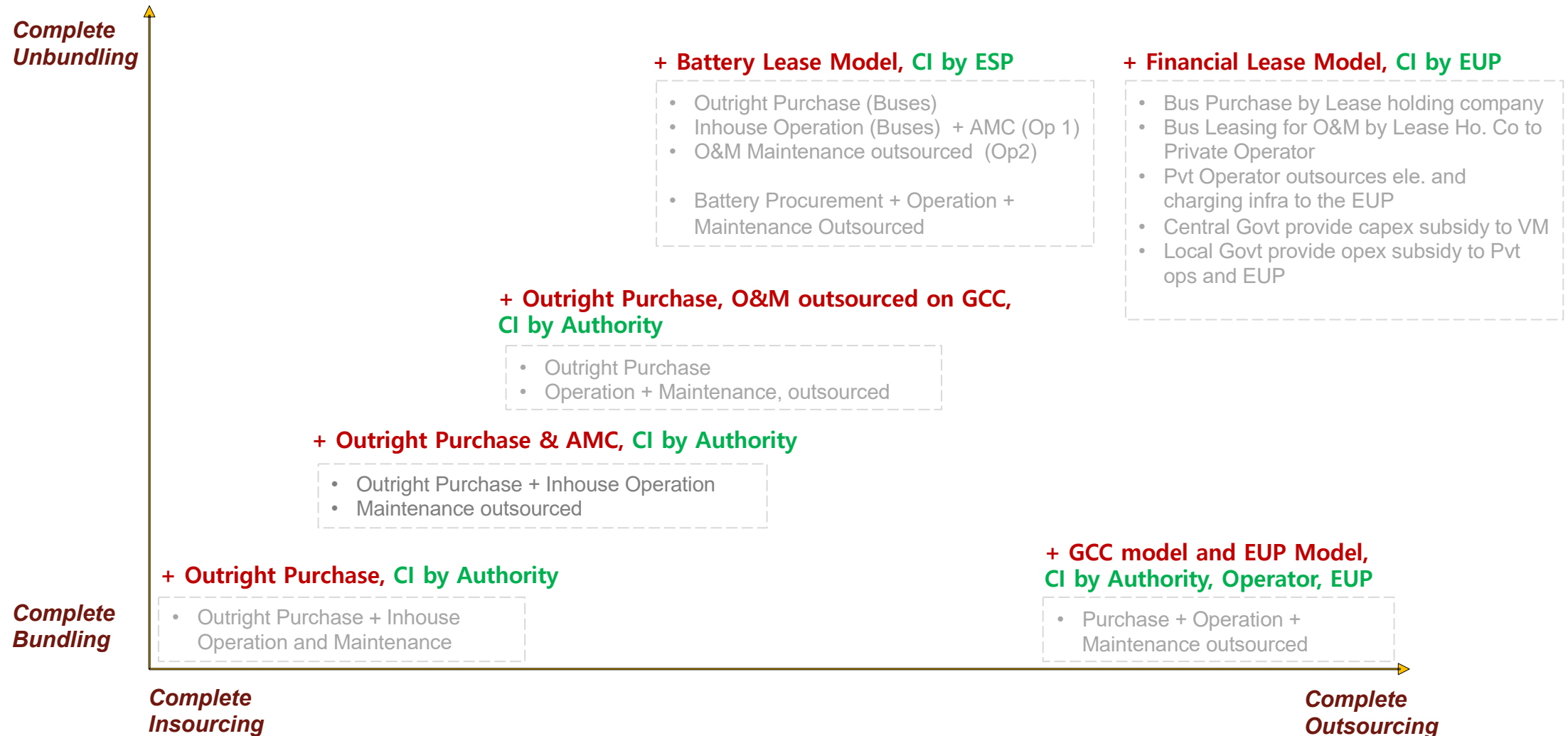
E-Bus Business Models Across the Globe



Inclined towards Unbundling and Outsourcing

Who provides Which Service?

