

GRIDbot Electric Vehicle Service Equipment Installation

Task #2 Deliverable Report

for:

**New Technology Research and Development
Program**

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Submitted by:

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Abstract/Executive Summary

This demonstration includes installing 28 charging stations in one centralized location to support the City of Houston's (the City) centralized fleet concept. The location is an underground parking garage in downtown Houston that encompasses 18 city blocks of parking space, is three levels deep and contains over 3,000 parking spaces. The City is purchasing all the vehicles that will make up the fleet, and this demonstration project is providing and installing all the components of the charging infrastructure.

The first site installation and data collection of this electric vehicle service equipment (EVSE) demonstration was completed August 30, 2011. The first site installation and data collection phase included installation of 14 charging units, development of staff training, delivery of the first Nissan Leaf vehicles, distribution of user materials, initial collection of data and initial feedback from vehicle and charging station users. This has been accomplished with the cooperation of various City staff, the principal investigators and contractors, all of whom have contributed their specific technical areas of expertise as well as their enthusiasm for being part of the first installation of this scope in the US.

Introduction/Background

The City developed a plan to reduce the number of fleet vehicles owned by the City and used by employees located in the downtown Houston area. Part of this plan is to increase the per vehicle use of a smaller fleet, and to replace the current gasoline vehicles with electric vehicles (EV) to reduce the tail-pipe emissions of the fleet. The City determined that the concept of a "pooled fleet" would enable them to monitor the vehicles more efficiently through an online reservation system and enable easy access for various departments.

This demonstration includes installing 28 charging stations in one centralized location to support the City's centralized fleet concept. The location is an underground parking garage in downtown Houston that encompasses 18 city blocks of parking space, is three levels deep and contains over 3,000 parking spaces. The City is purchasing all the vehicles that will make up the fleet, this demonstration project is providing and installing all the components of the charging infrastructure.

Key to this demonstration, information will be collected from the staff, the vehicles, and the charging stations to analyze the emissions reductions, and charging requirements of the various vehicles. Additional information from the staff will assess their acceptance of the centralized fleet concept, acceptance of dedicated electric vehicles over traditional combustion engine vehicles, and the use of the charging stations. All of these components and findings will be demonstrated, analyzed, and reported as part of this project.

GRIDbot's first EVSE product, Model UP 100J, was developed to target this type of fleet installation. It has both a level-1 outlet which supports plug-in hybrid electric vehicle (PHEV) conversions and scooters and a level-2 outlet which will provide faster charging for vehicles developed for the mass market, such as the Nissan LEAF or Chevy Volt. It also incorporates networking and reporting capabilities that will continue to enhance the fleet management of these vehicles beyond this demonstration. This product is now ready for full commercialization.

Project Objectives/Technical Approach

From the grant contract Grant Activities (Scope of Work):

1.2 The objectives for this work are:

1.2.1. Demonstrate the effectiveness and acceptance of GRIDbot's electric vehicle charging station technology in conjunction with a dedicated electric vehicle fleet.

GRIDbot, Good Company Associates (Good Company), and the Houston Advance Research Center (HARC) agreed to partner with the City to provide charging infrastructure for 25 dedicated electric vehicles which the City will purchase in 2011, as well as other plug-in electric vehicles included in the City's fleet. The City's goal is to consolidate its fleet, as well as shifting to adopt electric fleet vehicles. This project's infrastructure will provide the electric charging for the City's entire fleet and will be located in the City parking facility at Tranquility Park.

Good Company is providing project management for the installation of the equipment and providing equipment user training to the City staff. Once the equipment is in use, Good Company will collect information from the staff to evaluate user acceptance of the centralized fleet, the dedicated electric vehicles, and charging equipment.

The HARC will collect information from the vehicles and the charging equipment and analyze this data regarding charging station performance, vehicle use, and vehicle emissions, and will extrapolate the emissions impact based on this data using air quality modeling.

GRIDbot is providing the necessary technical oversight for all production, performance, and installation of the charging stations for the various contractors involved in the project. In addition, GRIDbot will work with the City staff to modify the customer interface and network operation based on project findings. This demonstration will enable GRIDbot's first EVSE product, the model UP 100J, to move quickly to broad product commercialization.

Task 2: Site Installation and Data Collection for First Group of Charging Stations

Initial site installation

From the grant contract Grant Activities (Scope of Work):

2.2. Task Statement: The PERFORMING PARTY will install the first group of charging stations and collect data on their use.

2.2.1. The PERFORMING PARTY will install 15 UP100J charging units (which include one level- 1 (120) and one level-2 (240) outlet in each unit) at a City of Houston motor pool site.

GRIDbot and Good Company oversaw the contractors who completed the First Phase of the installation at the Tranquility Garage. This included installation of a transformer, two breaker boxes, all necessary conduit and wiring, 30 wheel stops, signage, and security cameras to support the electric charging stations at the site. Electrical supply available at the site limited the installation to two rows of 14 stations or a total of 28 stations. Completion of this first installation and inspection by the city Electrical Permitting Department were completed on June 2, 2011.

GRIDbot installed updated firmware and completed all beta testing of the charging stations prior to vehicle assignment to the centralized parking area. On-site testing and adjustments to

the software were completed by GRIDbot in July 2011, prior to the delivery of the first two Nissan LEAF's. In addition, due to the delay in availability of vehicles, the Fleet Department reassigned 4 of the existing Prius PHEVs to the parking site.

Figure 1 below shows the first 14 units installed and operating at the City's Tranquility Parking Garage.

Figure 1: Phase 1 Installation at the City of Houston Tranquility Parking Garage



Development of staff training

From the grant contract Grant Activities (Scope of Work):

2.2.2. The PERFORMING PARTY will work with Good Company to develop and provide City of Houston staff training (including, but not limited to, both live presentations and written material) in an effort to promote and encourage adoption and use of the electric fleet vehicles.

