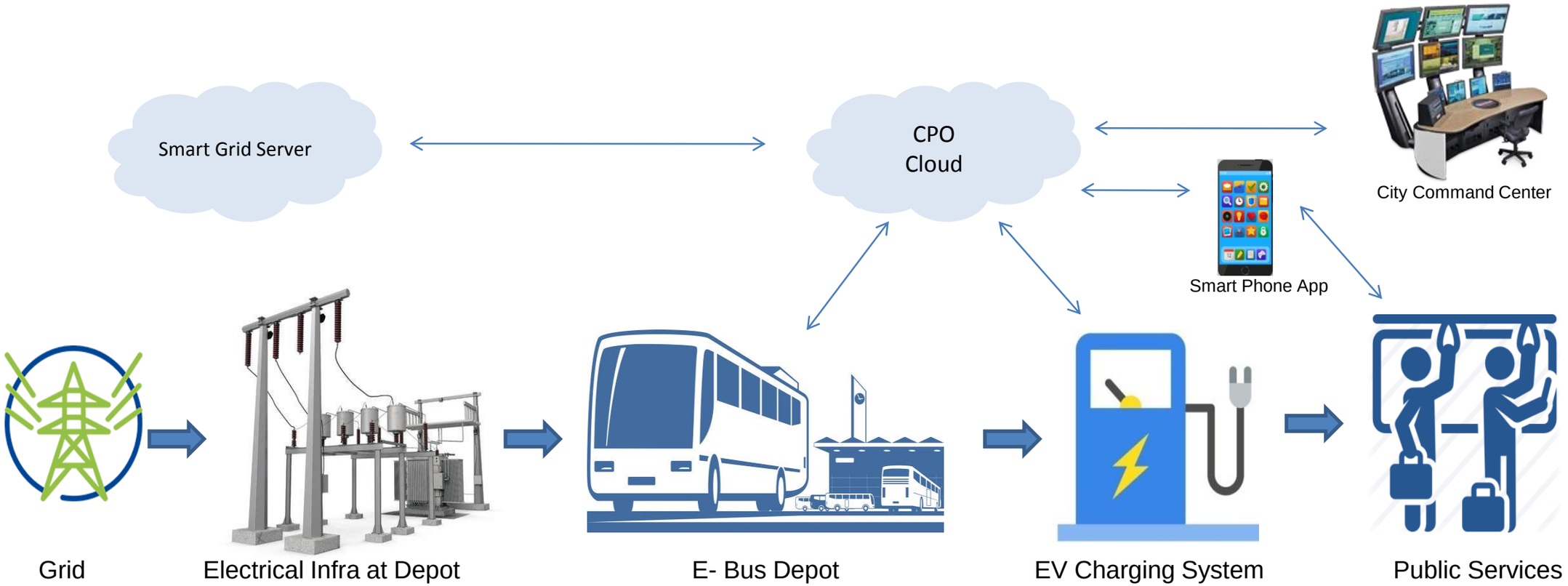
Exicom Tele-Systems
EV Charging Solutions