Generic Business Models



CI = Charging Infrastructure, EUP: Energy Utility Provider

Lessons from Global Experience



Mandated OEM Participation

To reduce technological and Operational Risk



Strong Contractual Arrangements

Multiple stakeholders are involved, hence the responsibilities to be defined clearly and risk to be passed on to the party best able to bear it



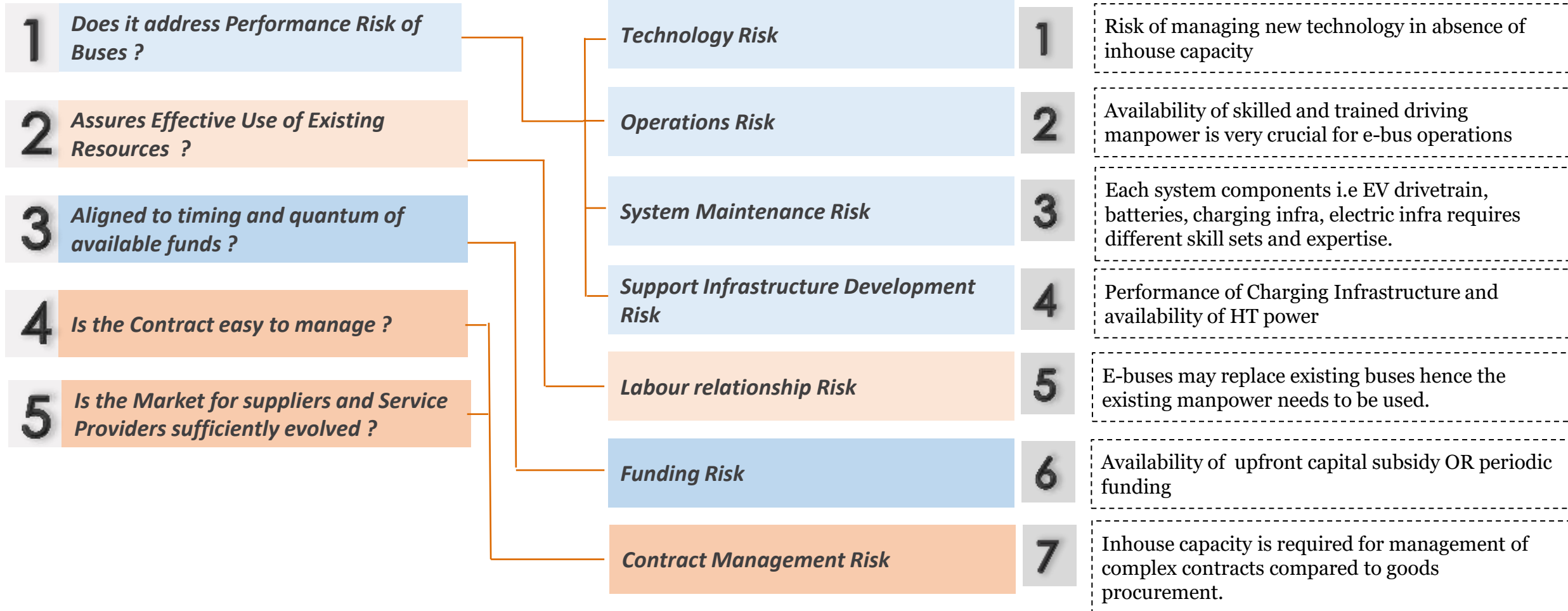
Warranty for Battery and Drivetrain

To mitigate the battery risk as it is about 40% of the bus cost

Criteria for Selection of E-Bus Business Model

