ENERGY INDUSTRY INSIDER

Q4 2019 Pulse
Electric Vehicle Charging Infrastructure

FutureBridge

WHAT'S INSIDE!

- Shared mobility shifts towards electrification with pick in partnerships and investments
- European utilities continues to dominate M&A landscape
- Off-Grid EVSE's powered by renewable energy
- Blink Charging clocks ~40% increase in Q3 revenue, baking on its various business models offerings

01

Pulse Themes:

a. Electrification of Ride-Sharing Services
b. M&A activities companies remains steady

02

Quarterly review of Framework Update / Project Tracker / Regulatory Policy Updates / Technology Developments

Off-Grid EV charging Stations for Remote Locations

a. H2-Powered EV charger based on alkaline hydrogen fuel cell technology
b. Off-grid Solar-Storage Systems based EV Charging

03

Startup Tracker highlights

a. Summary, Geographical Split
b. Highlights of Key Start-up

01 Emerging Trends

EV adoption grow in cab aggregators

Ride sharing companies are increasingly adopting electric vehicles. These companies are preferring partnerships to go ahead with EV adoption plans.

Since the turn of 2019, the industry has witnessed multiple partnerships between ride sharing companies and EV charging service providers/EV manufacturers, as these cab aggregator gear up for future mobility solution.

Market Developments

October

Set-up EV Battery Swapping Stations and Charging Stations across New Delhi

OLA BSES

50 eGolf models for company's app-driven "Move" service in Rawanda

Evgo to find out ways to accelerate use of electric vehicles (EVs) on the ride-sharing platform in US.

Uber EVgo

2019

Mahindra and Mahindra EV on Uber's platform includeing e20 Plus and the eVerito

Uber mahindra

November

Setting up of 20 EVgo fast charging stations across the greater Denver metro area

lyft EVgo

Provide EV charging when drivers opt to use the Express Drive program

lyft electrify america

December

Delivery of 20 Ioniq EVs and Investment by Hyundai-Kia in Grab

HYUNDAI KIA MOTORS Grab

November

DEVELOPMENTS

Emerging Trends

As cities and governments amends EV based ride-sharing requirements for cab aggregators, ride hailing service providers are shifting from hybrid cars to all-electric cars over the near future and constantly increasing their fleet of EV.

Support to build-out charging infrastructure will continue to be crucial along with range of policies to encourage further EV adoption and use in ride-sharing services.

FutureBridge Insight

EV adoption grow in cab aggregators

Government's across the globe are in process of tightening up policies to promote EV based shared mobility.

While in Los Angeles, Uber and Lyft are likely to be in skirmish with city's new policy for aggregators to go all-electric. In China, Shenzhen has already declared no licenses for vehicles that aren't pure electric, which is also being followed by Southern Guangzhou too. London is also stated to follow the line.

These regulatory changes has opened new opportunity for EVSE and charging solution providers to cash-in as cab aggregators integrate and invest in increasing number of EVs in their fleet.

Electrification of Ride-Sharing Services

High growth in EV-based shared mobility services

Why ?

Electric Vehicle based ride-sharing could be critical to reducing carbon emissions as ride-sharing firms may find themselves increasingly drawn into the discussion at the intersection of transportation and climate change

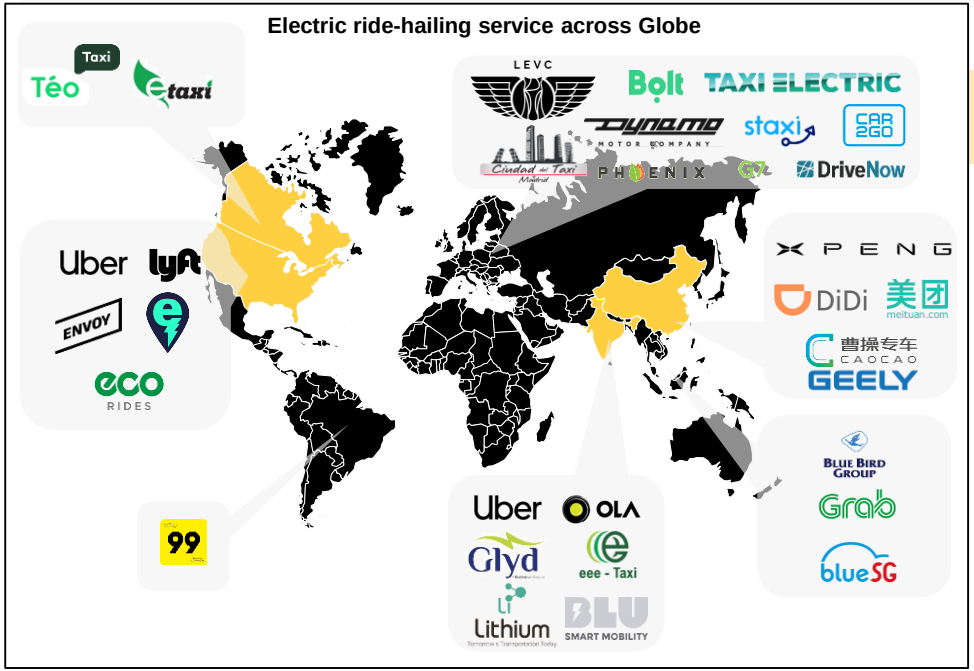
Benefits :