e-Bus Charging Infrastructure Setup and Management

17th November, 2019

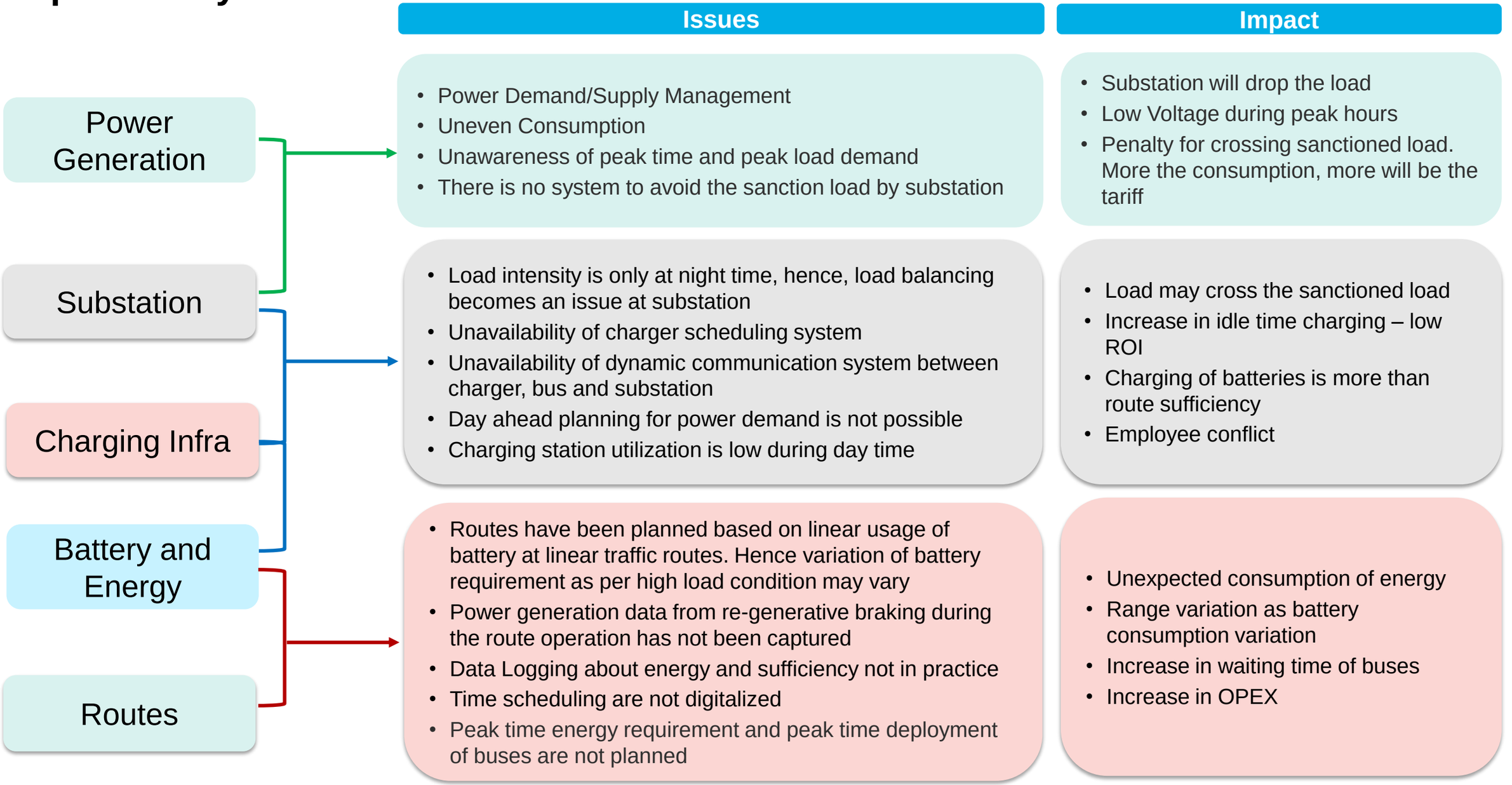
Electric Bus Eco-System



Barriers to Adoption of Electric Buses

	GENERAL BARRIERS		
	Technological	**Financial**	**Institutional**
Vehicle	• Lack of information on the advantages and disadvantages of e-buses • Range and power limitations of e-buses	• High Upfront capital cost compared to ICE engine buses • Lack of risk underwriting	• Lack of plans to replace existing buses
Operators	• Lack of information on how to start • Long range or short range • What to do with batteries post its usage in vehicles	• Rigid Financial Management & Business Models • Scaling investments past initial pilots	• Dependency on subsidy • Negative public perception
Charging Infra	• Lack of understanding of the requirements to upgrade infrastructure • Lack of skill set in operation • Grid instability	• Large capital expenses for grid infrastructure	• Limited planning for long-term implications

