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Introduction of High Speed EV Charger (SuperRAPIDAS™-SR)

1. Introduction

Since 2012, JFE Technos Co., Ltd. has designed and produced the RAPIDAS™-R quick charger, featuring a built-in storage battery, and the RAPIDAS™-X quick charger, which uses low-cost single-phase power, as rapid charging systems for electric vehicles (EVs) (**Photo 1**).

The RAPIDAS-R has earned a high evaluation from customers because it reduces the basic electricity charges by about half by holding input to 28 kVA while providing an output of 50 kW, and can also support BCP (Business Continuity Plans) as an emergency power source. A cumulative total of 170 units have been shipped.

RAPIDAS-X has also won high marks from customers, as the basic electricity charges can be reduced to 1/3 to 1/4 of the conventional charges by receiving power under a Metered Light B contract (single-phase 200 V), while also maintaining an output of 50 kW. A cumulative 210 units have been shipped.

1.1 Basic Specifications of RAPIDAS™-R and RAPIDAS™-X

The basic specifications of these two quick charging systems are as follows.

(1) RAPIDAS-R quick charger (built-in storage battery type)
- Input: 3-phase AC 200 V / 28 kVA
- Output: DC 50 kW / 0–125 A
- Features: Built-in 12 kWh storage battery
  Can be used as an emergency power source (supports BCP).

(a) RAPIDAS®-R

(b) RAPIDAS®-X

Photo 1 Charger exterior

(2) RAPIDAS-X quick charger (single-phase power type)
- Input: Single-phase AC 200 V / 55 kVA
- Output: DC 50 kW / 0–125 A
- Features: Metered Light B contract

In addition to these conventional types, JFE Technos recently developed the ultra-quick EV charger SuperRAPIDAS™-SR with an output of 100 kW, which is double the output of our previous chargers, and began sales in May of 2020 in order to respond to demand for larger battery capacity in EVs.

This article introduces the overview and features of the new ultra-quick EV charger SuperRAPIDAS-SR.

2. Introduction of Ultra-Quick EV Charger SuperRAPIDAS™-SR

2.1 Enables 100 kW Output with Low Voltage Power Receiving

The main specifications of the SuperRAPIDAS-SR are as follows.
- Input: 3-phase AC 200 V / 56 kVA
- Output: DC 100 kW / 0–250 A
- Features: Built-in 52 kWh storage battery
  Long-term use as an emergency power source (supports BCP).
  Equipped two charging connectors.

Focusing on the operating cost of quick chargers for EVs, JFE Technos developed and began sales of the RAPIDAS-R quick charger using a built-in storage battery, which makes it possible to reduce the received electricity charges.

The recently-developed SuperRAPIDAS-SR ultra-quick EV charger, which also features a built-in storage battery, anticipates the needs of future EVs, in which large capacity batteries will be the main stream. As shown in **Fig. 1**, the SuperRAPIDAS-SR can receive power at 50 kW from a commercial power source (grid power) and output a maximum of 100 kW to EVs by using the "battery assist" function of the built-in storage battery.

2.2 Substantially Reduces Power Rates

The 100 kW chargers marketed by other companies

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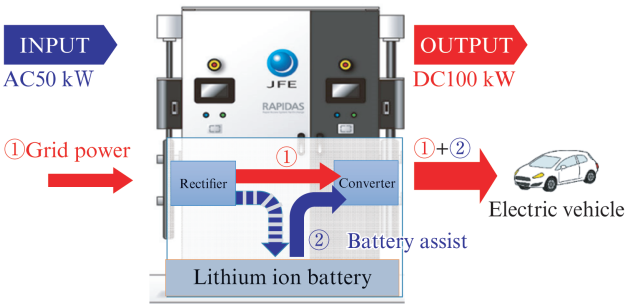

Fig. 1 Schematic diagram of charger with built-in battery

Photo 2 Exterior photo of SuperRAPIDAS™-SR (demonstration machine)