3-5 Yrs.
Length of recouping the additional cost of the vehicle

Do not require oil changes

Low cost for repair and maintenance

Electric ride-hailing service across Globe



Operation Model:

- Free-floating systems - cars can be parked anywhere across public charging station
- Hub/depot System : cars must be left in designated parking spots, usually, own chargers

In-app features to facilitate electric ride-hailing :

Uber

Long trip notifications on distances for trip requests to help drivers avoid running out of charge.
Drivers are matched with passengers traveling to destinations, near available charging stations.

DiDi

Shows nearby available charging stations, thereby providing a one-stop-shop for driving and charging.

lyft

Option for passengers to choose a hybrid or EV

EV adoption grow in cab aggregators

Charging infrastructure is a critical enabler of electric ride-hailing, and infrastructure availability remains a barrier in many markets.

In order to address this concern, ride-hailing companies are provided funding or partnered with other charging providers to deploy stations.

Electrification of Ride-Sharing Services

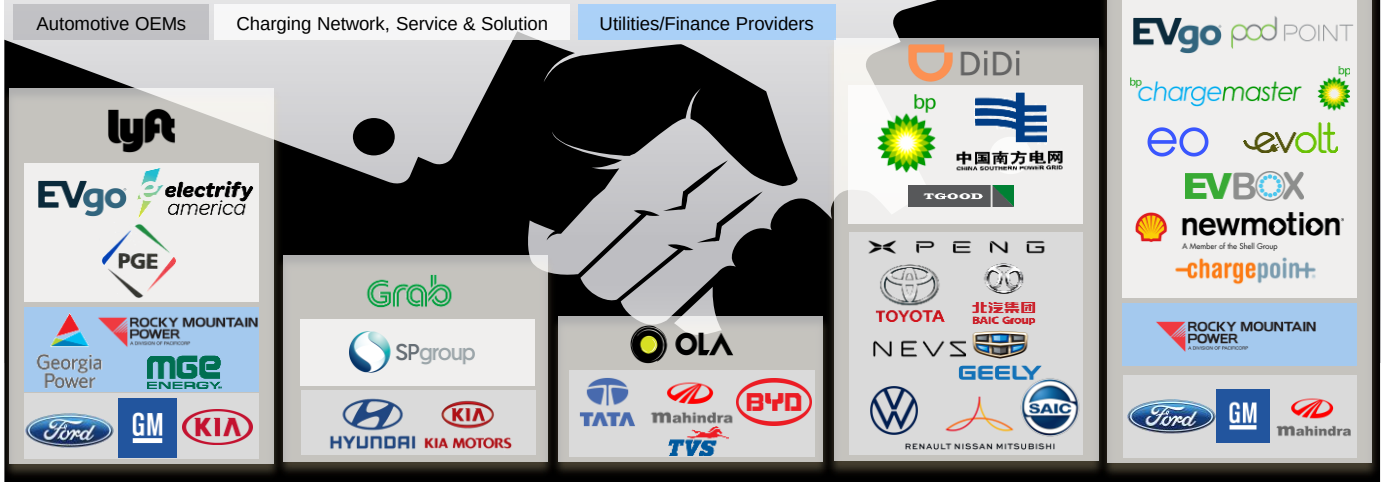
Partnerships shaping the market

Right EV models is a critical precursor to greater deployment of EV in ride-hailing service. Partnership with Automotive players mean that drivers have access to EV via short-term lease agreements at lower costs.