Impact Analysis



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E-Bus Infrastructure: Success Drivers

Land & Permissions

-Space identification and allotment

-Space under Municipal Corp, Transport Authority and Smart City should be utilized

- STU's to lead the project and provide right of way

Technology & Implementation

-Selection of Efficient Bus/ Vehicle

-Selection of Best Electrical and Charging Solutions provider

-Appointment of accurate operation management team

-Create ease of project implementation

Effective Business Model

-Adopt Effective and Efficient Business Model

-IOT - Energy Management and Scheduling Platform

-Attract System Integrators and Investors by providing mutual benefit schemes

-Provide additional revenue generation possibilities to system integrators

Land & Permissions

-Identification of right spots to create common EV Infrastructure
-STU’s Should provide locations to private players to offer Bus Charging

-STU’s Should join hands with multiple govt. departments to co-work on **City EV Infra Plan**

- Work on inter departmental support to get permissions to expedite projects

Technology & Implementation: How to be Best

"A chosen technology performs well only if put in its 'best operational' conditions"

Grid

Electrical Infra at Depot

E- Bus Depot

EV Charging System

Public Services

Bridging the Gap:

-All these above entities are working **heterogeneously**, there is a need to interconnect them
-All the stack holders should be connected and collaborate with each other, Compatibility should be ensured

ce
Timing, Terminals and

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Efficient Operation

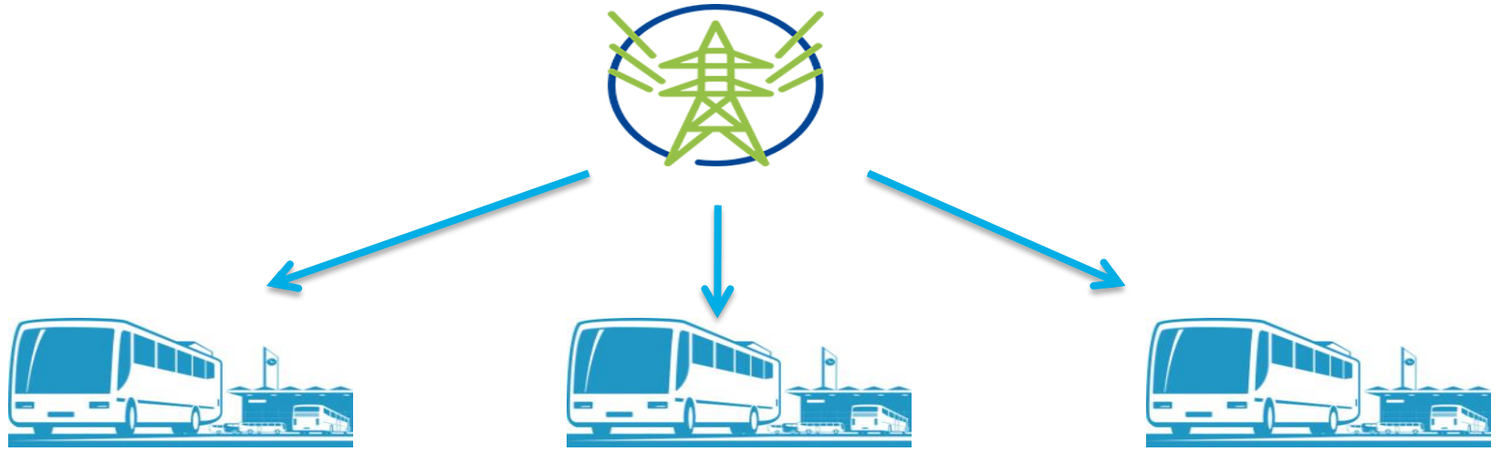
Depot Charging or Opportunity Charging?
Both the charging options are acceptable and viable but in different scenarios

