Service Upgrade Avoidance



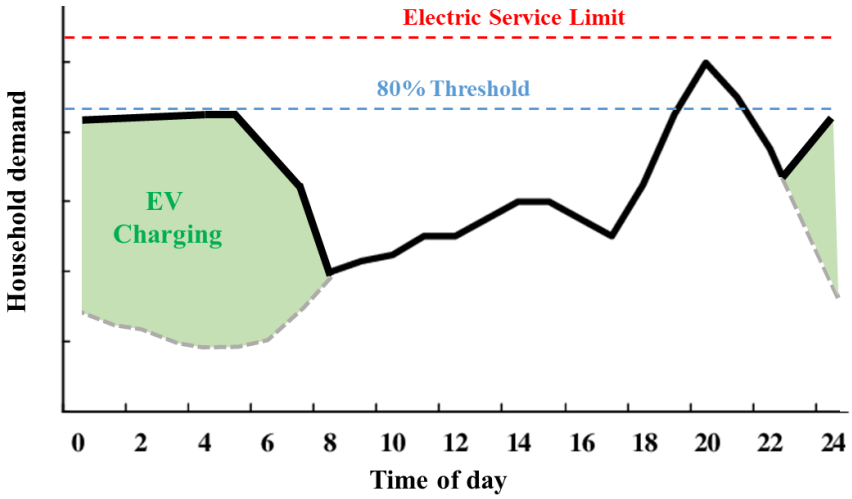
There are strong incentives for owners of electric vehicles (EVs) to install Level 2 chargers at their homes. Charging at higher power is faster and more efficient, and there are often rebate programs that make the purchase of a Level 2 charger very affordable. However, a Level 2 charger can add 30-60 amps to the electrical load for a residence, which may exceed their existing electric service capacity. This can create problems for the homeowner and the utility.

To expand the electrical capacity of their house, a homeowner can request a service upgrade from the utility. This can be a very costly undertaking – many times greater than the cost of the Level 2 charger itself. If the service is underground, a new trench may need to be dug to lay upgraded wiring and conduit, which can result in costs that run into the tens of thousands of dollars. In neighborhoods with high EV penetration and no remaining distribution capacity, providing a service upgrade to a single home may require significant upgrades to the neighborhood infrastructure, such as a transformer replacement.



A better alternative

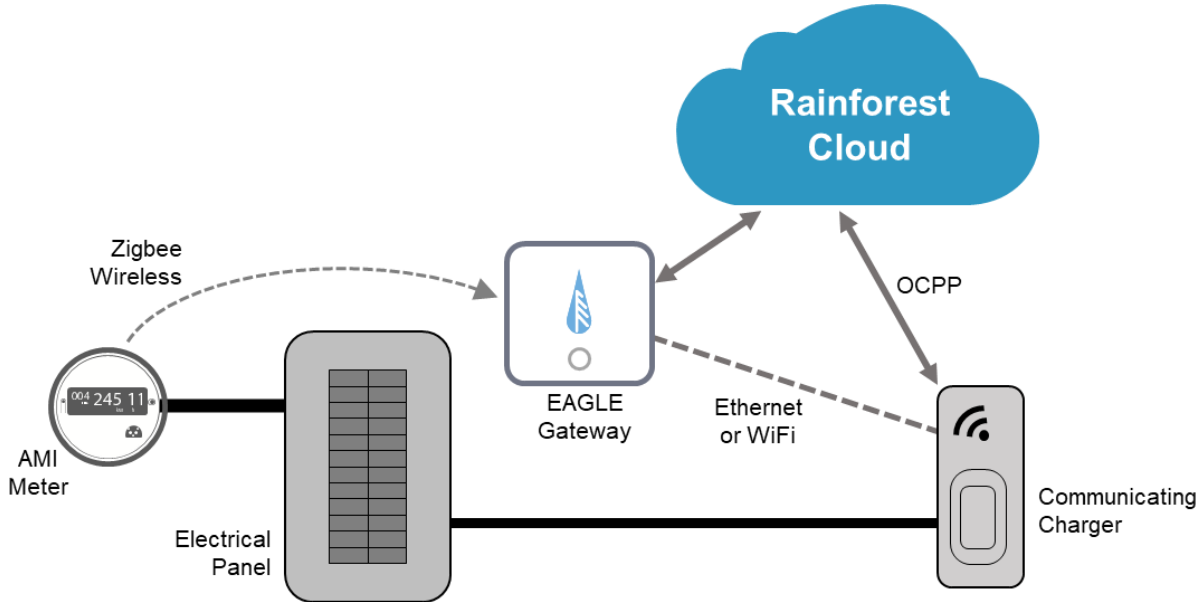
Fortunately, there is an alternative that saves the customer considerable expense and allows the utility to accommodate higher EV penetration without having to upgrade infrastructure. The National Electrical Code allows the total potential loads of the home to exceed the service to the panel if there is an Energy Management System (EMS) to limit simultaneous loads such that the service limit is not exceeded. By using an EMS, the homeowner can install a Level 2 EV charger – even if the maximum load of the charger exceeds the available capacity – without having to upgrade the electrical service to the home.



The EMS regulates the Level 2 charger output so that it stays within the available capacity of the electrical service. If a number of large electric loads (air conditioning, clothes dryer, oven) are turned on, then the EMS limits the EV charger to keep the total load of the house within its service limit. Conversely, when not many electric loads are turned on, then the EMS will allow maximum charge to the EV.

Our solution

The Rainforest EAGLE is an EMS that can control and manage communicating EV chargers. By leveraging charger protocols such as OCPP (Open Charge Point Protocol) or local protocols like Modbus TCP or IEEE 2030.5, the EAGLE can manage the rate of charge so that it doesn't exceed the electric service limit.



The EAGLE communicates directly with the utility Advanced Metering Infrastructure (AMI) meter using the meter's internal Zigbee radio. The EAGLE gets real-time demand (kW) readings from the meter and can determine how much capacity is available for EV charging. Commands are then sent to the EV charger to control the rate of charge to match the available capacity.

In the event of an internet outage, the EAGLE can switch from the OCPP connection to local control, if available. The EV charger is programmed with a default mode that limits the output to 12A if it loses connection.

Many benefits

This system allows a homeowner to install a Level 2 EV charger without having to worry about upgrading the electrical service to the home, making home charging technology more affordable – especially for older homes, particularly those in disadvantaged communities.

It also provides the utility with a non-wires alternative (NWA), preserving the capacity of the distribution transformer, and allowing additional EV chargers to be installed without having to upgrade the distribution infrastructure.

In addition to monitoring local demand reads from the meter, the EAGLE is also part of Rainforest's integrated managed charging platform, which enables charging using EV-specific TOU (time of use) rates, response to demand response (DR) events, and can even

implement fully optimized charging that takes customer, home, distribution, and supply needs into the equation. This gives the utility a full range of options to achieve peak load reduction, even as EV adoption is accelerating.