EV charging integrated with storage and local solar energy

The most common concern among EV drivers is range—the perception that their travel is limited by their vehicles' charge capacity and by the availability of charging stations. EV manufacturers respond by increasing car battery capacity and therefore drive ranges as much as they can, but as these increase, so does the demand for faster charging speeds. This requires higher-capacity charging stations, which can have a big impact on local energy distribution resources. As you can imagine, the costs to install and support these chargers can be high.

We wanted to find a way to lower the costs of necessary infrastructure upgrades, while also minimizing any environmental impacts. So, we proactively addressed the question of what to do with the old EV batteries when they no longer could hold enough charge to power the vehicles. Could we use them for something else?

Since there's still considerable life left in used EV batteries, we combined multiple used batteries to create a large stationary battery, to see if it would perform like any other battery you would install on the grid. We installed used Nissan Leaf batteries, a local site controller, a DC Fast Charger, and four controllable level 2 EV chargers at SMUD's Solar Port. This battery is controlled by the site controller, which acts as a universal remote.

The site controller is the brains of the operation. It automatically measures the output of solar energy and tells the battery when to charge. Currently, the battery system charges during the day, using excess solar energy generation, and provides power to the site during the evening and night. This makes the site almost 100% renewable and carbon-free.

Next, we're working on a way to keep the charging site load at the 150kW transformer limit, by reducing the EV charge output and discharging the battery. By keeping the site load at this limit, we can continue to use the original transformer and save the expense of replacing it with new—and larger—equipment.

Projects like this can replace the need for upgrades to the grid or energy distribution system where upgrades would be too costly, impractical or even physically impossible. With a few site modifications, the excess solar energy stored in batteries can be used to provide backup power to the site in case there's a grid outage. It's a sustainable EV charging model that limits its impact on the grid, which would benefit property owners and third party EV charger installers as well as utilities.

This could be the first step in creating a 100% renewable microgrid in the very near future!