Norway
grants

System power management and energy storage sizing in EV charger

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Warsaw University of Technology

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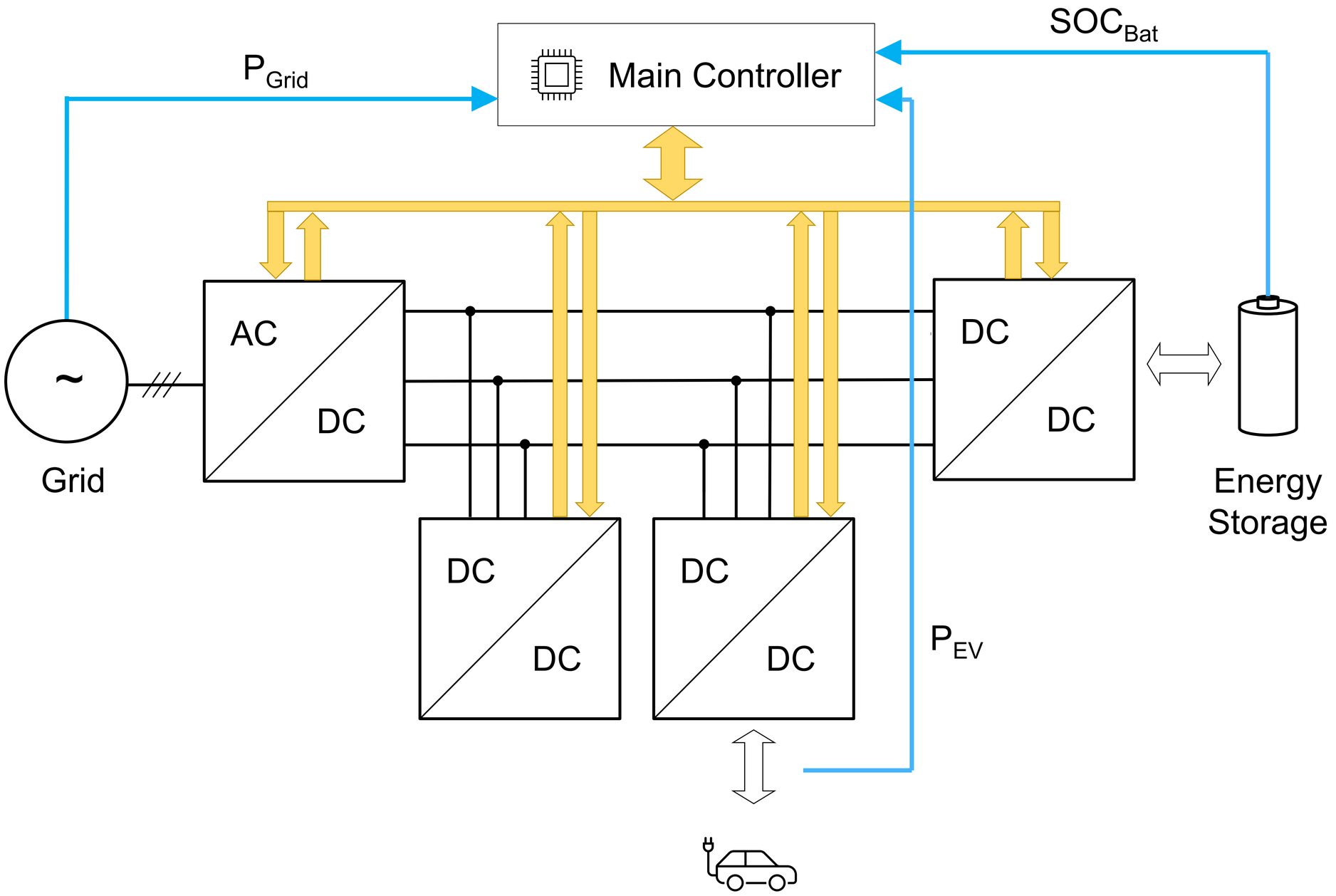
Agenda