GRIDbot and Good Company worked together to develop simple training materials for the drivers and charging station users. Due to the limitations of the vehicle insurance, only 5 drivers are able to be assigned to each of the LEAFs, limiting staff exposure and use. We designed materials that walk the user through the steps for both the level-1 and level-2 charging, that are on a card that is kept in the glove box of each car. It also provides the number to contact at Security if there are any problems. The stations are largely self explanatory and the interface screen gives simple and direct instructions to the users as well. Additional promotional materials and feedback will be accessed as more vehicles become available.

Vehicle procurement

From the grant contract Grant Activities (Scope of Work):

2.2.3. The City will take delivery and put into service the first 9 Nissan Leaf electric fleet vehicles, encourage use of the charging units, and promote broader adoption and use of the centralized fleet vehicles.

The first two LEAF's arrived in July, after several delays due to Japan's earthquake and tsunami. This event delayed vehicle and part manufacturing and even the delivery of available vehicles to the US ports. In addition, the city took some additional time to work out a lease-purchase agreement with Nissan, to take advantage of the tax credit that is currently available.

Figure 2 shows one of the first two LEAF's received at the City being tested by the City's Fleet Manager.

Figure 2: Testing of the First Nissan Leaf delivered at the City of Houston



Database development and data collection

From the grant contract Grant Activities (Scope of Work):

2.2.4. The PERFORMING PARTY will work with HARC to conduct initial tests of the vehicle data collection equipment on the first vehicles delivered. Data collection from the GRIDbot charging stations and vehicles will be collected and compiled every two weeks during the demonstration.

GRIDbot and HARC worked together with contractors to develop the software to provide HARC with the vehicle data collected from the stations in a format that would enable their use in modeling. There was some additional cost for this software “bridge” development, but they are now communicating in real-time. Readings are recorded at 30 minute intervals for all stations, to include the vehicle identification number, the time at the start of the charging session; time at the end of the charging session, and the kilowatt-hours used.

This station data is being incorporated with information from the vehicle data monitors in the Prius' and with the information obtained from the CARWINGS reports on the LEAF's. Initial

modeling to determine cost per mile and emissions savings are being collected and systems further refined.

Initial user feedback

From the grant contract Grant Activities (Scope of Work):

2.2.5. The PERFORMING PARTY will work with Good Company to collect feedback from vehicle and charging station users monthly during the demonstration. Feedback will include surveys, focus groups, educational forums, vehicle user data, and other forms of information that may become available.

Direct communication with the users has largely gone through the City's Fleet Manager due to the small exposure at this point in the project. He has provided the RFID access key-fobs, written instruction to the users, and is the point of contact for any fleet related issues. Various users have been contacted by Good Company to obtain initial feedback on the LEAF's, how the car communicates information about charging to the user, to establish future guidance for users and support staff.

Timeline and deliverables

From the grant contract Grant Activities (Scope of Work):

2.2.6. Schedule: The PERFORMING PARTY shall complete this task within 3 months of the signed Notice to Proceed Date as issued by TCEQ.

2.2.7. Deliverables: The PERFORMING PARTY shall submit a report to the TCEQ upon completion of this task. This report will include but is not limited to documentation, including photographs, of the installed charging outlets and in-service electric fleet vehicles.

The timeline for the installation was purposely delayed due to the delay in the procurement and delivery of vehicles. The timeline for the Phase 2 Installation will also be delayed as the City does not want all the stations sitting unused, as it would give the wrong message to the otherwise very supportive public. To the extent possible we have worked with the City staff and the contractors to streamline the efforts as the vehicles are expected to be available.

Task 3 is expected to be completed by October 31, 2011.

Discussion/Observations

Objectives vs. Results

Other than timing changes there have been no significant issues or barriers to the success of the project. As with all new technologies, the Project Team is learning through this field demonstration and solutions have been incorporated into this project plan.

Critical issues

The City has delayed some decisions, such as the fleet management software for the project, due to the slow acquisition of vehicles. They are likely to use a key/storage system rather than the proposed RFID access for the vehicles. Funding for fleet management systems were included in the City's FY 2012 budget, which began in July. No decision has been made on this or on the on-line reservation system.

We have adapted to the slow introduction of vehicles and the delay in the fleet management system by using key fob RFID's for charging and an instructional placard (specific to either

level-1 or level-2) for the vehicles that are to remain in the glove box. The charging interface has been simplified so that little or no user or driver training will be required.

Technical and commercial viability of the proposed approach

The manufacturer has identified several small changes to their production line that have been identified through this demonstration project. The benefit to the commercial viability of this product cannot be underestimated. This project has enabled GRIDbot to field test a large number of charging stations in one location, which would have been unlikely otherwise. The cooperation of the various Principals has been very helpful. GRIDbot is now offering the product in limited supplies on the commercial market, while developing a distribution framework for the United States and Canada.

Scope for future work

Due to the limit of capacity for charging stations in the Tranquility Garage for the City's Centralized Fleet, we have budgeted for two more stations. We are working with the City of Houston to determine another location for these two stations to be installed in another site to broaden the support for their fleet and to provide additional data for the project modeling.

Intellectual Properties/Publications/Presentations

No new IP has been developed, no publications identified, or presentations planned at this time.

Summary/Conclusions

With this Deliverable Report, GRIDbot has demonstrated the ability to bring together the appropriate technologies, resources, and personnel to proceed with the field demonstration. GRIDbot is looking forward to the next step in realizing this vision and demonstrating this new technology and its viability in future markets.

Acknowledgements

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