Charging infrastructure study
Case study Latam- Bogota

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VGMobility

Who is VGMobility?

- VGMOBILITY is Vitol's dedicated team in electrifying fleets in the Americas
- We started operations in Bogota: the largest E-Bus RFPs outside of China

Why electric mobility?

- Improve air quality and reduce noise pollution, promoting better public health without increasing the operational cost of the fleet
- Better working conditions for drivers and better quality of service to users, among others

What type of solutions do we offer?

Turnkey solutions with:

- Buses
- Depots
- Charging Infrastructure
- Energy and Energy management

Our E-mobility Business

- VGMobility- Turn-Key solution for E-mobility in the Americas
- VEV- Fleet Charging in Europe
- SunMobility- Battery swapping in India

E-Mobility project analysis

Thing to know before executing a project for e-mobility

Location

Client

No. of buses to be changed
Buses + Reserve fleet

Type of bus
Eg: 10, 12 or 18-meter electric buses

No. of Depot
To be defined

Average km/bus/day
Eg: 115-220 km

Project duration
10 to 15 years

Recommendations for a successful implementation of e-mobility

Electromobility is not only the acquisition of the vehicles. Is an ecosystem that is needed to implement successfully the solution

Implementation

Grid Connect	▪ Enabling the patio/depot location for large scale e-mobility ▪ Assessing the requirements and timing to provide sufficient energy ▪ Key criteria: local legislation, power availability and transparency in grid connection responsibility
Energy supply	▪ **Analyze pricing/ tariffs for electric mobility** ▪ Understanding energy supply requirements and optimization ▪ Key criteria: local market regulation, access to long term PPAs
Depot	▪ Ensure a 10 to 15-year depot availability ▪ Allow charging flexibility among different depots ▪ **Allow alternative uses different from public transport** ▪ Key criteria: appropriate sizing/ timing of the civil works and electrification
Charging infra	▪ **Flexible charging schemes based on operational requirements** ▪ **Sizing, selection, purchase and installation of charging infrastructure** ▪ Warranty and maintenance package/spare parts availability ▪ Key criteria: product versatility, local representation and track record
Provision of Electric Vehicles	▪ Select the bus according to the operation requirements and the bus typology available on the market
Buses, batteries and energy advisory	▪ **Implement smart charging solutions** ▪ Management of buses, their batteries and the entire electrical component of the operation, seeking permanent efficiencies ▪ Key criteria: asset utilization and potential second life of the assets

Grid connection and energy supply

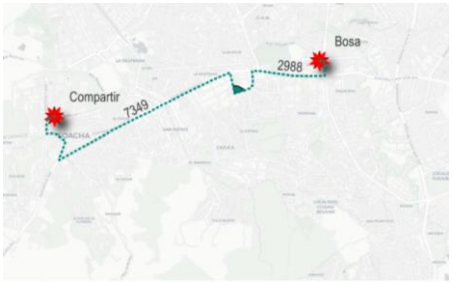
Energy and grid connection availability are paramount to a successful e-mobility project

Grid Connect

- 286 buses require up to 14-25MW
  - Is there enough grid capacity to provide 14-25MW?
  - What is required to bring 14-25MW (either as a whole or by patio) to each garage?
- Distribution
  - How does the distribution chain work?
  - Which is the local utility company?
    Who pays for the grid connection from the sub-station to the patio?
  - How far is the substation from the different patios?
  - How long does it take to get the grid connect?

Energy Supply

- Type of energy
  - How is energy generated in the country (energy matrix)?
    Hydropower, Methane Gas to Power, Thermal, Eolic, and Solar
  - Are there renewable energy sources?
  - Is there available energy to be purchased for electric mobility (1150 MWh/month)?
- Tariff
  - Does the energy cost vary during the day?
  - Are there long-time contracts (Power Purchase Agreement - PPA)?
    5, 10 or 15 years
  - Are there any taxes related to the energy?



Power requirement
8.4MW

Distances:
Perdomo – Bosa Substation: 3 km
Perdomo – Compartir substation: 7.3 km

Charging substations for Perdomo depot with available power

Depot and charging infrastructure

It is necessary to develop a tailor-made solution depending on the terrain and available partners

Depot

- Design
  - Location:
  - Who is the owner of the depots?
  - Dimensions and available area:
  - Routes
  - Topography
- Charging/operation
  - Are there night operational restrictions?
  - Which operations are preformed at the garages?
  - Charging window requirement – (is there daily charging opportunity?)
- Providers
  - Are the local providers with civil-electric experience?