Partnership with utilities, includes measures such as installing public fast charging stations, and preferential rates for drivers. Also, help utilities understand, plan, and better manage the electric loads of these commercial fleets.

Major Partnerships

Charging infrastructure product and network availability and coverage of public and fast chargers could be a winning factor in how quickly these fleets become electric, and how business models evolve around shared and/or automated mobility.



M&A continues as big players expands

The push from governments and people for shift in mobility is insisting key players to enter electrification value chain, and transform their business models through M&As or internal developments.

LS Power acquired of one of the largest network of EV charging. ABB also invested to became the newest European company to expand in China after BP's push, while Statkraft strengthened its presence in Germany-Scandinavia region.

Market Developments

October 2019

ABB bought a majority stake in Shanghai Chargedot New Energy Technology Co., intended to boost ABB's presence in the fast-growing Chinese EV market, and strengthen the company's relations with makers of electrically powered trucks and cars. ABB has been working with BYD and Daimler since 2016, supplying its DC Wallbox units for charging Denza electric vehicles.

November 2019

EDF Group announced acquisition of start up company working in battery storage and infrastructure for electric vehicle charging, **Pivot Power**

December 2019

LS Power has announced the signing of agreement with Vision Ridge Partners for the acquisition **EVgo**.

December 2019

Statkraft has acquired ownership in the Norwegian electric vehicle charging company **Grønn Kontakt.**

The move comes after the company made acquisition in German EV charging market with **E-WALD** and **eeMobility** for further growth within the European charging market.

DEVELOPMENTS Emerging Trends

The acquisition of EVgo is a big change in US markets as the LSPower investment compliments its earlier acquisition of DER company, Cpower, and existing fleet of power generation assets, making it a company present across the complete value chain of EV charging.

ABB has also made interesting move, as the company will hold charging network in a market where it already supplies EVSEs.

However, in line with the earlier trends, European utilities still dominated EV charging M&A activity in this quarter, to gain additional market share and cash-in from continued policy support.

FutureBridge Insight

FutureBridge Insight on EV charging infrastructure

- The account of partnerships in past year clearly indicates that ride-hailing companies are equipping with future ready solution to charge EVs without hassle to drivers. Not only about the availability of EV charging points, these companies are also partnering for supply of low-cost EVs and lower rates of charging.
- As utilities and big oil companies dominates the M&A landscape of globe, the investments from IPP and developer like LS Power, might as well trigger other diverse companies to enter EV charging value chain.

What should you investigate ?

How are cab aggregators partnering with various EV charging stakeholders and utilities?

What are the untapped opportunities and business prospects as ride-hailing services add more EV fleet?

What are the best suitable routes to enter and expand in EV charging value chain?

02 Quarterly review of Technology Developments

H-Power™ EV Charger System – H_2-Powered EV charger based on alkaline hydrogen fuel cell technology

AFC Energy, a UK based company, has launched H-Power electric vehicle (EV) charger based on alkaline hydrogen fuel cell technology. This charging system overcomes issues associated with lack of strong grid infrastructure coverage which is needed to provide rapid EV charging anywhere.

Alkaline fuel cell system development company, AFC Energy's H-Power works through a combination of HydroX-Cell(L)™ fuel cell and battery storage or supplementary grid power.

- ✓ The self-contained, zero emission charging system overcomes issues associated with poor grid coverage to provide rapid electric vehicle (EV) charging anywhere it is needed.
- ✓ Mechanical and electrical components can be housed within an ISO container which is insulated and fitted with the environmental controls to allow operation in a wide range of climates without the odour or noise associated with diesel generators.

The HydroX-Cell(L)™ H-Power EV Recharge system delivers a first in commercialised off-grid hydrogen fuelled EV recharging for C&I vehicles.

Company has made hydrogen sourcing and auxiliary equipment available from third -party suppliers for integration into the final product solution.

Key advantages:

- ✓ Modular and rapid charge ready
- ✓ Removes or delays the need for costly grid augmentation and upgrades
- ✓ Can be operated completely off grid or in conjunction with grid power
- ✓ Scalable from 2 to over 100 charge points at a single site with limited increase in footprint.

