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**Development and Introduction of a Power Grid-Connected
Vehicle to Home (V2H) System
—Cars as a Household Power Supply—**

NICHICON CORPORATION has made many contributions with regard to the adoption of electric (EV) and plug-in hybrid (PHV) vehicles and their use as emergency power sources during disasters, including the mass production and sales of EV and PHV quick chargers since 2009, the introduction of the world's first EV Power Station[®] V2H system in 2012, the Power Mover[®] Vehicle to Load (V2L) portable power supply in 2017 and in 2018, we developed and launched the Tribrid Energy Storage System[®], aimed at promoting the adoption of low-environmental impact EV and PHV.

NICHICON has also developed and launched two types of power grid-connected V2H systems (model numbers VCG-663CN3 and VCG-666CN7) with the CHAdeMO (V2H).

The design concept of these products will be displayed at the 31st International Electric Vehicle Symposium and Exhibition & International Electric Vehicle Technology Conference 2018, held at the Kobe Convention Center from September 30–October 2, and CEATEC JAPAN 2018, held at Makuhari Messe from October 16–19.

Planning and Development Background

Six years have passed since the launch of the V2H system EV Power Station[®] in 2012. During that time, the development of regulations concerning power supplies from EV and PHV (CHAdeMO V2H Guidelines DC Version 2.1) and power grid connections linking EV and PHV to homes (JET, JIS C 4412-1 and “Safety Requirements for Electric Energy Storage Equipment (1)” 10) has laid a foundation for the introduction of V2H.

The verification of CHAdeMO ensures connective compatibility between EV and PHV and V2H systems, while JET verification enables the efficient and uninterrupted supply of electricity to homes from power companies and electricity stored in the batteries installed in EV and PHV. This also enables the continued double-speed charging (up to 6 kW) of EV and PHV.

It is estimated that, by the end of the Feed-in Tariff (FIT) period in fiscal 2019, 56,000 homes will have solar power generation equipment installed, with another approximately 20,000 homes installing solar power generation equipment after the end of the FIT period

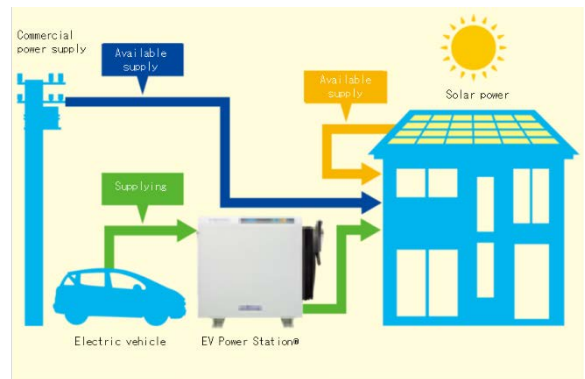
every year thereafter, as consumer trends shift from selling electricity to private consumption. NICHICON introduced the Tribrid Energy Storage System in July 2018 as a flagship model providing multiple options in response to household needs after the end of the FIT period.

Of the two models developed by NICHICON, high-end model VCG-666CN7 is equipped with a communications function compatible with ECHONET Lite, facilitating the power trading that is expected to be commercialized in the future. In particular, this will enable the realization of connections between this device and multiple EV and PHV for Work Place Charging*¹ (WPC) at companies and offices and corporate use of Virtual Power Plants*² (VPP).

Features

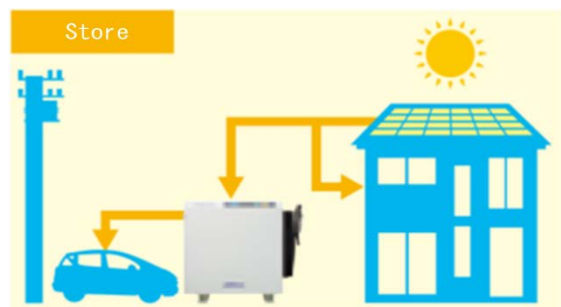
1. Interconnected with power grid to enable simultaneous power supply

Power grid interconnection enables electricity from electric cars, power companies and solar power generation to be used at the same time. Users can continue to enjoy their regular comfortable lifestyle while using electricity stored in EV.



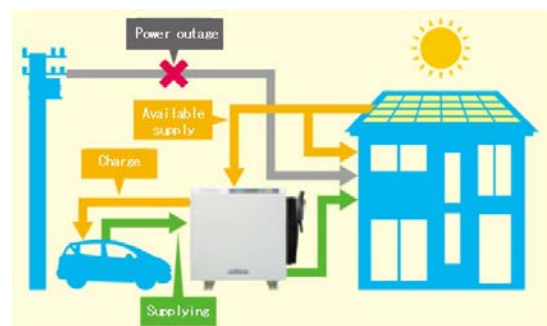
2. Eco-driving using electricity generated by solar power

Charging the EV with excess electricity generated by solar power realizes clean and economical driving.



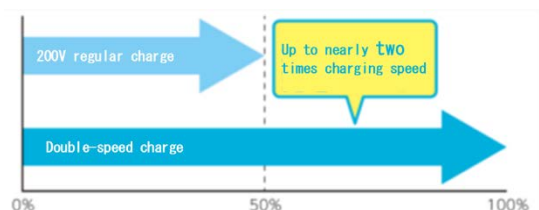
3. Utilizes electricity from EV during power outages

In the event of a power outage, electricity stored in the EV can be used for the home. And, if solar power is being generated, the EV can be charged even during power outages.



