

ENERGY

INDUSTRY

INSIDER

Q1 2020 Pulse

Electric Vehicle Charging Infrastructure

FutureBridge

WHAT'S INSIDE!

- EV charging companies are partnering with technology providers to improve the EV charging infrastructure
- Ultra- fast EV charging are gaining attention in the market
- Impact of Covid-19 on Electric Vehicle charging infrastructure
- EV charging giants are investing on self plug-in charger or mobile EV charger

01

Pulse Themes:

- a. Inorganic Growth: The Mantra for Business Expansion in EV Charging Market
- b. Ultra-Fast Charging Technology to Improve EV Charging Experience
- c. Impact of Covid-19 on EV Charging Infrastructure

02

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

- a. Self-plug-in Charging Technology
- b. Integration of Street Lights with EV Charger

03

Startup Tracker Highlights

- a. Freewire Technologies

01

Emerging Trends

M&A continues as big players expands



Energy Efficiency Services Ltd, a JV under PSU of Ministry of power, has been spearheading EV charging infrastructure revolution in India with multiple partnership. EESL follows innovative model of demand aggregation and bulk procurement, receiving electric vehicles and chargers at a significantly discounted rate as compared to the actual market value.

Inorganic Growth: The Mantra for Business Expansion in EV Charging Market



March 2020

Vattenfall entered into agreement with Statkraft to transfer ownership of its electric vehicle business in the UK. Post-acquisition, Statkraft will take on the current electric vehicle charging network and staff from Vattenfall in the UK

February 2020

State-owned Energy Efficiency Services Ltd (EESL) has signed the Memorandum of Understanding (MoU) with BSNL for installing charging stations for electric vehicles. EESL will set up public EV charging stations at 1,000 BSNL sites in a phased manner across the country



February 2020

ChargePoint has announced the partnership with NATSO to set up \$1 billion in capital to deploy charging at more than 4,000 travel plazas and fuel stops by 2030

The partnership was formalized as part of a Memorandum of Understanding signed to establish public-private partnerships at off-highway fuel retailers across the nation



DEVELOPMENTS Emerging Trends



The quarter has witnessed multiple partnerships and collaboration of EV charging companies with service providers to improve EV charging experience. Countries like India and UK have witnessed multiple partnership & collaboration to expand the EV charging stations in the country



Companies are opting to acquire or partnership with other to expand portfolio and market share

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The acquisition of Chargedot Shanghai New Energy Technology Co., Ltd is a big change in Asian market as the Chargedot has made a significant contribution to the uptake of electric vehicles in China.

It is expected to further strengthen ABB's relationship with leading Chinese electric vehicle manufacturers and broaden the company's e-mobility portfolio with hardware, software and service offerings, developed specifically for local requirements

Inorganic Growth: The Mantra for Business Expansion in EV Charging Market



January 2020

FSG Smart Buildings, a division of Facility Solutions Group has partnered with ChargePoint Inc., provide turnkey electric vehicle (EV) charging solutions to the commercial market, including system design, installation, commissioning, project management and service from a single-source provider

January 2020

Eaton has collaborated with Green Motion to enable a smooth integration of intelligent EV charging and energy storage solution for commercial buildings, residential housing and shopping malls. The combined solution will enable building owners to access the power capacity required to install the EV charging infrastructure as needed



March 2020

ABB has completed acquisition of a majority stake in Chargedot Shanghai New Energy Technology Co., Ltd.

Chargedot supplies AC-DC charging stations, as well as the software platform to a range of customers



January 2020

Ashok Leyland has signed the Memorandum of Understanding (MoU) with **ABB India** to expand the eco-system for efficient and greener electric bus transportation systems in India.

The companies will partner to develop a pilot electric bus based on ABB's innovative flash-charge technology, TOSA, which tops up the battery in just seconds



February 2020

MINI Electric has announced the signing of agreement with OVO Energy providing an offer of 5,000 free, green miles to new MINI Electric owners in the UK. Including free Polar Plus membership, which provides unlimited access to the UK's largest EV charging network of over 7,000 public charging points

January 2020

Elitegroup Computer Systems has partnered with IoTecha Corp. to bring an advanced Smart AC Charger, named as LIVA™ 80A Smart AC Charger, coupled with power of IoT through IoTecha's IoT.ON™ platform.

The integration of these service & platform has resulted in valuable features such as Plug and Charge, Smart Load Management & Predictive Maintenance



Companies are investing with more ambitious focus on rapid charging



Iberdrola SA announced an investment of EUR 150 million (USD 170.5m) to install 150,000 charging points in households, corporates and on public highways (both urban and interurban) over the next five years.