Charging infrastructure

- Energy voltage
- Certifications required for the design
  - Is there a regulator/does the local distribution company ask for a certificate?
- Provider preferences:

Buses, battery and energy advisory

Energy and grid connection availability are paramount to a successful e-mobility project

Buses, batteries and energy advisory

- Smart-charging solution
  - Has the Operator considered to implement a smart charging solution?
  - The charging infrastructure usually doesn't include the necessary elements to deploy a smart charging solution
- Maintenance monitoring
  - How is the maintenance monitored? Through an ERP?
  - Does the Operator have access to the information / reports?
- Operation monitoring
  - How is the operation monitored? Through a Fleet Management System (FMS)?
  - Does the Operator have access to the information / reports?

Types of buses

There are mainly 2 types of electric buses for traditional public transit operation (excluding BRT systems)

40 pax / 6m bus

- Length: 6.5 m
- Width: 2.1 m
- Weight: 9.5 ton approx.
- 40 pax (18 seats, 22 standing)
- Battery capacity: Unknown
- Initial Autonomy: Unknown

50 pax / 10m bus

- Length: 10 m usually
- Width: 2.4 m usually
- Weight: 14 – 14.5 ton approx.
- 50 pax (22 seats, 28 standing)
- Battery capacity: 280 kWh
- Initial Autonomy: 315 km

80 pax / 12m bus

- Length: 12 m usually
- Width: 2.5 m usually
- Weight: 20 – 21 ton approx.
- 80 pax (36 seats, 44 standing)
- Battery capacity: 350 kWh
- Initial Autonomy: 280 km

Considerations for

Road dimensions

Autonomy (km/bus)

Low floor
High floor bus

Air Conditioning

Charging standard
N. America/EU/China/ Japan

Types of chargers and energy required – 12m bus

Different charging solutions exist depending on the need of the client and the operational constraints

**Calculations are based on 286 buses, 12m bus and a 350-kWh battery, 5hr simultaneous charge for Colombia*

Type	Integrated charger	Sequential charger	Split-type charger
Capacity	180kW DC Charge	150 kW	360 kW
Charging strategy	Simultaneous 2 buses	Sequential 4 buses	Simultaneous 12 buses
Cabinets	143	121	50
Depot boxes / dispensers	N/A	286	143
Grid connection	25.7 MW	18.2 MW	18 MW
Charging infrastructure CAPEX	+++	+++	++
Footprint	+++	+++	++

Considerations for our projects

Night window	Number of user unit guns	Depot area
5 hours	**286**	**130 - 150 m2/bus**

Operation 1- VGMobility Fontibón

Location/Period	Bogota, Colombia December 2020- 15 Year operation
Assets provided	60 e-buses (12 meter) + 60 e-buses (10 meter) Concession agreement
Charging infrastructure	56 cabinets – 112 guns Integrated 150 kW (StarCharge)

Contract 1	Contract 2	Contract 3
• Grid connection • Depot Design construction and maintenance • Charging Infrastructure	• Bus provision and maintenance supervision	• Bus Operation (Drivers+ bus maintenance+ energy contracts)

Things to improve

- ✓ Maximize use of charging infrastructure
- ✓ Optimize the parking/ charging
- ✓ Make the charging stations talk with the other two contracts

Operation 2- VGMobility Suba

Location/Period	Bogota, Colombia February 2021- 15 Year Contract
Assets provided	91 e-buses (12 meter) Fleet renewal in an existing contact
Charging infrastructure	46 cabinets – 92 guns Integrated 150 kW (StarCharge)

Contract 1	Contract 2	Contract 3
• Grid connection • Depot Design, construction and maintenance • Charging Infrastructure	• Bus provision and maintenance supervision	• Bus Operation (Drivers+ bus maintenance+ energy contracts)

Things to improve

- ✓ Maximize use of charging infrastructure
- ✓ Optimize the parking/charging
- ✓ Make the charging stations talk with the other two contracts

Operation 3- VGMobility Perdomo

Location/Period	Bogota, Colombia September 2022- 1 year preoperative + 15 year operative
Assets provided	195 e-buses (10 meter) + charging infrastructure + depot - Concession agreement
Charging infrastructure	21 cabinets – 93 dispensers – 186 guns Split-type 360 kW (StarCharge)

Contract 1	Contract 2
• Grid connection • Depot Design, construction and maintenance • Charging Infrastructure • Bus provision • Bus maintenance supervision	• Bus Operation (Drivers+ bus maintenance+ energy contracts)

Things to improve

✓ Authorization to maximize the use of the charging infrastructure

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Electric mobility for a sustainable future.

VG Mobility are experts in electrifying transportation. Partnering with Vitol's worldwide presence, we are uniquely placed to help your business achieve its low-carbon goals and meet the requirements of cities looking to move into electromobility.

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