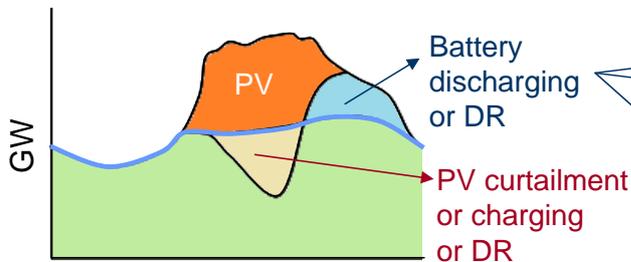


# Study on the harmonized control of residential batteries

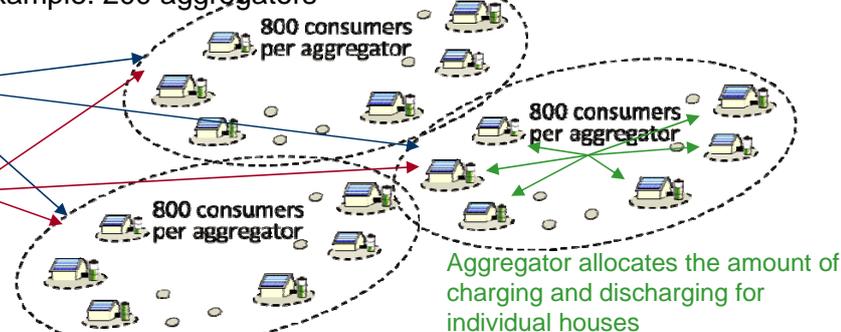
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## Background

### Day-ahead planning



Example: 200 aggregators



- EEDC determines how much energy should be charged or discharged.
- HDP dispatches required charging and discharging to the aggregators. (Spatial dispatching with low-time resolution)

### Real-time operation

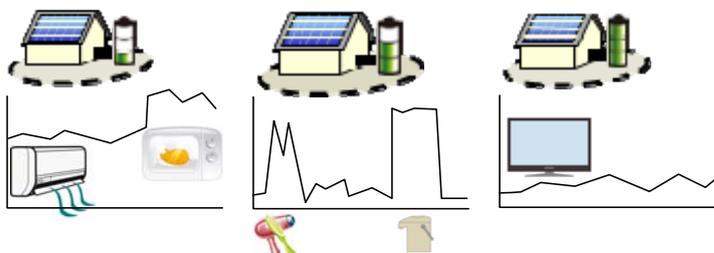
- Aggregators should secure reasonable and fair allocation of battery charging and discharging between various electric consumers in order to share the loss of electricity due to the battery operation.

### Objective

- Development of a harmonized energy management strategy for aggregators in residential sector satisfying the maximum use of renewable energies, economic efficiency (minimum use of batteries) and fair sharing of DR without restricting the electric usage of the residents.

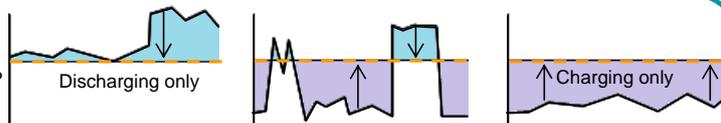
## Harmonized EMS

### What is "fair sharing of DR"

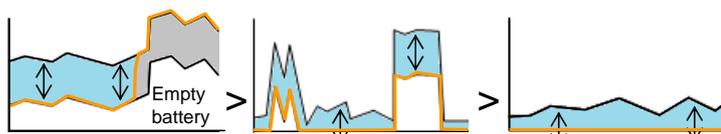


- SOC and the power flow have wide variations among individual houses.
- Individual houses' load is difficult to predict.

Constant power flow?



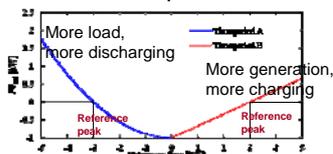
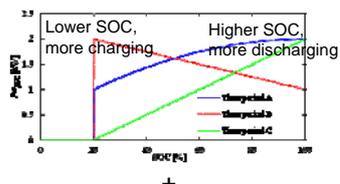
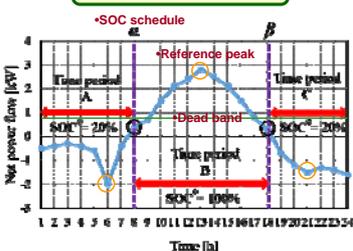
Constant discharging power?



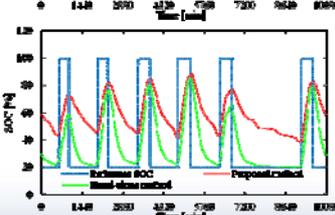
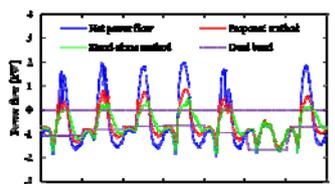
- Each houses should take "Common but differentiated responsibility"
- We assumed that consumers who use more electricity or feed more power to the grid receive more benefit from the grid.  
→ Should contribute more.

## Results

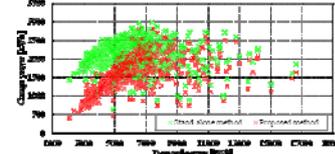
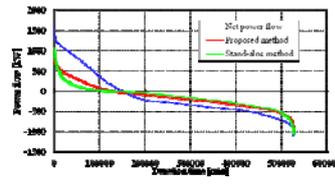
### Day ahead planning



\*Stand-alone method:  
Batteries are charged or discharged based on the local power flow.  
Positive (reverse) flow = charging,  
Negative flow (load) = discharging



- More peak reductions were achieved with less battery use.



- Annual simulation result showed more peak shaving and better correlation between demand and charging.