The main focus is to invest in ultra and super-fast infrastructure (150 kW and 350 kW) with a capability to charge the vehicles in 5 to 15 minutes

Ultra-Fast Charging Technology to Improve EV Charging Experience



At CES 2020, EVBox launched its latest next generation of electric vehicle (EV) ultra-fast chargers, along with redesign of its HPC Ultra-fast charger. The company introduced a fast charger EVBox Troniq 100 and re-designed ultra-fast charger EVBox Ultroniq.

EVBox Ultroniq offers ultra-fast charging with a powerful output of up to 350 kW, and its robust design will maintain optimal performance even in extreme weather conditions



ABB has received a contract from IONITY to expand its network with additional 324 high-power electric vehicle (EV) chargers, with an output capacity of 350 kW, as part of the second phase of its network expansion. The chargers are to be rolled out in 24 countries by the end of 2020.

In 2018, ABB was already appointed as technology partner to deliver 340 high-power chargers to IONITY and was the first to market 350 kW chargers featuring liquid cooled cables in Europe



DEVELOPMENTS Emerging Trends



Companies such as Iberdrola, ABB, EVBox, Volkswagen, Porsche etc. are investing heavily on ultra-fast charging stations.

The quarter observed a high number of developments coming up with ultra fast charging infrastructure



The high power ultra fast chargers not only save time but also help EV manufacturers to gain customer's confidence of providing effective charging solution.

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Hitachi in partnership with Gridserve is scaling up the financial support for a solar-backed EV charging stations.

The partnership will facilitate to develop the UK's most technically advanced hybrid solar farms, in conjunction with a new network of solar powered Electric Forecourts to provide ultra-fast, dependable charging for all types of electric vehicles

Ultra-Fast Charging Technology to Improve EV Charging Experience



Porsche opened a new charging park called Porsche Turbo Charging with Europe's most powerful rapid-charging EVSEs installed in Leipzig, operated entirely with electricity from renewable energy sources. The Porsche Turbo Charging consists of twelve rapid charging points with 350 kW (direct current)

The rapid Porsche Turbo Charger charging point was developed by Porsche Engineering with charging time of just five minutes for up to 100 kilometers



Volkswagen is working on deployment of its new electric car charging stations with integrated batteries as part of a pilot project in Wolfsburg. The integrated system will help manage the power demand of the stations and keep them online in case of a power outage.

The deployable all-in-one fast-charging solution has a charge rate of up to 100 kW and includes 360 kWh of energy storage



FreeWire Technologies has raised \$25 Million funding to accelerate development and rollout of its "infrastructure-light" EV charging technology. The financing will support the commercialization of FreeWire's ultrafast electric vehicle charging technologies to launch a new battery-integrated charging product called 'Boost Charger'

The company claims to support ultrafast EV charging without the need for new grid infrastructure investments, thereby saving up to 40% on installation costs

Impact of Covid-19 on EV Charging Infrastructure



“The installation of new lantern charging points in London would be suspended as the work was not considered “essential”. However, the existing charging points will continue to be maintained”

Daniel Bentham
Managing Director, Ubitricity

Ubitricity and Pod Point postponed charging point

- Ubitricity and Pod Point postponed charging point installations in the UK that are currently not necessary due to major impact of Covid-19 pandemic in the country
- Both the production of charging points and the maintenance are facing a challenge due to the pandemic
- Due to the Covid 19 pandemic, not only the production lines in most electric car plants at a standstill but also the charging infrastructure are facing a lower demand
- The same applies to Pod Point, but in some “critical” cases the company announced exceptions such as home chargers ordered will continue to be installed at homes of people who were classified as “key workers” in the coronavirus crisis
- The lockdown is also showing immediate impacts on the supporting industry of EV charging services, affecting the charging service and the related supply chain for charging station deployment.

Rolec has temporarily suspended temporarily suspend its manufacturing operations

- Rolec Services, another leading EV charging services provider, has announced it will temporarily suspend its manufacturing operations in the UK because of the COVID-19 pandemic
- The production is on hold until the government announces it is safe for employees to return

Fastned has lowered charging activity in March by 70%

- Fastned, the charge point operator which is mainly active in the Netherlands and Germany, is experiencing delays in the construction of new stations and the upgrading of existing ones
- The coronavirus outbreak and social distancing policies significantly affect public charging activity

→ FutureBridge Insight on EV charging infrastructure

- The growth of EV charging infrastructure is fueled by rising investment in the technology development for charging infrastructure by automotive manufacturers, such as Volkswagen Group, BMW Group, MINI Electric, Ashok Leyland among others, and partnering with solutions based companies
- Ultra-fast charging solutions are emerging to enhance the EV charging experience

What should you investigate ?



Which countries are experiencing the maximum partnership or collaboration activities in the EV charging infrastructure market?



What are the strategies and areas in which the various EV charging stakeholders are focusing on for mergers, and acquisition?

