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Research on DC distribution demonstration

SC C6

PS 3 and Question 8

Yuko INAOKA, JAPAN

 Kansai Transmission and Distribution

 Kansai Electric Power
power with heart

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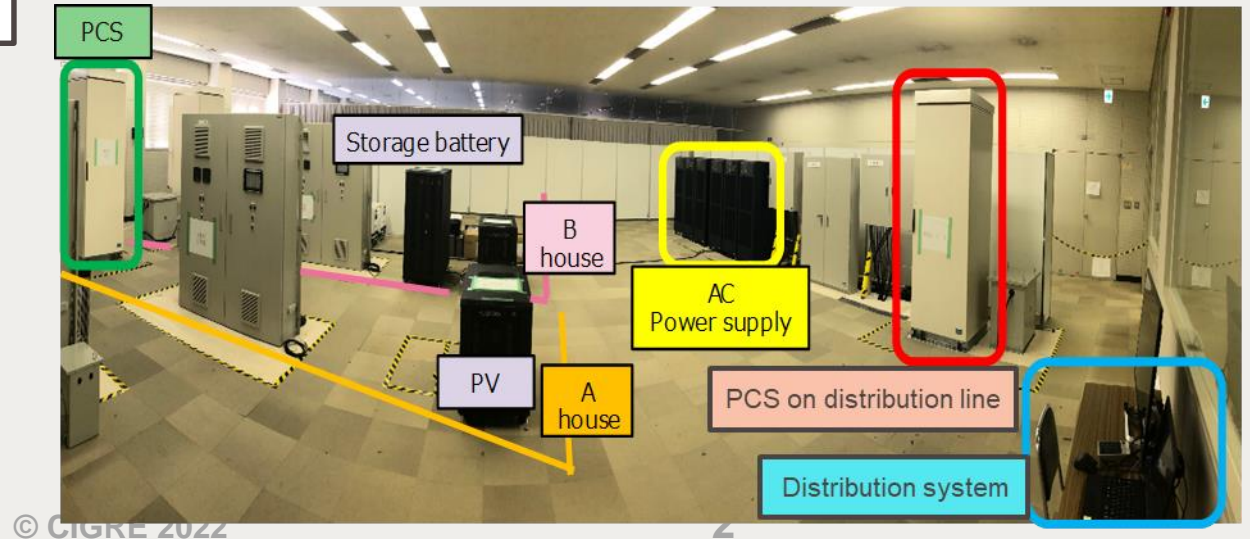
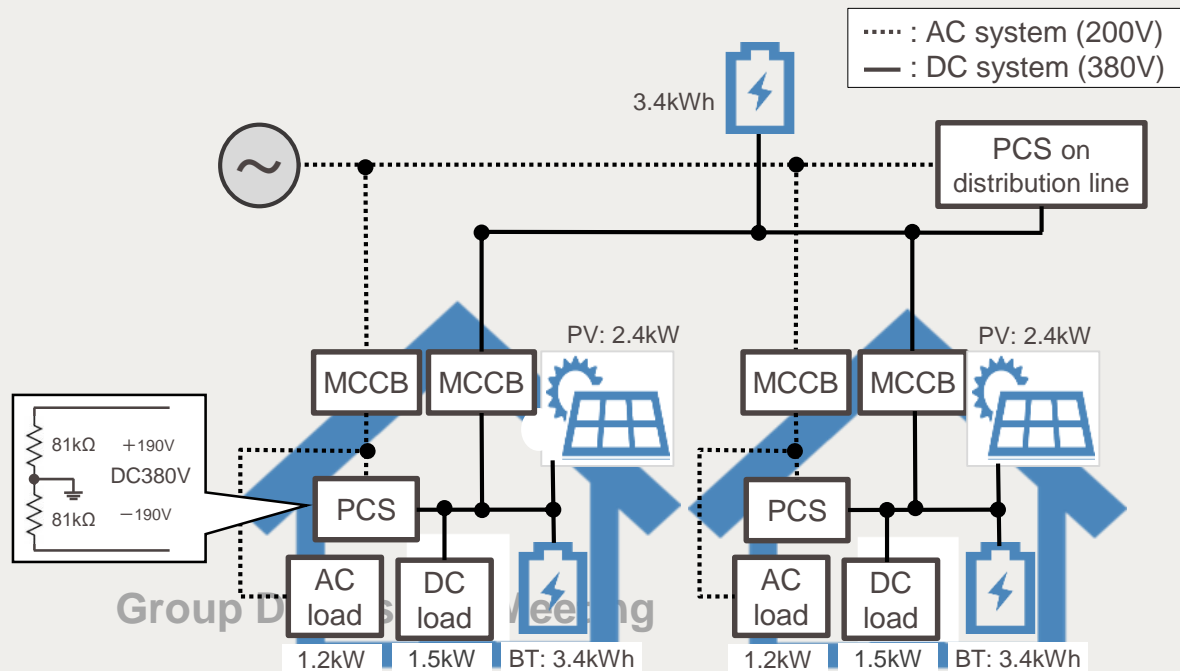
General Outline

•Background

- To effectively utilize PV and storage battery in the distribution system, we constructed a demonstration system for sharing power between residential houses applied DC network, and verified technical issues such as protection and control.