	Depot Charging	Opportunity Charging
	-Flexible of Operation -Easy to manage charging infra	-Small Battery Size -Range assured within city
	-Large Battery Size -Range Anxiety	-Big Infra cost in Multi location -Complex Operation
	Good for Tier 2 Cities	Good for Tier 1 cities or intercity bus operation

Efficient Operation

Effective Grid Management:
- There could be multiple Depot/ Charging Location under a common grid, Effective use management of charging sessions will ensure efficient operation without burdening the Grid

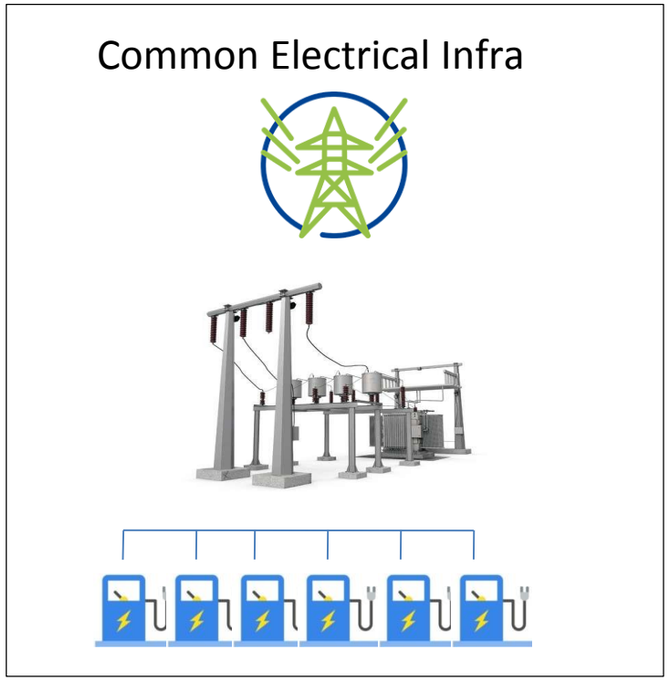
Depot 1	Bus set 1	Charging			
	Bus set 2		Charging		
Depot 2	Bus set 1			Charging	
	Bus set 2				Charging
Depot 3	Bus set 1	Charging			
	Bus set 2			Charging	

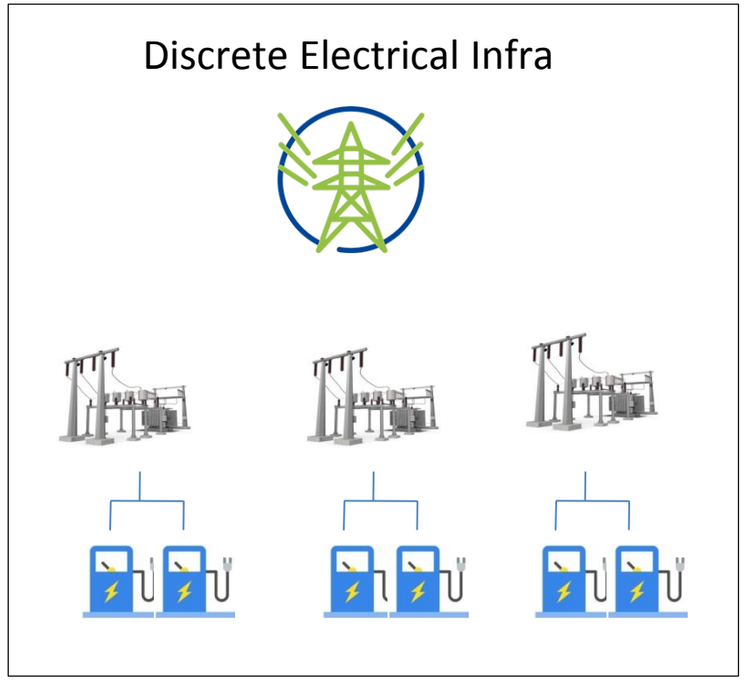


Efficient Operation

Discrete Electrical Infrastructure:
- Building discrete Charging infrastructure will help more to grid than creating a Big Infrastructure at a Depot location.