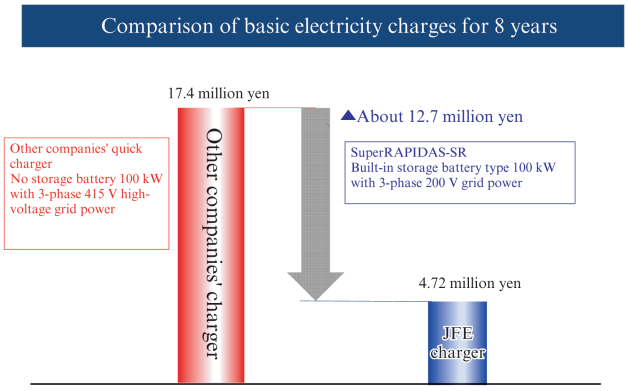

Fig. 2 Comparison of basic electricity charges for 8 years

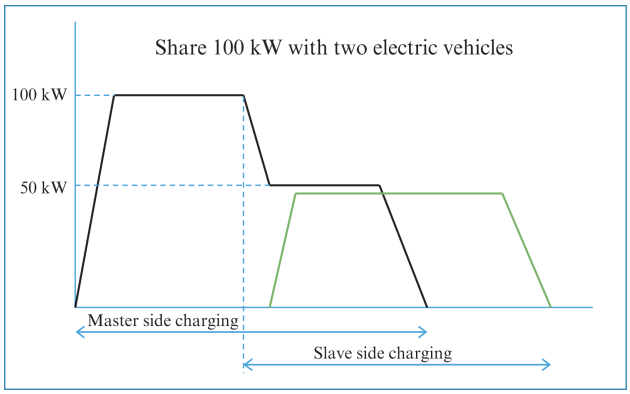

Fig. 3 Charging output when charging two units simultaneously

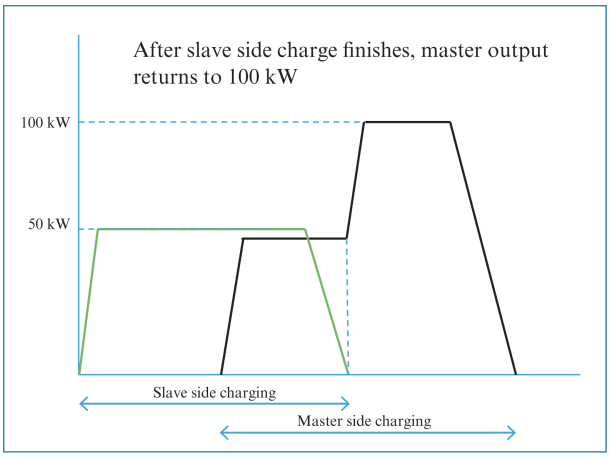

Fig. 4 Charging output when returning to master side alone

receive power under a high voltage power contract. In contrast, the SuperRAPIDAS-SR can output a maximum of 100 kW while operating under a 50 kW low voltage power contract, which dramatically reduces the operating electricity charges.

Figure 2 shows a comparison of the basic electricity charges over 8 years for the SuperRAPIDAS-SR and a conventional 100 kW power-receiving quick charger.

2.3 Flexible Installation

The SuperRAPIDAS-SR consists of a charger control panel, which contains the main circuit inverter, and the storage battery panel where the lithium ion battery is installed. Because these two units can be separated, flexible installation is possible.

Photo 2 shows an example of installation of the SuperRAPIDAS-SR, where the charger control panel is on the right and the storage battery panel is on the left. In the future, we plan to improve the operability of the charging cable and develop a more compact equipment design.

2.4 Enables Simultaneous 2-Unit Charging

The SuperRAPIDAS-SR has two charging outputs, and the charging output is shared by two charging connectors.

For example, during 100 kW charging on one side ("Master side"), the output on the Master side is gradually reduced in order to charge the other side ("Slave side"), and after the Master side output has decreased to 50 kW, charging starts on the Slave side. (This function is called "dynamic control.") **Figure 3** shows the condition of charging output during simultaneous charging with 2 units.

In addition, when charging on the Slave side is finished after simultaneous 2-unit charging, it is possible to increase the output on the Master side again and charge at the maximum 100 kW.

Figure 4 shows the condition of charging output

when the Master side returns to 1-unit charging after simultaneous 2-unit charging.

As described above, by utilizing the dynamic control function, the SuperRAPIDAS-SR can provide the optimum charging for charging requests from 2 EVs during charging at 100 kW output.

3. Conclusion

Because both domestic and foreign auto makers have announced a large number of new EVs for the Japanese market in recent years, further popularization and expansion of EVs are expected in the future.

As a maker of rapid charging systems, JFE Technos will continue to provide charging systems and services that can be used with complete confidence and convenience by commercial customers who install charging devices for EV fleets, and by EV users in the general public.

Note: "RAPIDAS" is a registered trademark of JFE Technos.

For Further Information, Please Contact:

Engineering Dept., Photovoltaic/Wind power generation/EV Division, JFE Technos
Phone: (81)45–505-6574 Fax: (81)45–505-6537
E-mail: kikuchi-tsutomu@tec.jfe-eng.co.jp
https://www.jfe-technos.co.jp/en/