



From Smart Metering to Electric Vehicle Charging

Thomas Ho, Siraj Sabihuddin (Ubiik Inc.)

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June 28, 2021

Recent years have seen a significant push towards the development and mass adoption of Electric Vehicles (EV). Charging station infrastructure has become an important element that would remove the barriers towards adoption of EVs. Ubiik has been working towards helping transition to a smart charging paradigm by integrating long range wireless technology infrastructure that can support monitoring and control of charging stations. This article discusses how smart charging can lead to a more sustainable future through EVs and how Ubiik is playing an innovative role in this future.



In the past decade, three trends have pushed forward innovations in the traditional automobile industry: Networking, Artificial Intelligence (AI) and Electrification. Among these trends, electrification in the form of Electric Vehicles (EV) has attracted the most attention from the market, and naturally has become a focus for most manufacturers.

When it comes to the charging of electric vehicles, DC fast charging and AC charging tend to be well known in terms of impact to EV operation. However, less discussion has been given to the impact of networking of electrical charging equipment. For example, Tesla charging stations have been widely deployed across Taiwan. In the early days, most of these did not have the ability to connect to the internet. The stations were limited to the use of the charging gun delivering controlled charging at the point of operation with no feedback to the cloud.

This has limited the ability of higher-level data analytics on how EV charging happens and has also limited potential efficiency improvements that can be made to the charging regime as well as the distribution and maintenance of charging stations themselves. In the past two to three years an increasing number of charging stations have Internet connectivity. This even includes charging stations installed at the home of an EV owner. The connectivity has allowed management of charging through a cloud backend system and consequently also allowed a careful analysis of power consumption across installed stations—this has created a paradigm known as smart charging.

Ubiik Background

Ubiik was founded in 2016 with a focus on LPWAN (Low Power Wide Area Network) Solutions. At this time Ubiik adopted and improved on an open standard LPWAN protocol (now known as Weightless™) and successfully demonstrated the possibilities of long range industrial and national scale wireless communication hardware and software. Over the last three years, the effectiveness of the solution quickly led Ubiik to consecutively winning contracts towards implementing and deploying smart metering infrastructure for the nationalized Taiwan Power Company (TPC or Taipower). To date, Ubiik has won contracts in excess of NT \$1.2 billion.

During this time frame, Ubiik has built a complete Advanced Metering Infrastructure (AMI) Solution. This includes, not only the smart meter communication modules but also a complete cloud platform. The AMI solution provides elements ranging from the electronics and data communication systems all the way to the application services, database infrastructure, the front-end interfaces, data analytics and various other management tools. This has transformed Ubiik from its initial focus as an IoT communication systems manufacturer to an IoT solution provider.

Weightless™ Features



High
Capacity



Very
Low Power



Long
Range



Bidirectional



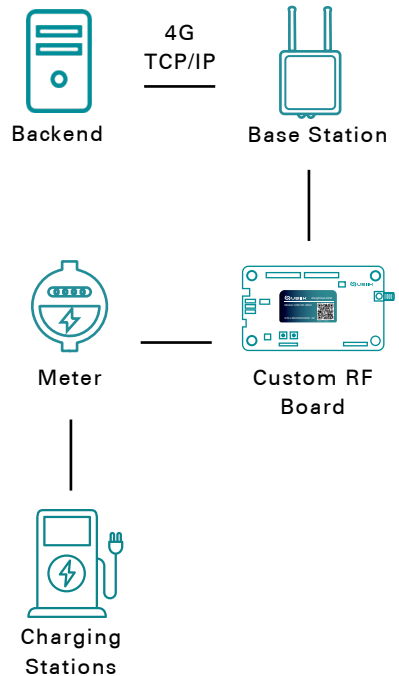
Open
Standard



True
Security

Testing Smart Metering with EV Charging

Early last year, Ubiik sent 30 smart meters to California to test applications of LPWAN in charging stations. The original field was set up with electric vehicle charging stations without network capabilities (commonly known as dumb chargers). As a result, there was no way to know the electricity usage statistics of charging stations let alone to manage the charging regime. Ubiik installed smart meters with additional relays (switches) to the ports of charging stations and then connected them via Weightless™ (LPWAN) communication modules. The meters were connected through a gateway using the Weightless™ protocol. The California customer could thus monitor power usage of each charging contact from a backend system located on the cloud. In addition to monitoring the power consumption of charging devices, Ubiik's meter could (and continues to) also respond and impact the charging process.



For this test application, when the user charges to the upper limit of the paid amount the specific meter in question powers off the appropriate charging relay from commands issued through the gateway via Weightless™. This application was a demonstration of stable and bidirectional transmission capabilities of Weightless™ communication technologies.

In China, Ubiik was awarded a gold medal in the 2020 Audi Innovation Award (AIA) sponsored by Audi Taiwan. Here a Proof of Concept (POC) project was initiated by Audi to replace the current 4G communication approach for their existing DC charging equipment with Weightless™. The POC demonstrated that with appropriate field environments Weightless™ technologies could provide a suitable network infrastructure for EV charging equipment. And they could do so with costs potentially lower than those encountered via 4G the implementation of 4G.



The Future for AMI & Smart EV Charging Stations

These, along with other, small local and international projects have demonstrated clear applications of Ubiik's wireless IoT infrastructure for expanding its electric vehicle charging business. Below follow some examples of this expanding business.

Many residents in Taiwan's metropolitan areas live in high-rise buildings. Parking lots are typically located in the basement. These basements have frequent dead zones that make 4G communication unreliable. However, Ubiik has spent the last three years implementing smart meter communication systems in challenging environments like this. Many residential meters are set in the basements of buildings. Routing ethernet cabling in these environments can become expensive in old infrastructure. It is here that Weightless™ technologies shine. Weightless™ also does well over long ranges in large shopping mall parking lots as well.

Over the past decade, the world is making significant efforts towards a move from fossil fuels towards renewables as an energy source. While renewable energy is both sustainable and low carbon and requires less up-front financial investment, it is an intermittent source. How to effectively control this increasingly important power source has become an important issue for the energy industry globally. Energy storage equipment can act as a buffer between energy production and demand. As a result, energy storage systems are being implemented across the world. With the increasing popularity of electric vehicles, the number of electric vehicles are also increasing rapidly year by year. The batteries in electric vehicles can also act as energy storage for better managing energy supply and demand on the electricity grid.

The use of relatively new technologies related to Vehicle to Grid (V2G) provide a method of building Energy Management System (EMS) that utilize household electric vehicles as a small reservoir of energy for use by electrical utilities. At night, the battery of an electric vehicle can be fully charged with cheap electricity. And during the day, this can be discharged back to the grid for peak shaving operations aimed at reducing high demand load for energy producers. There is even some possibility here of utilizing vehicle batteries for household use for demand side management. The above scenarios may seem far out in the future; however, they are currently becoming a reality. And Ubiik will be part of that reality.

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... the power generated by offshore wind farms in the Taiwan Strait at night can be wasted without use, and can be stored in electric vehicles according to the situation.

Tienhaw (TH) Peng
Chief Executive Officer (CEO), Ubiik

Conclusion

The EV industry will be very important for the next generation of industrial transformations in Taiwan and around the world. Starting from smart meter communication systems, Ubiik's technological innovations are making significant strides forward in the broader energy industry. Through innovative and effective energy management, electric vehicle charging is no longer just limited to simply using electricity – it can now drive the world to a sustainable future by helping to stabilize grid connected renewables.

Let's make a better future for everyone.