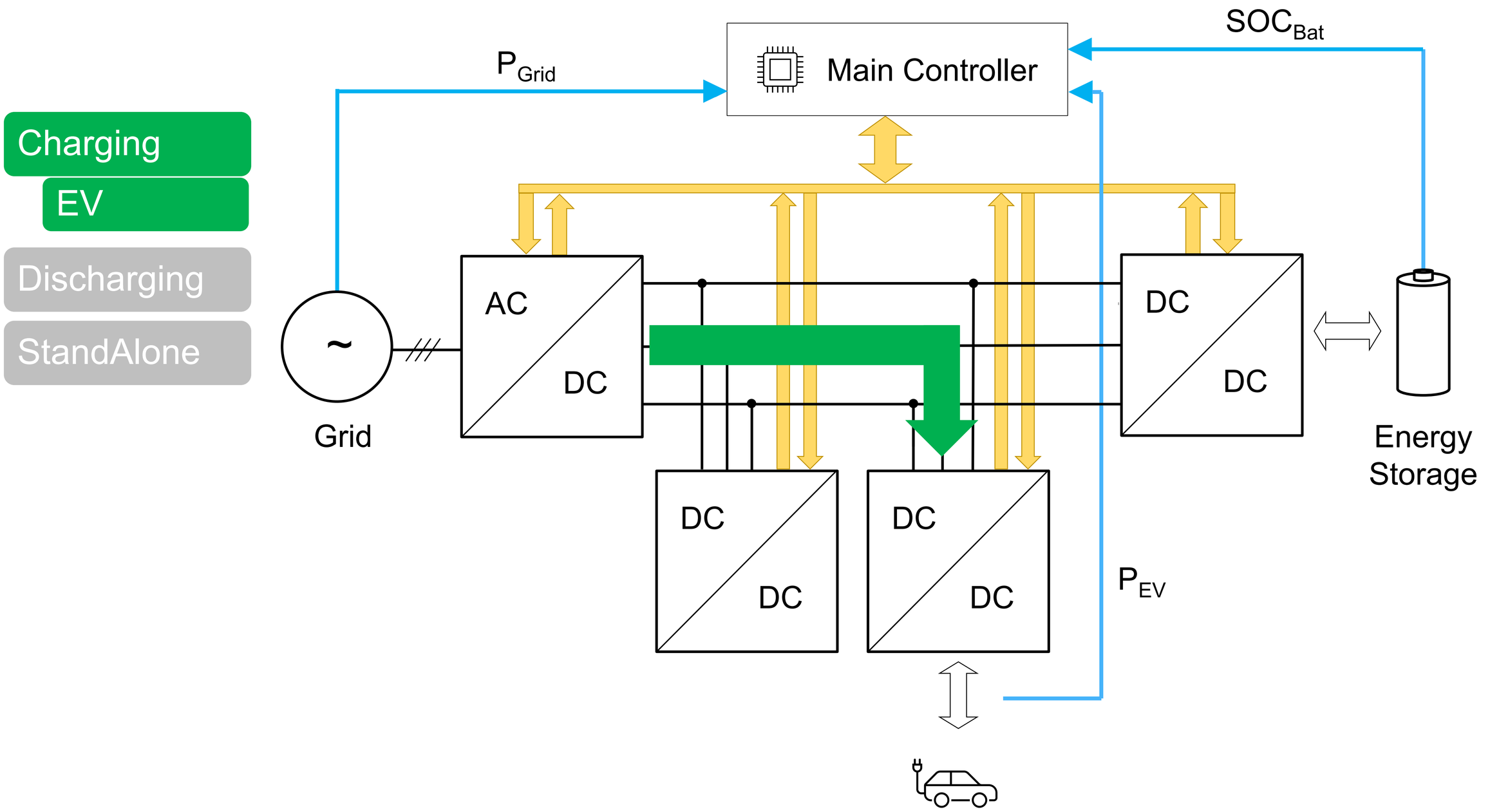
1. Possible operating modes of the system
2. Managing power – the idea
3. Sizing the energy storage
   - a. Initial data sets and outcomes
   - b. Important considerations

