**OBJECTIVE AND SIGNIFICANCE:** The main objective of this demonstration project is to develop and evaluate the performance of novel GridSTART algorithms to optimize the charge/discharge of shared fleet vehicles. Project experience and results will inform University consideration of options such as the electrification of fleet vehicles, advanced car share applications, integration of distributed renewable energy resources on campus, and the optimal management of campus energy use and cost containment.

**BACKGROUND:** HNEI GridSTART is collaborating with Hitachi Limited (Hitachi) on a technology development, test and demonstration project to install two (2) bi-directional electric vehicle (EV) chargers (Hitachi’s Hybrid-PCS) at two designated parking stalls adjacent to Sinclair Annex buildings, University of Hawai‘i at Mānoa. Figure 1 depicts the planned location of the two Hitachi Hybrid-PCS units on campus.

![Figure 1. Location of bi-directional EV chargers](image)

The new control algorithms will ensure that the shared vehicles for designated UH personnel use are efficiently assigned and readily available for transport needs, while providing ancillary power and energy services by virtue of the stored energy in the vehicle batteries to benefit both the customer (UH Mānoa) and possibly the operational needs of the local grid operator (Hawaiian Electric Company).

Two EVs will be used by designated university personnel through a limited-user pool car sharing system via a smart phone/web-based app made available to the drivers. More specifically, two EVs with associated EV charge/discharge stands are planned to replace the present use of two existing UH gasoline-powered vehicles for the duration of this two-year demonstration. A functional diagram of the system is shown in Figure 2.

![Figure 2. Functional diagram](image)

A commercial web-based software suite will be made available to EV users to sign-out the cars for use, and HNEI GridSTART will design, code and integrate software to optimize charge/discharge schedules for the EVs, balancing transport needs and power/energy benefits for the University (building load shaping, demand charge reduction, smart EV charging, etc.), and possibly grid ancillary services. The Hitachi bi-directional EV chargers can also incorporate solar PV power as a source of energy for EV charging; GridSTART’s optimization software will thus incorporate state-of-the-art solar forecasts under development by GridSTART and maximization of solar energy as the preferred source for EV charging. Project results are of wide interest.

**PROJECT STATUS/RESULTS:** HNEI has taken delivery of the first Hitachi Hybrid-PCS for the project. The procurement of design/construction services and equipment needed to install the bi-directional chargers on campus, and the purchase of EVs is underway.

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