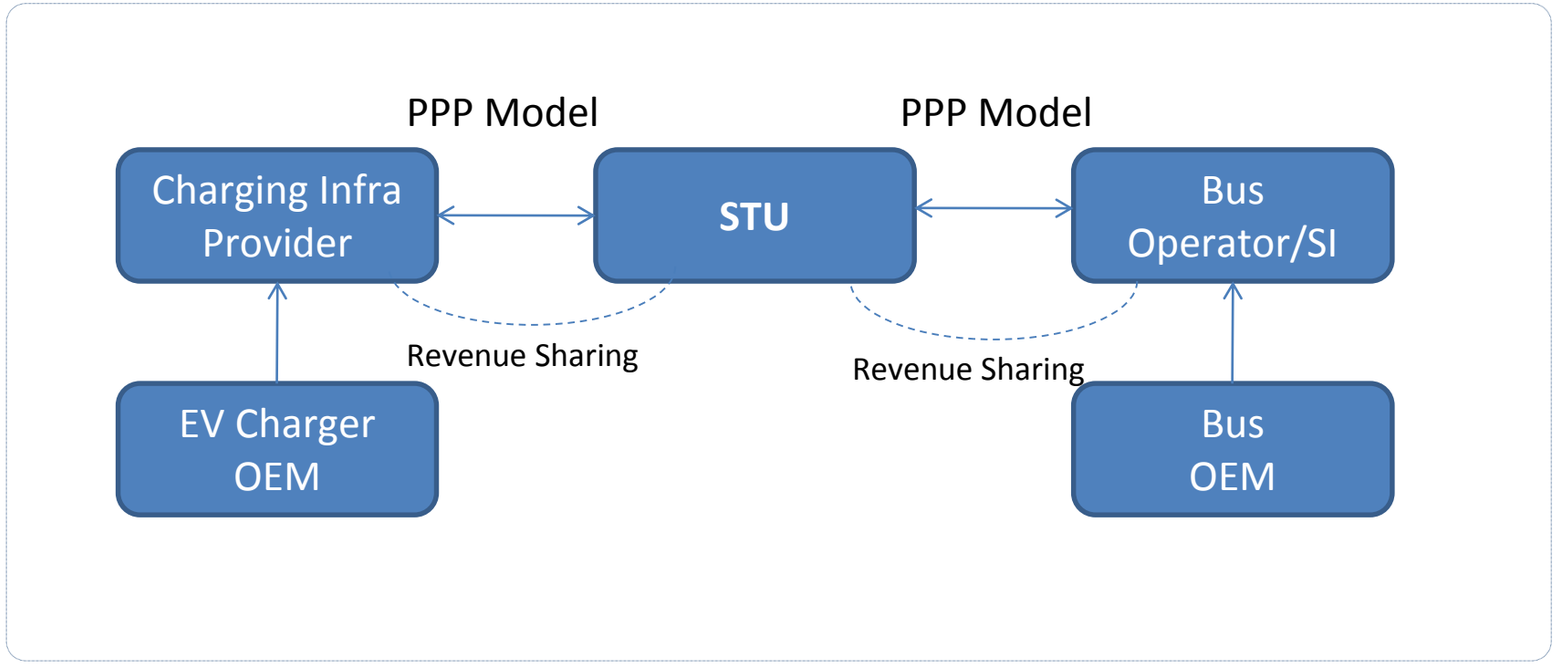
It will be beneficial with:
-Charging Infrastructure redundancy
-Optimized Power requirement in a particular Area





Effective Business Model

Effective Business Model
- We recommend to create separate operation of Bus and Charging Infrastructure, This will add more encouragement among stakeholders and create efficient model



How to Bridge the Gap?