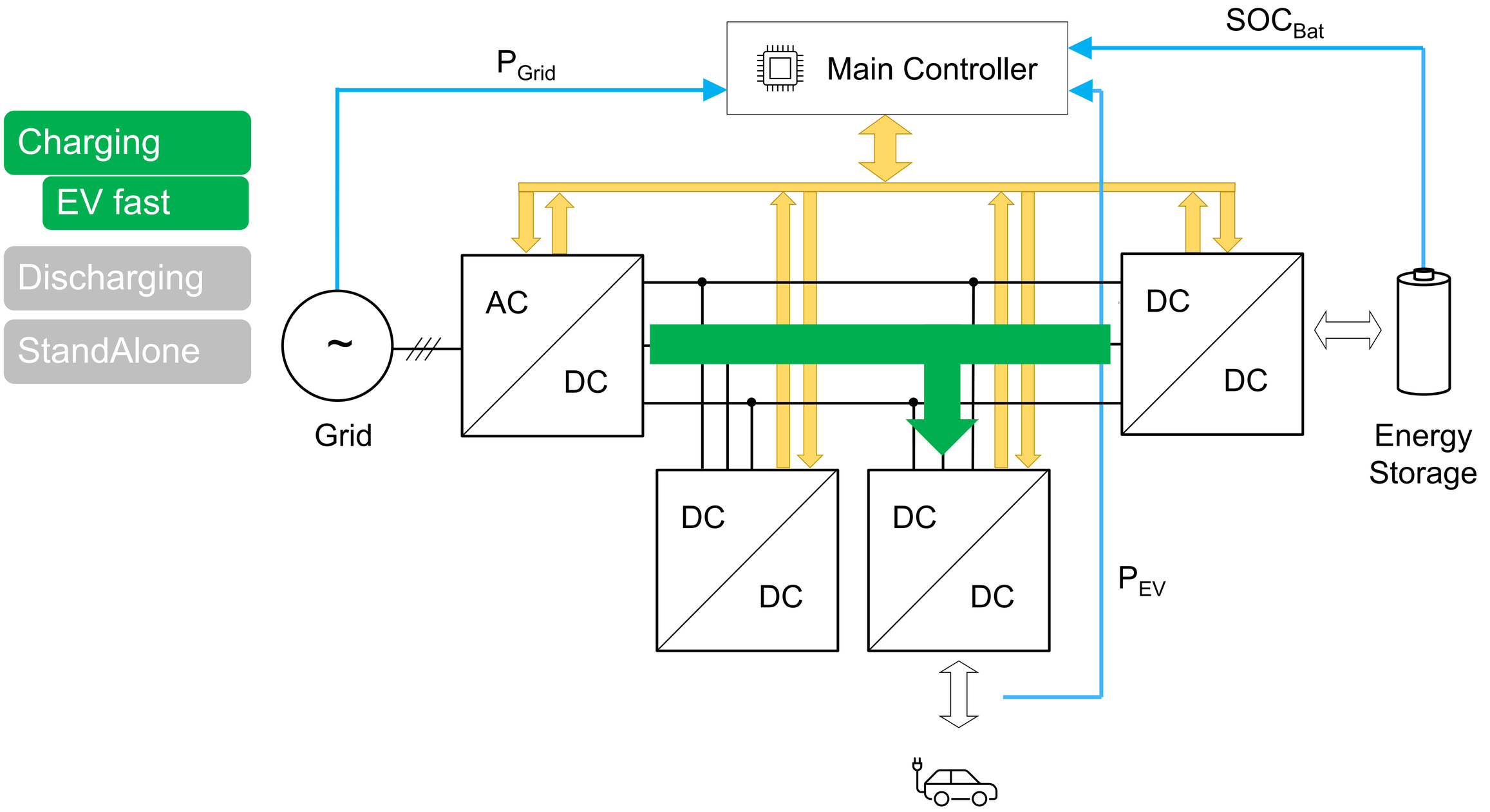
Charging

Discharging

StandAlone




Charging
EV
Discharging
StandAlone
P_{Grid}
Main Controller
SOC_{Bat}
~
Grid
AC
DC
DC
DC
DC
DC
DC
DC
Energy
Storage
P_{EV}
EV


