End-to-End Electric Vehicle Charging Solution for Long-Duration Parking Locations

HEY-CHARGE

Startup
HeyCharge
Munich, Germany

Hosts
EPRI
Ameren
Tucson Electric Power

Ameren

TEP
Tucson Electric Power

Technology Solution

Providing electric vehicle (EV) charging for long-dwell locations, like multi-unit residential buildings, can be challenging due to the cost of charger hardware and controls. Innovations that simplify charger installation and charging management have the potential to enable more widespread deployment in these situations, improving the customer experience for EV owners.

This pilot project tested the end-to-end technology solution developed by HeyCharge to enable low-cost installation of plug-and-play EV charge points that communicate exclusively through a mobile app. The lightweight charger simplifies installation and includes wireless communications capability, avoiding telecommunications costs while providing connectivity for customers regardless of mobile network coverage. The app's interfaces for EV owners and service providers support charging, metering, and billing functions.

HeyCharge's plug-and-play hardware is designed to reduce the costs and complexities of EV charge point deployment.

Project Overview

EPRI acted as the site host for the demonstration, working directly with HeyCharge to deploy hardware and evaluate the end-to-end solutions at its EV lab in Knoxville, Tennessee. Ameren and Tucson Electric Power (TEP), a Fortis company, also participated in the project as sponsoring utilities.

Three HeyCharge units were installed, commissioned, and operated by EPRI personnel. The units, manufactured for the European market, were not listed to UL standards, limiting the type of testing that could be performed. A Nissan Leaf EV battery was applied as a test load with a lab-grade power quality analyzer used to log energy usage during charge sessions.

The lab testing protocol was designed to investigate the following questions:

- How well does the app work for drivers?
- How well does the smart phone communications path support operation?
- How useful are the system-level web portal tools?
- How well does the software work for billing the correct party?

If successful, the next step would involve field demonstration of the HeyCharge hardware involving a larger

number of units and live EV charging at diverse host locations.

Results & Learnings

The installation process was relatively simple—for hardware units, comparable to 240 V_{AC} receptacles; and for software, involving straightforward use of a computer to access the HeyCharge "Admin" Portal via the internet and set up the EPRI "Admin" account.

System-level station management and EV customer tools were simple to use with clearly labeled tabs allowing access to needed information. Adding drivers involved a fully automated invite process. To set up user accounts, the HeyCharge phone app was installed on several iPhone and iPod devices by following the email invite to the app store and using a HeyCharge-assigned username and password. HeyCharge also provided an Android device with the app already installed.

Unit commissioning—done via smart phone app during a live lab demonstration hosted as a web conference with the supporting utilities—involved a simple and intuitive process that took only a few minutes to complete. Initiating charger operation via the app also was straightforward; charge sessions for both the Leaf battery and a live EV were conducted. In addition, system-level tools were demonstrated.

Over several days of testing, use of both cell phones and iPod devices to conduct charge sessions proved reliable with no problems relating to Bluetooth™ communications.

To assess capabilities for billing the correct party for charging sessions, EPRI was able to access HeyCharge's data application programming interface (API) using the instructions provided. JSON-structured files were downloaded and documented to assist the participating utilities in evaluating the data for use in isolating the energy consumed during individual charging sessions at each access point from the main meter's total.

A couple of issues were encountered throughout the course of the pilot. During hardware installation, terminal blocks were found to be small, relative to typical U.S. wire sizes. HeyCharge updated the terminal blocks in the units being evaluated for UL standards compliance and certification for the U.S. market.

During operational testing, an offset in metered energy measurement was detected and traced to the use of 120 V_{AC} power (the European units were natively designed to operate at 230 V_{AC}). This issue was addressed via firmware upgrade, executed via Bluetooth without problems.

Testing also indicated that an active charge cable can be unplugged and moved to serve another vehicle without the session being interrupted, suggesting that the start/stop logic for charging sessions requires an update to support a more robust approach to theft prevention.

According to HeyCharge, this logic is already configurable via back-end settings that can be remotely adjusted and optimized without further software development. The plan is to expose this and other advanced configuration options as HeyCharge gains more experience with the settings preferred by charger hosts and customers.

At EPRI's EV laboratory, three HeyCharge access points with Bluetooth capability were deployed and tested for app-based, end-to-end management of the EV charging process.

Implications & Next Steps

This pilot proved successful in demonstrating the HeyCharge solution's ease of installation and use, though some minor updates, such as larger wire terminals, will be needed for the U.S. market.

HeyCharge is in the process of starting early commercial deployments with individual building owner/operators and utilities. Both standalone hardware and the end-to-end solution with the Bluetooth-based charge management system are expected to be available for European markets in early 2022.

For U.S. markets, a field demonstration using UL-certified hardware, HeyCharge units deployed at several locations, and dozens of real EV drivers is needed to provide a more robust evaluation of capabilities and costs. This could include development and testing of an automated approach for extracting

metering data from HeyCharge's API for integration with a utility billing system.

Resources

Chris Carde, *Founder & Chief Executive Officer, HeyCharge,* chris@heycharge.com

John Halliwell, *Senior Technical Executive, EPRI,* jhalliwell@epri.com

Travis Herman, *Contractor Services Supervisor, Ameren,* therman@ameren.com

Ray Martinez, *Principal of Emerging Technology & Innovation, Tucson Electric Power (now with Arizona Public Service),* raymundo.martinez@aps.com

TESTIMONIAL: HeyCharge

Incubatenergy Labs afforded an amazing opportunity to test HeyCharge hardware and our end-to-end platform in a realistic environment and collect the real-world feedback needed for partnering with utilities to bring the advantages of low costs and underground usability to the U.S. market.

TESTIMONIAL: EPRI

During our lab testing experience, the HeyCharge hardware proved easy to install and operate, and web-based tools for both EV owners and charging station hosts provided simple and intuitive user interfaces.

TESTIMONIAL: Tucson Electric Power

The HeyCharge product provides a novel approach for filling a gap in the fast-emerging market for vehicle electrification by looking to overcome cost, billing, and connectivity obstacles to the installation of charge point locations serving multi-unit dwellings, hotels, and underground parking lots.

Resources

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