- Impart training on multiple levels
- Encourage Stakeholdars to share knowledge

Training & Knowledge Sharing Matrix

Trainers \ Trainees	Govt. Authority	Bus OEM	Charging Infra OEM	Bus Operation Team
Govt. Authority		-Policy -Certification -Subsidy -City Infrastructure	-Policy -Grid Availability -Govt. Servers -Parking Space	-Allowance -Statutory Requirements -Code of Conduct -Route Plan
Bus OEM	-Bus Specs -Battery Optimization -User Comfort		-Bus Specs -Battery Optimization -Testing Procedure -Vehicle – Charger Communication	-Bus Features -Comfort Drive -Troubleshooting -Failure/ Rectification
Charging Infra OEM	-Product Specification -Capacity Planning -Software Infrastructure -Communication -Infra Optimization	-Product Specification -Vehicle Communication -Testing Procedure -Charging Operation		-Charging Operation -Troubleshooting -Safety Precautions -Software Applications
Bus Operation Team	-Manpower Planning -Effective Operation -Daily route planning -Field Challenges -Business Model	-Passenger Feedback -Routine Issues -Battery behavior -Deterioration	-User Feedback -Routine Issues -Charging Session behavior -Charging Pattern	

Exicom Support

Market Leader with State of Art Technology

All 3 Market Standards in DC

CCS CHAdeMO GB/T

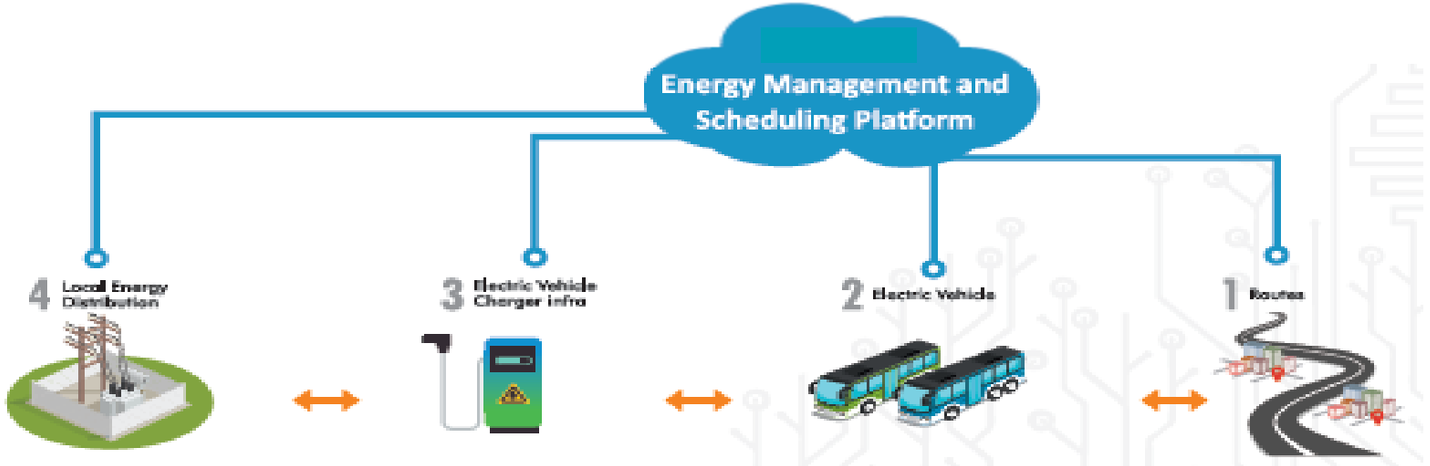
Members of

CHARIN CHAdeMO

Certification

IEC CE

IOT Based Operation Management



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Exicom is playing a key role in India’s transition to clean energy & riding the wave of disruption in mobility and electricity markets
Thank You