4. Double-speed charging enables rapid charging

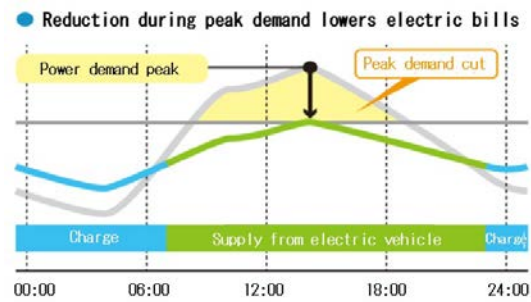
Electricity from solar power or the power company can be used for charging in approximately half the time required for standard 200 V charging equipment. Household electricity consumption is monitored in real time and



an onboard intelligent charging function enables automatic control of chargeable electric power volumes.

5. Peak demand reduction leads to lower costs

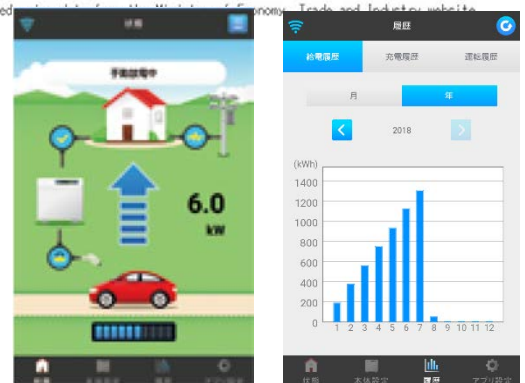
By using electricity stored in the EV during the afternoon hours reduces peak power demand, enabling reductions in electric power costs. Using electricity generated by solar power will contribute to further reductions in peak demand.



6. Easy remote operation using smartphones

Using a dedicated smartphone app, settings such as the start time for charging EV can be easily adjusted. Usage history can also be reviewed using this app. And, the use of HEMS communication standard ECHONET Lite enables smooth support for future VPP.

Note: Only compatible with VCG-666CN7.



Product Overview

Specifications common to both models:

- Charging performance: Under 6 kW (includes intelli-charge function)
- Power grid connectivity (compatible with CHAdeMO V2H Category 3^{*3})
- 7-segment indicator mounted on main body display, membrane switch used for operation realizes high visibility and operability
- Earthquake resistance and construction efficiency are greatly improved by an integrated system configuration that simplifies installation

(1) VCG-663CN3

Significant reduction in installation costs as a power grid connected V2H system. A popular more affordably priced unit that is easy to use has also been developed Power supply performance: 6 kW (self-sustaining^{*4}: 3 kVA)

- Two-year manufacturer warranty after installation
- Suggested retail price: ¥398,000 (excluding consumption tax and installation cost)

(2) VCG-666CN7

A high-end version of VCG-663CN3, provides security with improved features and convenience, including communications functionality (ECHONET Lite), remote control (smartphone app), submergibility and a long warranty (five years).

- Power supply performance: 6 kW (self-sustaining: 6 kVA)
- Supports Echo Net Light
- Remote operation with a dedicated smartphone application, display viewing available
- Warranty: Five-year warranty after installation.

- Base floor height: 10 cm + main body: 25 cm enables total water submergence of 35 cm
- Rust prevention is standard specification
- Suggested retail price: ¥798,000 (excluding consumption tax and installation cost)

Model	VCG-663CN3	VCG-666CN7
Outside dimensions	W809 x H855 x D337mm (excluding protrusions)	
Weight of main unit	About 88kg (3.7m cable)	About 91kg (7.5m cable)
Input of grid	Single-phase, three-wire, AC 100/AC200V	
Output power of charging unit	Less than 6kW	
Output power of discharge unit	6kW(when connected to grid), Scheduled to acquire JET, Standalone output3kVA	6kW(when connected to grid), Scheduled to acquire JET, Standalone output6kVA
IP grade	IP36	
Installation environment	Outdoors, at elevation of 2,000m or less(-20 to +40° C)	
Operating noise	About 45dB	
Control/Display	Control : Main unit membrane switch Display : Main unit 7 segment display	Control : Main unit membrane switch Display : Main unit 7 segment display And operation and operation status check by dedicated smartphone application
Remote Control	-	DCHONET Lite command implementation

Scheduled sales launch: January 2019

Sales target: 18,000 units (three years)

1. Work Place Charging: Chargers are installed at company headquarters and offices enabling EV and PHV charging while employees work.
2. Virtual Power Plant: The simultaneous control of a large number of small power generators, capacitors and power demand control systems as a single power plant.
3. CHAdeMO V2H Category 3: The provision of electric power with indoor wiring connected (system interconnection) to power grid via an electric power converter installed inside a house or other building. However, there is no reverse flow of power to commercial power.
4. Self-sustaining: Operation during power outages.

Product Image



Power Grid-Connected Vehicle to Home (V2H) System (VCG-666CN7)

Connecting the VCG-660CG3 Vehicle to Grid (V2G) system to the power grid is made compatible with the G59 UK regulation, compatibility with the CE regulation enables rollout to the rest of Europe. England is conducting a test called “Electric Nation” with UK company Crowd Charge on this device.

NICHICON CORPORATION PROFILE

Head Office: Karasumadori Oike-agaru, Nakagyo-ku, Kyoto

Representative: Ippei Takeda, Chairman and CEO

Established: August 1, 1950

Capital Stock: ¥14,286 million (as of March 31, 2018)

Employees: 5,284 (consolidated, as of March 31, 2018)

Product Lines: Aluminum electrolytic capacitors, Plastic film capacitors, Positive thermistors “Posi-R”, Household energy storage systems, Vehicle-to-Home (V2H) systems, EVs/PHVs Quick Charger, Public and industrial power storage system, Switching power supplies, Function modules, Power sources for medical accelerator, Power sources for academic study accelerator, Momentary voltage sag compensator, Power outage compensator

Net Sales: ¥114,767 million (consolidated, as of March 31, 2018)