En-route and destination applications:

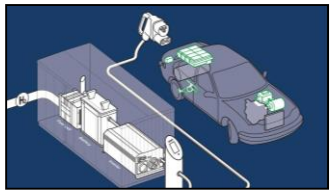
Motorway Service Centers | Multi-storey/ Open Car Parks | Mines | Hotels, Supermarkets and Shopping Malls | Commercial Fleet Hubs | Logistics Hubs | Construction sites

Available in three standard configurations

Model	L20	L160	L400+
Charge Point Support (rapid)	2-8*	15-30	25-100
Storage Capacity (KWh)	72-288	288	360
Recharge Rating (kW)	20	160	400+
Noise/Odour	Low		
Fuel	Hydrogen / Ammonia		
Availbility	Dec 2019	June 2020	June 2021

100% Clean Electricity

Capable of Level 2 or 3 fast charging



Joint Solar based EV Charging Research Project – Off-grid Solar-Storage Systems based EV Charging

Launch of final stage commercial field trials of **Joint Solar Charging Research Project** to test environment-friendly and cost-efficient charging options for EV owners with solar power chargers that do not require updates to grid connections and can operate in areas without grid power.

Project Components

Funding VICTORIA State Government **AU$210,000**

Evaluation Period **200 Days**

NISSAN

- ✓ Nissan is performing the testing and evaluation of the project using multiple Nissan LEAF EVs.
- ✓ Project is being powered by solar PV at Nissan's office.

DELTA

- ✓ Delta developed project's cabinets that combine a solar system with battery storage and EV charging.
- ✓ The new solar integrated technology from the project will bring two charging platforms to the market.

CSIRO

- ✓ CSIRO integrated technology with solar and battery systems to charge multiple EV quickly, in various weather. Each station is capable of charging up to four EVs at a time.
- ✓ It tested a range of heat management strategies to ensure batteries charge and discharge efficiently.
- ✓ The system completed initial tests on performance in various environmental conditions at the CSIRO Monash facility's temperature control chambers.

AC Mini Plus EV Charger
Adjustable operating current
RFID charging authentication
Multiple communication options

7kW
Recommended PV power
97.2%
Peak efficiency

RPI Series Photovoltaic E5 inverter

BX 6.0 Li-Ion Battery
6kWh
Nominal capacity
4.8kWh
Usable capacity (80% DoD)
$LiFePO_4$ Panasonic

5kW
Two Solar Charging Units
10kW
Two Solar Charging Units

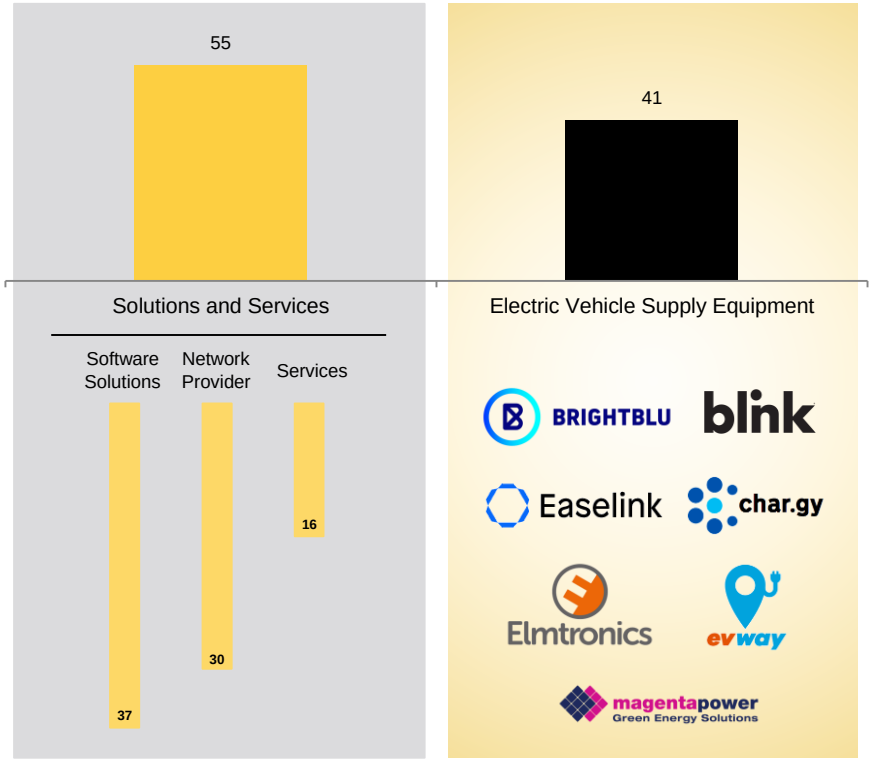
15kW Solar System

The charging stations were developed with the Australian household in mind, overcoming challenges associated with EV charging, including managing temperatures on even the hottest days.