Ultra-Fast Charging Technology



- IONITY, a joint venture of BMW Group, Daimler AG, Ford Motor Company, as well as the Volkswagen Group with Audi and Porsche, opened 202 charging sites across 18 European markets
- IONITY fast-charging network is entering the second phase of the rollout, which will include another 324 ultra-fast customized chargers
- The company claims high-power level can enable a charging speed of 200 kilometers in as little as 8 minutes
- Plug-in vehicle sales in Europe reached 408,000 units in 2018, 33 % higher year on year, with predictions that Europe will quickly pull ahead of the U.S. as the number two EV market in the 2020s

02

Quarterly review of Technology Developments

Self-plug-in Charging Technology Shaping the Future of Electric Vehicle Charging Units



Volkswagen Group, a German based company, has unveiled the concept of mobile robots to charge electric vehicles completely autonomously. The prototype developed by the company presents a new and visionary charging concept which is autonomous, compact and flexible.



The prototype consists of a self-driving robot fitted with cameras, laser scanners, ultrasonic sensors and flexible energy storage devices also known as battery wagons which allows for DC quick charging with up to 50 kW and have full charged capacity of 25 kWh each.

- ✓ Mobile robot is being called using an app or V2X communication, which brings mobile energy storage device to the vehicle and connects it
- ✓ After charging process is complete, the robot collects the energy storage device and brings it back to the charging station. The entire process runs without any human intervention

The robot CARL is smart enough to find an electric car independently and plug-in to replenish energy using its own mobile energy storage of 30 or 60 kWh. This device is compatible with any electric vehicle and should be able to provide quick charge with a recognized charging standard

- ✓ As per the company, it takes less than 50 minutes to charge an electric car up to 80 per cent
- ✓ Always aimed to make EV ownership as simple, easy and enjoyable as possible and provide a blueprint for how EVs can be charged in future

Volkswagen engages in initiatives to establish a charging infrastructure at many levels. Together with its dealers, the company is installing a total of 36,000 charging points throughout Europe by 2025.

Volkswagen is also launching its own wallbox for home charging called the ID Charger. And as a co-founder of the IONITY joint venture, Volkswagen participates in installing 400 fast-charging parks on major European highways.



Always, a Chinese startup company, has been granted seven patents across Europe and China for the development of its autonomous mobile charging robot named CARL. The charger is self-plug-in charging unit which can be activated via an app.



Integration of Street Lights with EV Charger

Envision Solar International, Inc. has been granted a patent from **U.S. Patent and Trademarks Office** for its **EV Standard™**



It designed to overcome the hurdles associated with the provision of on-street EV charging while also providing an energy-efficient and sustainable lighting solution

The newly patented EV Standard™ is equipped with a high-lumens, low-consumption LED light and a Level II EV charger

“We have demonstrated our ability to bring renewably energized EV charging to business and government with our EV and Solar Tree products”

Desmond Wheatley (CEO)

Benefits :

- ✓ The product is easy, reliable and cost-effective solution to the EV charging infrastructure
- ✓ Fastest deployed solution and believed to be the lowest lifetime costs
- ✓ It is a renewably energized street lamp product, which provides EV charging at the curb
- ✓ No need to connect to the grid or perform any construction or permitting
- ✓ It provides efficient street lighting and curbside EV charging by combining solar, wind and utility-generated electricity in a bank of integrated batteries
- ✓ The product leverage streetlamp's pre-existing foundations and connections to the electrical grid, and hence can be deployed without having to invest in expensive, disruptive and time-consuming civil or electrical upgrades

Large Corporate Customers:
Google, GM, Kohl's, UCLA, DELL, McDonald's, Fiat

Government Customers:
DOD, DOE, State of California and City of New York

Record 2018 Revenues of \$6.2 Million, a 336% Increase Over 2017



Magenta Power unveiled its first Street Lamp Integrated electric vehicle charger



Magenta Power partners HPCL for EV Street Light integrated Charger



Indian EVSE provider Magenta Power unveiled its first Street Lamp Integrated electric vehicle (EV) Charger to be launched in the market by April 2020 dubbed as **ChargeGrid Flare**