•Research Contents

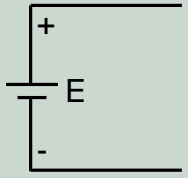
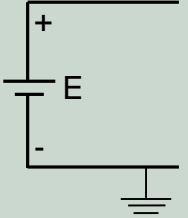
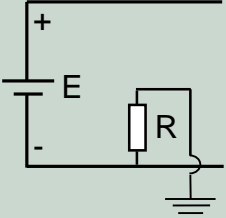
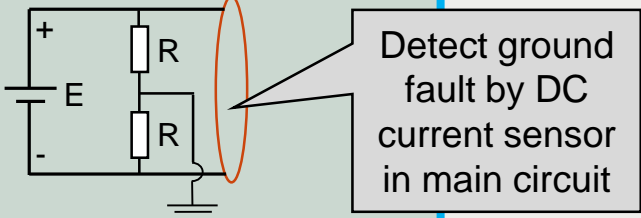
- Hybrid supply by AC and DC



Protection

•Grounding System

- Establish suitable grounding system for DC current sensor to detect ground fault.
- Apply the grounding system by inserting resistors to neutral point, and arrange resistance value.

	Un-grounding	Single grounding	Grounding by inserting resistor to single pole	Grounding by inserting resistors to neutral point
Configuration				
Evaluation	Impossible to detect ground fault either + or – side.	Ground fault results in short circuit, and ground fault current is large.	Ground fault current is suppressed by a resistor. Impossible to detect ground fault on – side.	Ground fault current is suppressed by resistors. Possible to detect ground fault both + and – side.

•Demonstration Results

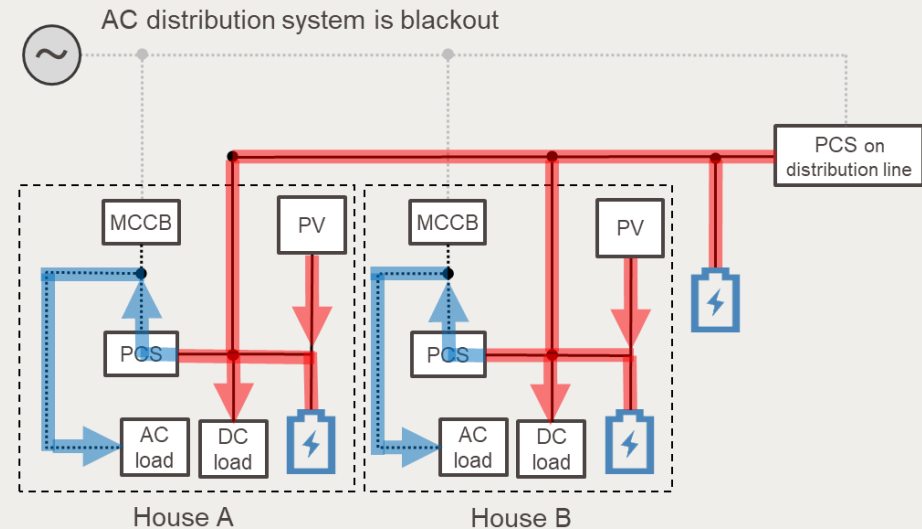
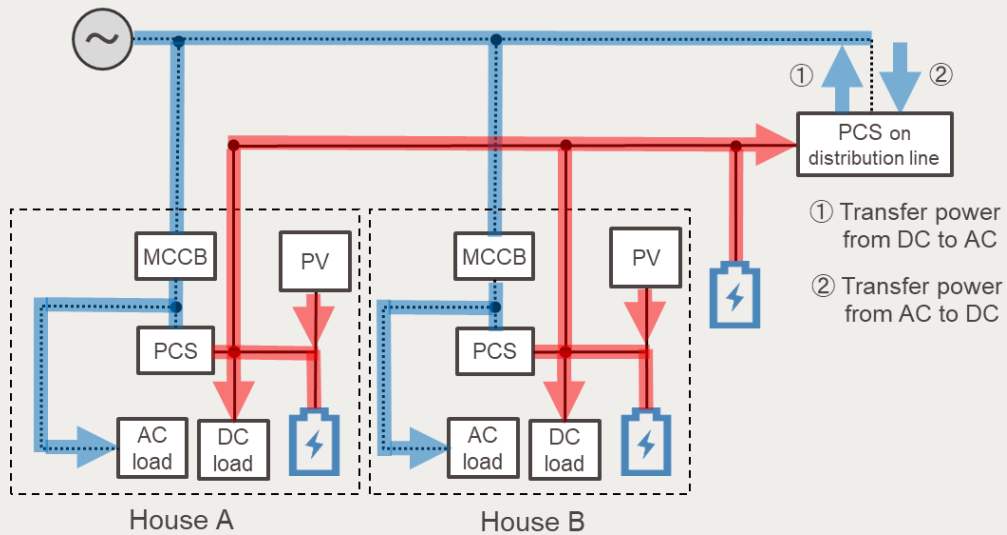
- DC current sensor with the grounding system enabled to detect ground fault in a certain condition of the demonstration system.
- Further study is needed about arranging the specification of the grounding system for different conditions of the demonstration system.

Control

•Power Flow Control System

Consists of the below 3 components

- PCS on the distribution line, which transfers power between the DC system and the AC system in order to compensate excess or deficiency of power in the DC system.
- PCSs in houses, which switch on automatically and supply AC load from batteries in case of AC distribution line outage.
- Battery Management System, which monitors output voltage of batteries and controls the charging/discharging amount.



•Demonstration Results

- It was confirmed that Power Flow Control System can control batteries and compensate power for loads in houses in case of AC distribution line outage.
- Further study is needed about practical use in different conditions of the demonstration system.