Charging
EV fast
Discharging
StandAlone
Main Controller
P_{Grid}
SOC_{Bat}
~
Grid
AC
DC
DC
DC
DC
DC
DC
DC
Energy Storage
P_{EV}
EV

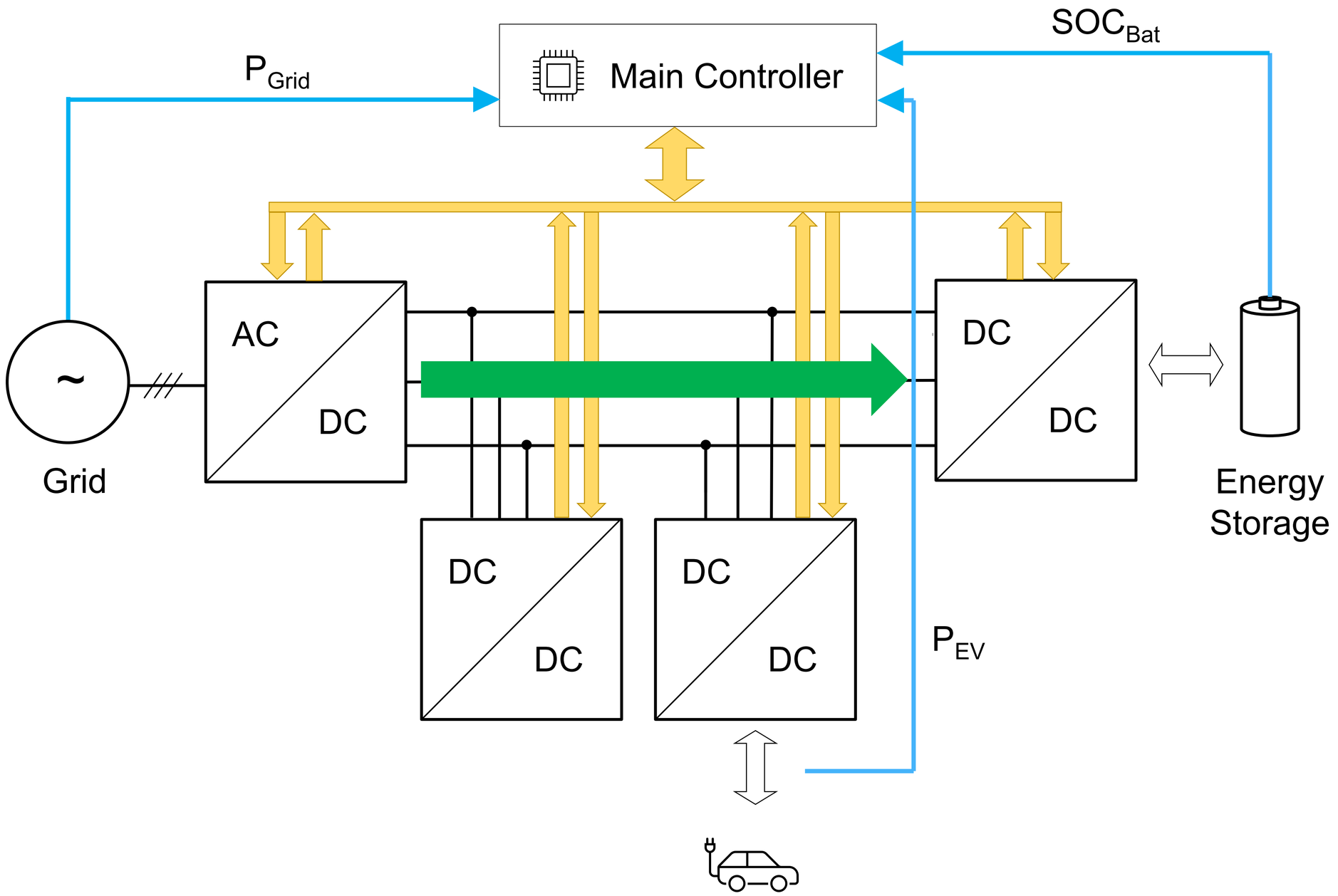
Charging

EV

Storage

Discharging

StandAlone



Charging

