



## Electric Vehicle Charging Stations and IoT—How One Revolution is Accelerating Another One

INDUSTRY BRIEF



### AT A GLANCE:

The big advantages with smart charging stations are cost containment and time management, and this is where home systems can add significant value.

Dramatic advances in battery technologies have made electric vehicles (EVs) a more mainstream proposition, with cars like the Tesla Model S and the Chevrolet Bolt being prime examples.

While worldwide sales still only represent 0.86% of the total vehicle market, many governments (China, California) are mandating the use of EVs to mitigate pollution issues. The main concern preventing mass acceptance has been battery range or, more specifically, how to efficiently charge a vehicle. Home charging requires either specialized equipment or longer charging times using conventional outlets. Outside the home, charging stations are few and far between, with few exceptions such as Silicon Valley.

### Charge Ahead

Internet of Things (IoT) and Machine-to-Machine (M2M) communications are changing what's possible with charging stations, literally redefining how the world fuels its vehicles. Public/commercial charging stations are not like traditional gas stations

where a fill-up takes less than five minutes. Depending on vehicle type, amount of electricity needed, and station technology, reaching full charge could take several hours. That presents a significant issue as more people and companies employ EVs. The key is to make charging stations smart as well.

One solution is to treat charging stations like a popular restaurant. Using a smart phone app, an EV driver can search for a nearby charging station and schedule a time to fill up. The app automatically can confirm the station is available and reserve a set number of minutes/hours for recharging based on electricity needs, type of EV being charged, and other factors—similar to booking a table at a busy restaurant. The app also can notify the driver of the exact cost to charge the EV, or recommend less expensive charging times.

The EV will be given a unique identifier so its time will not be taken by another vehicle that shows up out of the blue. In fact, the station only will dispense electricity to the scheduled vehicle during the time allotted. Likewise, if a scheduled vehicle does not show up and station-generated alerts go unheeded, the system can cancel a reservation. The system even can compensate for emergencies, such as an EV about to run out of power. The vehicle would get a higher charging priority, and all the appropriate notifications would be delivered prior to any EV arriving for a recharge.

Unfortunately, charging will take some time so while the EV driver is elsewhere, the station monitors itself. It can send real-time notifications to the user's smart phone about a variety of factors, including exact charging time left, weather conditions that could affect charging times (extreme cold/heat), cable position (if someone accidentally dislocates the cable or deliberately tries to remove it), and similar information. So while the station is autonomous, it can send for human assistance if an issue of any type is detected.

### Why Go to a Station When it Can Come to You?

An emerging solution for the inevitable upcoming charging station congestion is mobile charging stations, where the fuel comes to the car, not vice-versa. This can take many forms, but basically an EV driver schedules a recharge at their workplace, a designated parking lot, or other area. As with fixed charging stations, the EV generates a unique code that would allow a human operator to insert the cable without setting off the vehicle's alarm. Robotic units could charge EVs automatically if the EVs

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came to a specific charging area, such as a roped-off parking lot. As an added bonus, charging stations themselves could be battery powered, further eliminating pollution common to internal combustion engine delivery vehicles.

Theoretically, people would be able to charge their cars on demand, on their schedule, with billing being handled via a preloaded credit card or other payment form. Vehicles always would be fully charged, further eliminating range anxiety, and owners can spend their charging times doing other tasks. Given the tremendous flexibility IoT / M2M applications offer, it is conceivable that mobile stations could one day supersede — if not replace — traditional fixed stations.



### Homeward Bound

Additionally, IoT / M2M will have a big impact on home charging stations, which can involve anything from a typical plug-in unit to an undercar ‘floor mat’ charger, on top of which a vehicle would park.

The big advantages with smart charging stations are cost containment and time management, and this is where home systems can add significant value. Smart home rechargers can search for the ideal utility pricing by incorporating the utility's Time of Day (ToD) and demand pricing structure. ToD is the pricing at any given time, whereas demand is the total amount consumed by the house.

In other words, a homeowner could set a charging time for 3 a.m. (when rates are lowest) but if all appliances (washing machine/dryer, EV charger, dishwasher, air conditioning, etc.) are running at the same time, demand pricing could be higher.