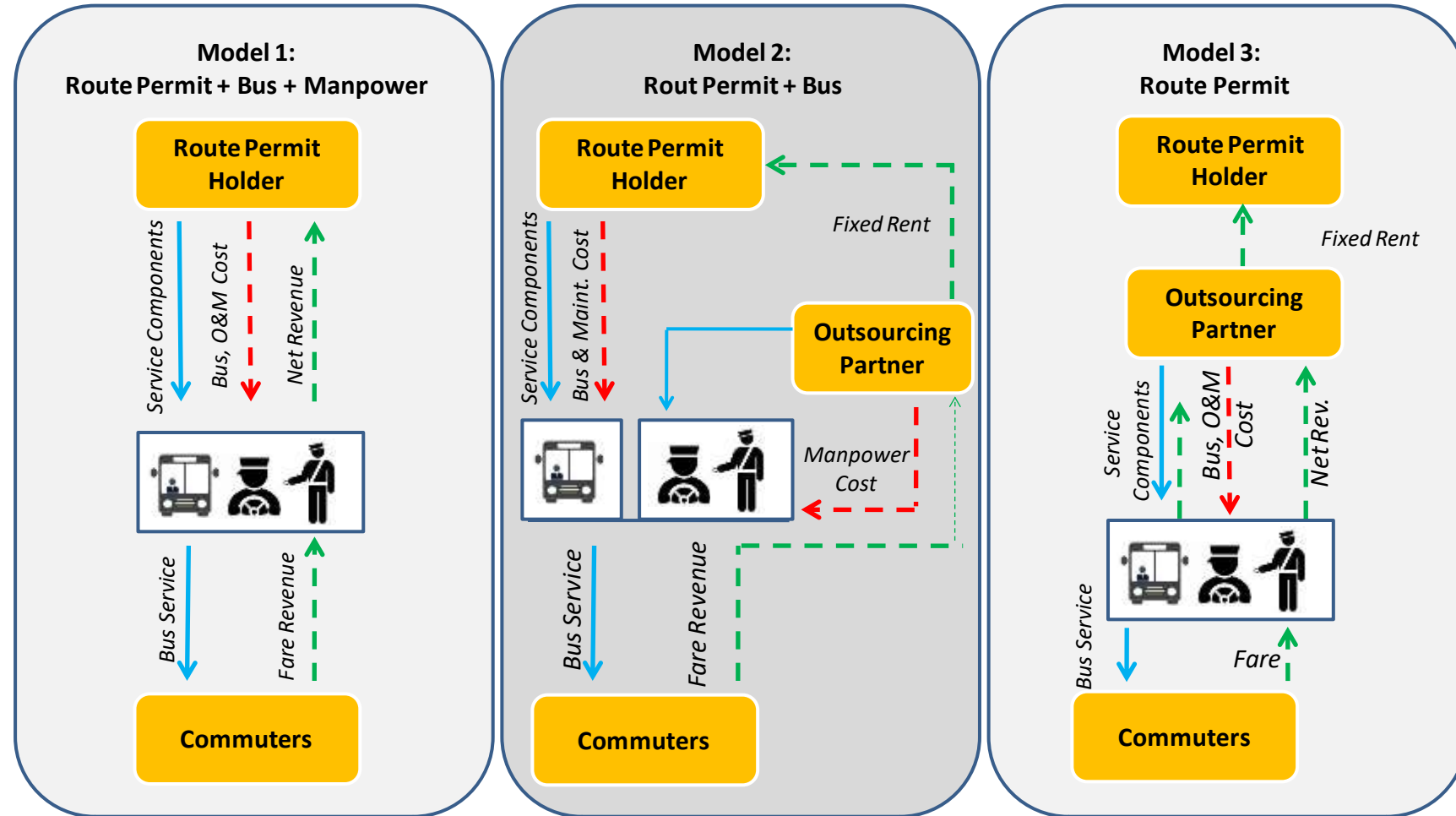
Selection Criteria

Risks to be mitigated

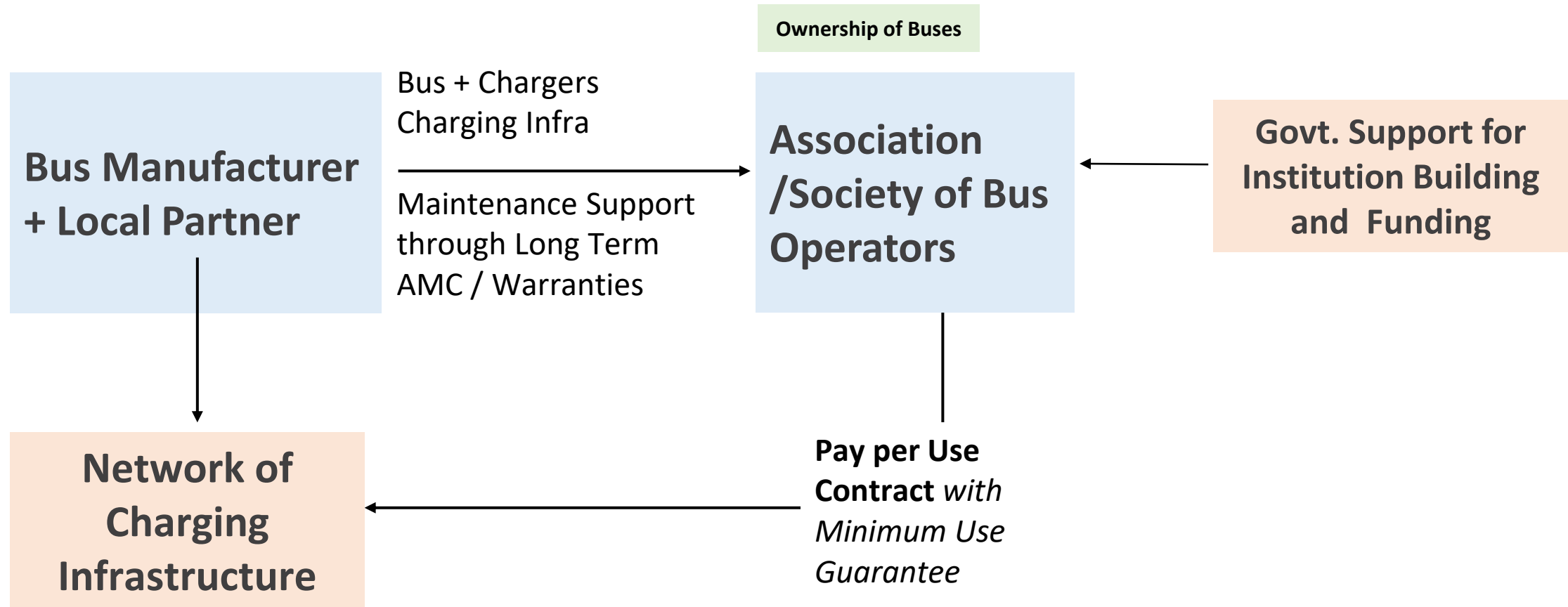


Business model in Nepal

- Small, fragmented Public Transit operators.
- Net cost basis/ low fare
- Cost recovery is assured only when
 - Occupancy is high (waiting for passengers, crowding, operations only on truck routes)
 - Use of old and unsafe vehicles comp
 - Compromise on **Comfort, Reliability and Punctuality**



Suggestions for Nepal



E – Mobility an Opportunity for Reform in Nepal

- **Public Transport Market** : Transform from small and fragmented, to consolidated, resourceful and formal.
- **Ownership of Public Transit** : Government must step in to create capable, bankable Public Transit institutions/Authority which can benefit from scale, funding ability and operational capability.
- **Planning** : Common Mobility Plan and local level planning very important. Kathmandu Transport Authority relevant
- **Business model** : can evolve as the market for E mobility changes. Initially funding challenges due to bankability issues will limit options.

Thank You

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