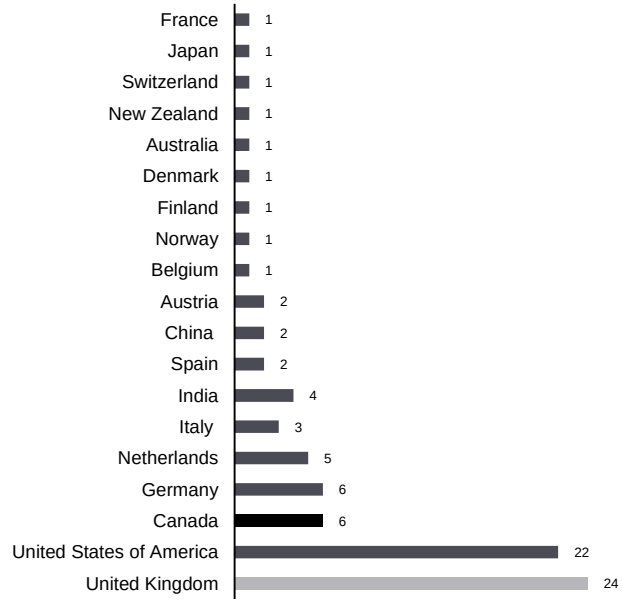
03 Startup Tracker highlights

Startup Tracker summary Q4 2019

Distribution by technology segmentation



Distribution of Start-ups by Country



United Kingdom and United States of America dominates, in terms of origin of startups. The push from governments in Major cities of UK and California has led to a number of startups popping up in high demand market.

Highlights of Key Start-up

blink

Blink Charging Co. is the owner, operator, and provider of EV charging equipment and networked EV charging services.

Products:
- Level 2 (AC) EV charging equipment
- DC Fast Charging equipment

Services:
- Blink Network
- Blink Mobile App

Blink (in Numbers)

14,719 Total Charging units

blink Network
- Commercial **5,014**
- DC Fast **105**
- Residential **1,563**

391 Level 2 Units (Other networks)

7,646 Residential (Non-networked)

as of Sep, 30, 2019

Direct Competitors

chargepoint, EVgo, SemaConnect, evconnect, ClipperCreek

Partnerships

YSB Ya'acobi Brothers Group, EUNICE ENERGY GROUP, DSPOne Co., Ltd.

HUBJECT

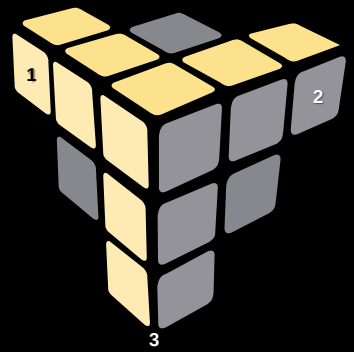
Blink's nationwide network of chargers will become accessible to all EV drivers participating in Hubject's charging platform using their provider's membership card and app.

Business Models

- ✓ **Blink offers its Property Partners a range of business models for EV charging equipment and services. that generally fall into one of the three business models.**
- ✓ **The company owns a large percentage of its network stations, which allow it to control the settings and pricing for EV charging services, bring price uniformity and greater brand management.**

Turnkey

Blink owns and operates the EV charging station, undertakes and manages the installation, O&M and related services, and Blink keeps substantially all of the EV charging revenue.



Hybrid

Blink provides charging equipment, while Property Partner incurs installation costs. Blink then operates, manages the EV charging station and provides connectivity to the Blink Network. Blink shares a greater portion of revenue.

Host Owned

Blink provides site recommendations, connectivity to the Blink Network and optional-paid maintenance services. Property Partner purchases, owns and manages EV charging station, while incuring the installation costs of the equipments and keeping substantially all of the EV charging revenue.

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