



V2X Charge Hub



A compact, high-efficiency on-board charger for low losses and faster charging with bidirectional capabilities for V2X connectivity

What it is

This bidirectional on-board electric vehicle charger allows vehicles to both charge from the grid and to feed energy stored in vehicle batteries back into the grid.

Based on almost a decade of research, the charger is built on innovative wide-bandgap semiconductor materials (GaN, SiC) and advanced algorithms. Its novel architecture reduces the number of passive components, and an advanced manufacturing technique called "Powder Injection Molding" further reduces the overall size of the charger.

What it can do

V2G (vehicle-to-grid) connectivity is one of the main challenges not only around electric vehicles, but around intermittent renewable energy production, as well. New power converter concepts are needed to respond to the challenges of these markets. This automotive-grade charger was developed with and successfully transferred to carmaker Renault; it should reach the market within the next five years. The charger could also respond to broader V2X connectivity needs:

- Solar panels could be connected to vehicle batteries, promoting the adoption of intermittent renewable energy and reducing overall electricity-related GHG emissions.
- Vehicle batteries could be used as V2L (vehicle-to-load) emergency generators (in island mode with voltage regulation).

What makes it unique

The electronic power converter architecture developed for this demonstrator is integrated directly into the vehicle. State-of-the-art chargers generally rely on filters for power-factor correction (PFC). Here, PFC has been virtualized using CEA-Leti algorithms and control law optimizations. The resulting single-stage converter is both compact and highly efficient.

At a glance

- Bidirectional for V2X connectivity
- Reduces energy losses by 30%
- Reduces cooling requirements
- TRL: 5-6, transferred to Renault



The grid is powered by renewable energies.
The energy supply is higher than the demand: **the vehicles charge.**



When the energy supply is lower than the demand, vehicle charging stops.
The plugged-in vehicles can then return electricity into the grid.
This is called bidirectional charging, or Vehicle to Grid.

Renault Group

What's next

Additional research at CEA-Leti will pave the way toward higher conversion frequencies and efficiencies, and CEA-Liten's research on insulators and transformers could lead to further cost reductions.

Interested in this technology?

Contact:

Philippe Despesse

philippe.despesse@cea.fr

+33 438 785 842

CEA-Leti, technology research institute

17 avenue des Martyrs, 38054 Grenoble Cedex 9, France

cea-leti.com

in @CEA-Leti

Research
for industrial
innovation