

Paris Session 2022



Simulation study to compare the centralized and de-centralized voltage control

SC C6
PS2 Question 2.7

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Group Discussion Meeting

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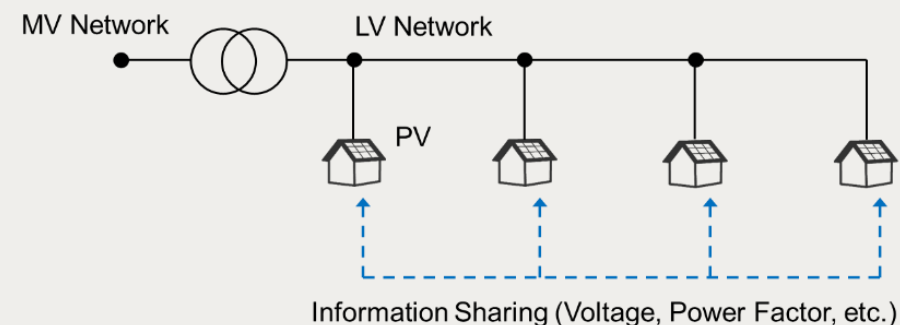
Proposed Control Method through Communication between Customers

- Large number of Photovoltaics (PVs) are installed in distribution systems and the reactive power control of PV is used to cope with the voltage rise.
- In near future, many customers will have energy storage devices (battery storage systems and EVs).
- Then, the reactive power output may be excessive because the reverse power flow from customers will be decreased by the self-consumption of PV power.



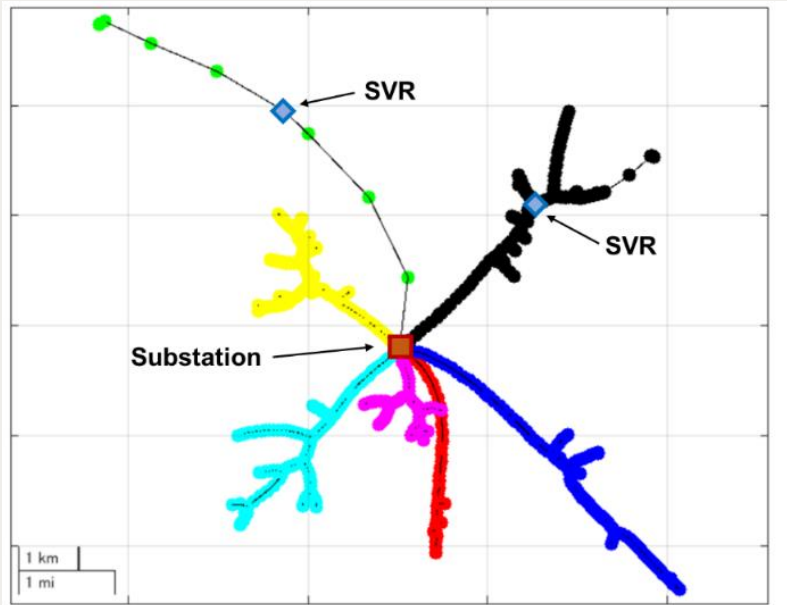
Control method through communication between customers was proposed.

- Information of voltages and power factors is shared among customers
- Reactive power is controlled only when the voltage exceeds the upper limit
- Target PV is properly selected



Control method through communication between customers

Simulation Study to Compare the Centralized Control and the De-centralized Control



Distribution System Model
(Substation and 7 Feeders)

Group Discussion Meeting

Simulation conditions to compare the effect of voltage control

- Control method of PVs
 - **Autonomous control method (conventional)**
 - Constant power factor: $PF=0.95$
 - **De-centralized method (proposed)**
 - Control method through communication between customers
 - **Centralized control method**
 - Centralized control using LRT, SVR and reactive power of PVs
 - Voltage control considering distribution line loss

Simulation Results

- The reactive power is significantly decreased by the proposed de-centralized control and the centralized control compared with the autonomous method.
- The distribution line loss and the number of tap change (an LRT and two SVRs) are decreased by the proposed control and the centralized control.
- Considering the cost, the proposed method is effective in the transition period to the future.

	PV (Reactive Power Control)	LRT, SVR	Voltage	Reactive Power (Line Loss)	Number of Tap change	Cost (Communication Network)
Autonomous Control (PF=95%)	Constant Power Factor	Autonomous	○	△	×	○
De-centralized Control (Proposed)	Communication between Customers	Autonomous	○	○	△	△
Centralized Control	Centralized	Centralized	○	○	○	×

○, △, × : Relative evaluation of control methods