A smart charger constantly would seek the lowest pricing, even ‘bidding’ with other appliances for the lowest rates determined by the utility. For example, if a dishwasher used more energy than the charger, it would get priority for the lowest rate times. The charger could generate real-time reports demonstrating usage and cost savings. There would never again be a question of getting the best pricing. All of this would be accomplished via preset criteria programmed by the homeowner. Of course, the homeowner always has the option of overriding/reconfiguring the system as needed, such as requiring an immediate full recharge upon arrival, regardless of rates.



### Smart Charging Stations Require Smart Networks

IoT-enabled charging stations gather immense quantities of data and then communicate that data in real time. This requires all new levels of internetworking capabilities, including:

#### **Dedicated end-to-end connections**

Legacy analog networks cannot handle the amount of data traffic and 24/7/365 usage demands

needed today. Digital remedies from carriers do work, but are built on a consumer infrastructure — IoT / M2M communications are added as an afterthought. What's needed is a network dedicated exclusively to the unique requirements of IoT / M2M.

#### **Ease-of-use and zero learning curves**

Smart charging station systems can involve a variety of stakeholders — from homeowners to security guards at parking lots — with varying technical knowledge. In-depth training and similar efforts aren't practical. Smart devices and their networks must be up and running right out of the box.

#### **Pay-as-you-go pricing**

Like managing utility rates, the dynamic nature of smart devices and their applications require flexible pricing structures. Traditional "one size fits all" pricing models would make IoT / M2M systems cost prohibitive.

#### **Ironclad security**

Security always is of paramount concern, but with so many devices in diverse locations, the network always must be the first line of defense.

#### **Future proofing**

IoT / M2M technologies are constantly changing, and companies and organizations cannot afford to be locked into obsolete solutions. That's why a network infrastructure must take into account ever-increasing data loads, new device types, constant updates, and a variety of unplanned events.

## **AERIS IoT SERVICES IS THE LEADER IN CELLULAR IOT / M2M NETWORKS. HERE'S WHY.**

Aeris IoT Services offerings were designed from the ground up, exclusively for IoT / M2M connectivity. That means the solution offers unparalleled flexibility and 'future proofing', in addition to remarkably simple operation.

### **Just look at the advantages:**

#### **Reliable and secure network**

Aeris IoT Services offers an always-on service, which works anywhere, regardless of the amount of data being generated. And that data is secure as your traffic always is separate from the public internet, unlike competing solutions.

#### **A single provider for all your connectivity needs, all the time**

With so many devices moving across disparate geographic areas, having different networks can be problematic. Aeris is the only carrier-agnostic service provider that offers both GSM and CDMA connectivity, including 2G, 3G, and 4G LTE. That means with the Aeris solution, you are connected 24/7, regardless of device type or location.

#### **Device management portal provides complete visibility**

Using the Aeris IoT AerPort management portal, Aeris clients have total visibility into every device, including data usage and billing rates. The AerPort dashboard allows you to manage, monitor, and troubleshoot devices to gain insight into your network operations in near real time.

#### **Operational support ensures continuous uptime**

At Aeris, we back our solutions with industry-leading customer support. Our team is staffed exclusively with IoT / M2M experts ready to help. Aeris Infinity Support is available five days a week with a five-minute response time, proactive monitoring, and issue identification.

#### **Lowest total cost of ownership**

Through our flexible pricing and transparent management portal, Aeris ensures "bill shock" never happens. We give you complete visibility into the operation and billing of every device, no matter how many devices, their locations, or how the devices are dispersed.

## ABOUT AERIS:

Aeris is a technology partner with a proven history of helping companies unlock the value of IoT. For more than a decade, we've powered critical projects for some of the most demanding customers of IoT services. Aeris strives to fundamentally improve businesses by dramatically reducing costs, accelerating time-to-market, and enabling new revenue streams. Built from the ground up for IoT and road tested at scale, Aeris IoT Services are based on the broadest technology stack in the industry, spanning connectivity up to vertical solutions. As veterans of the industry, we know that implementing an IoT solution can be complex, and we pride ourselves on making it simpler.

Visit [www.aeris.com](http://www.aeris.com) or follow us on Twitter @AerisM2M to learn how we can inspire you to create new business models and to participate in the revolution of the Internet of Things.

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