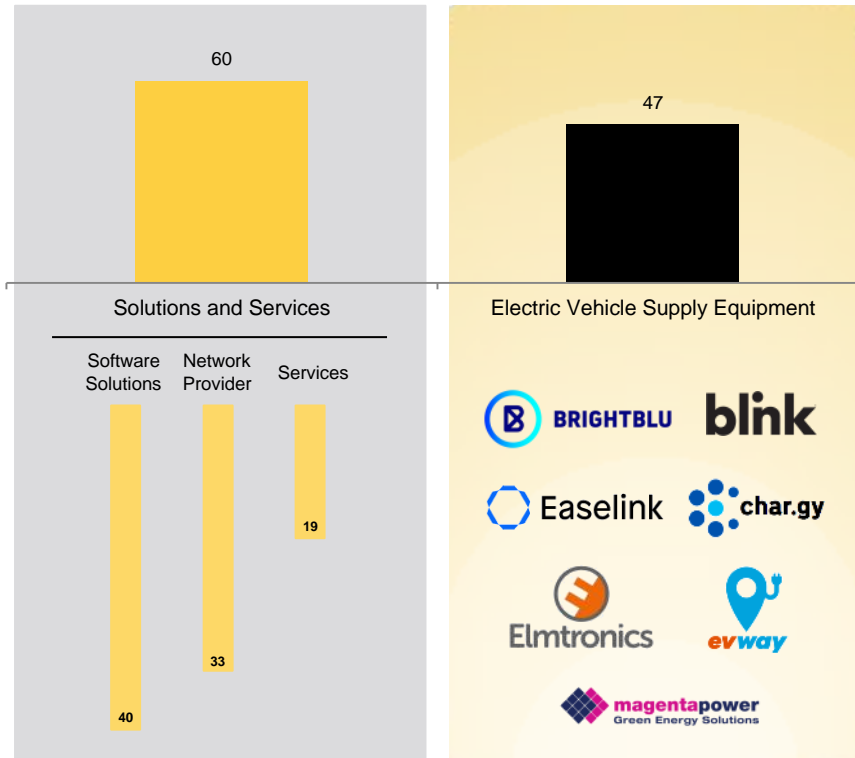
- ✓ This charger can be incorporated within energy-efficient street lamp columns that will encourage EV adoption for flexible and low cost charging solutions
- ✓ The charger specially designed in partnership with Hindustan Petroleum Corporation Limited will enable the cities to deploy curb side vehicle charging more quickly, with lower cost, and less street clutter than other approaches
- ✓ These EV chargers will be installed at HPCL retail outlets in major cities on pan India basis, in initial stage

03

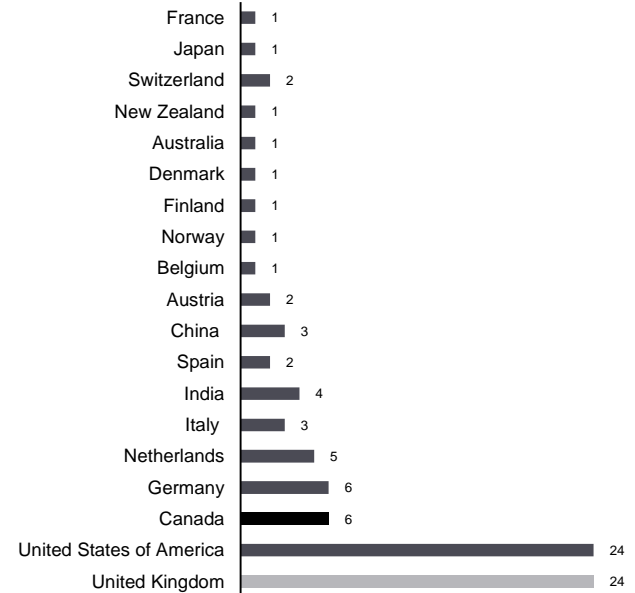
Startup Tracker highlights

Startup Tracker summary Q1 2020

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



- FreeWire Technologies is the manufacturer of mobile electric vehicle charging stations and zero-emission, quiet mobile power
- FreeWire Technologies has raised \$25 Million funding to accelerate development and rollout of its "infrastructure-light" EV charging technology
- This Series B funding is backed by its existing investor BP Ventures and attracted many new investors like ABB Technology Ventures, Energy Innovation Capital, and other financial & strategic investors, including Silicon Valley Bank

Battery-Boosted Fast Chargers

California startup finishes its "infrastructure-light" electric car chargers and moves into initial deployment

Products Launched

- ✓ Boost Charger
- ✓ Mobi EV Charger
- ✓ Mobi Gen

Industry Application

- ✓ Automotive OEM
- ✓ Corporate Campuses
- ✓ Electric Utilities
- ✓ Entertainment
- ✓ Fleet Operators

Features

- Lower Energy Costs:** Tap into off-peak rates using FreeWire's Energy Buffering Technology and reduce EV charging bills by over 50%
- Unparalleled Speed:** Deliver up to 480 miles of range with a single, With 160 kWh of battery capacity and 120 kW output, Boost Charger is ready for current and next generation EVs
- Intelligent Charging:** Provide full visibility into charger status and usage with FreeWire's Activity Management Platform (AMP)
- Easier Setup:** Avoid panel upgrades, new transformers, costly infrastructure updates and permitting delays



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