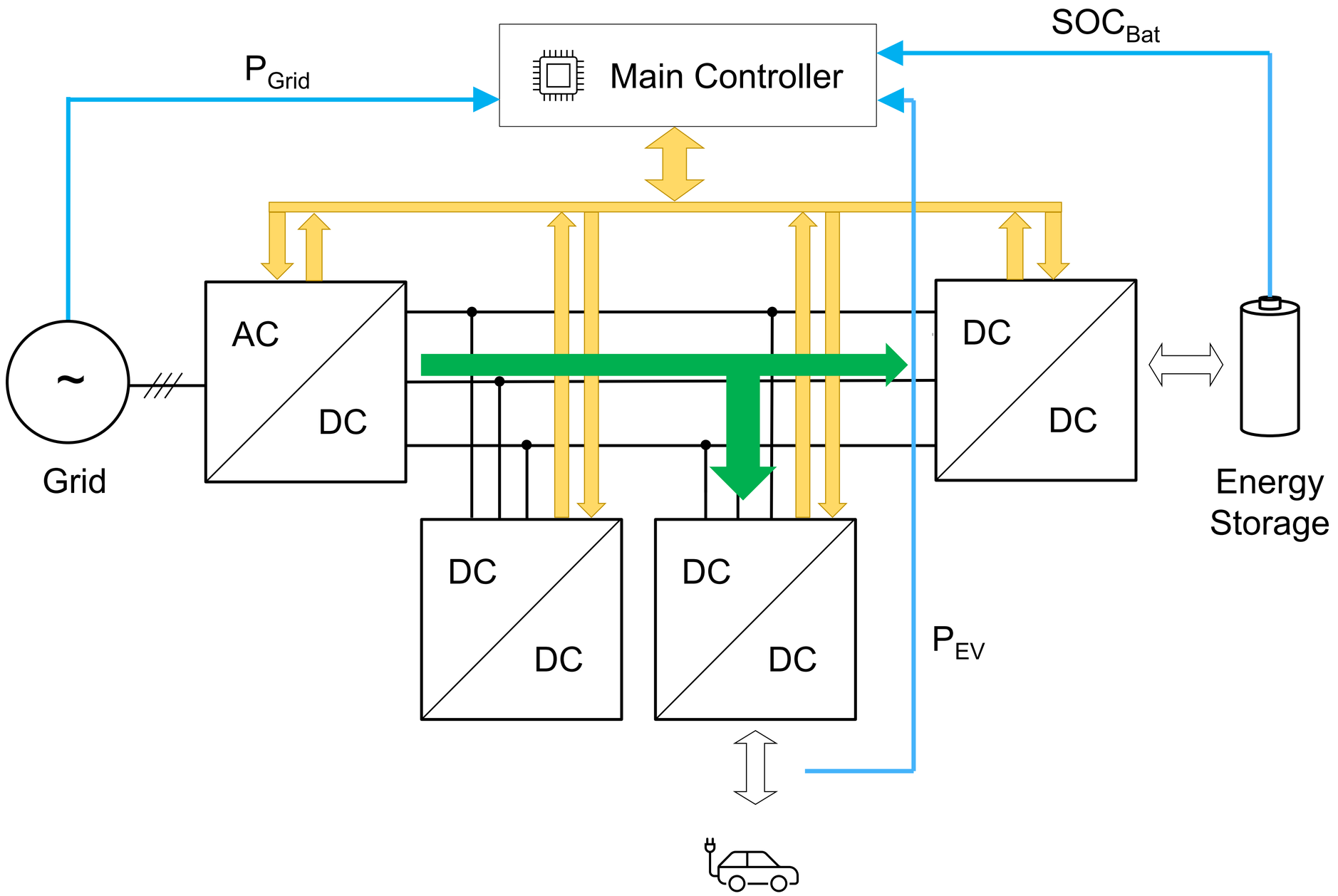
EV

Storage

Storage +EV

Discharging

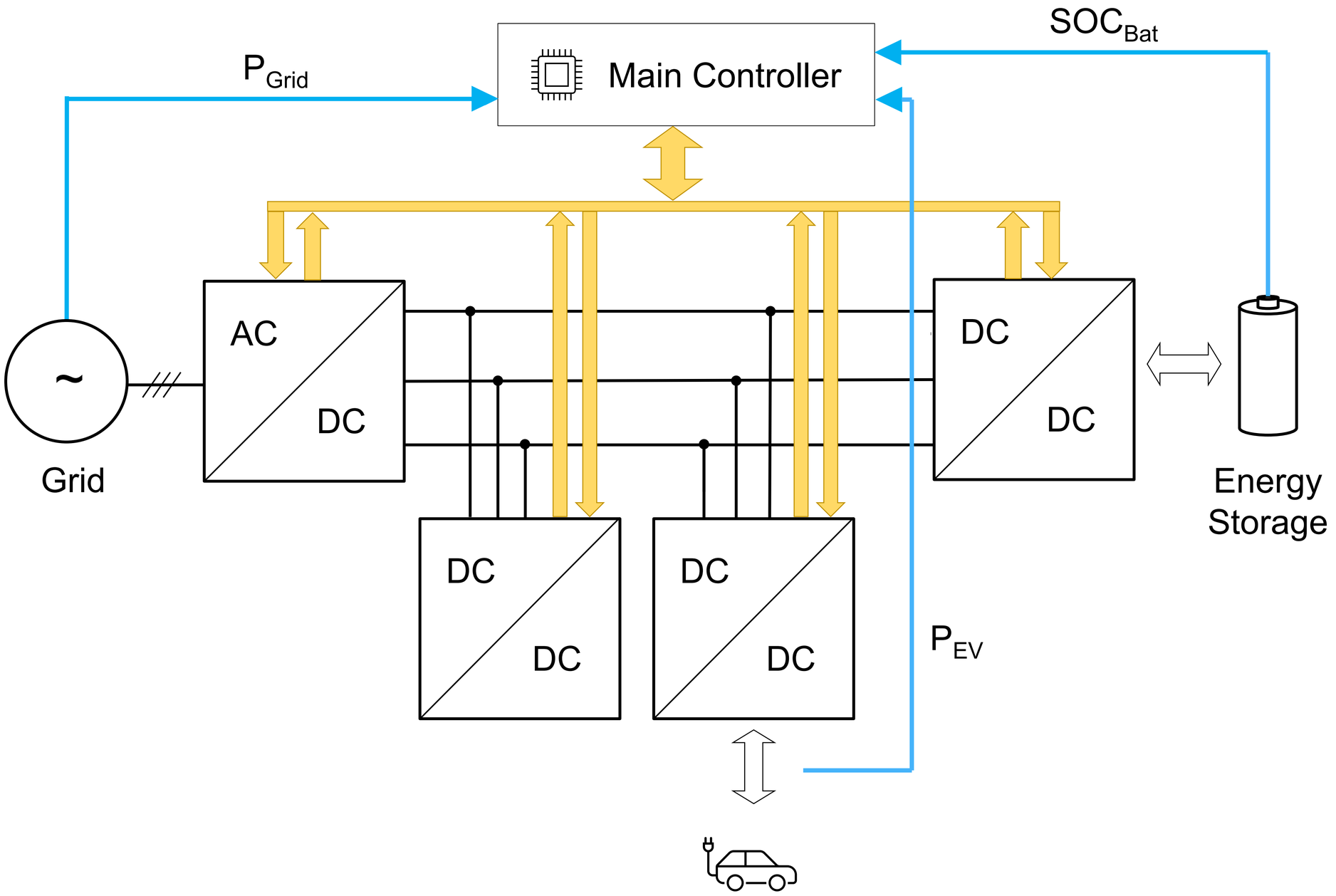
StandAlone

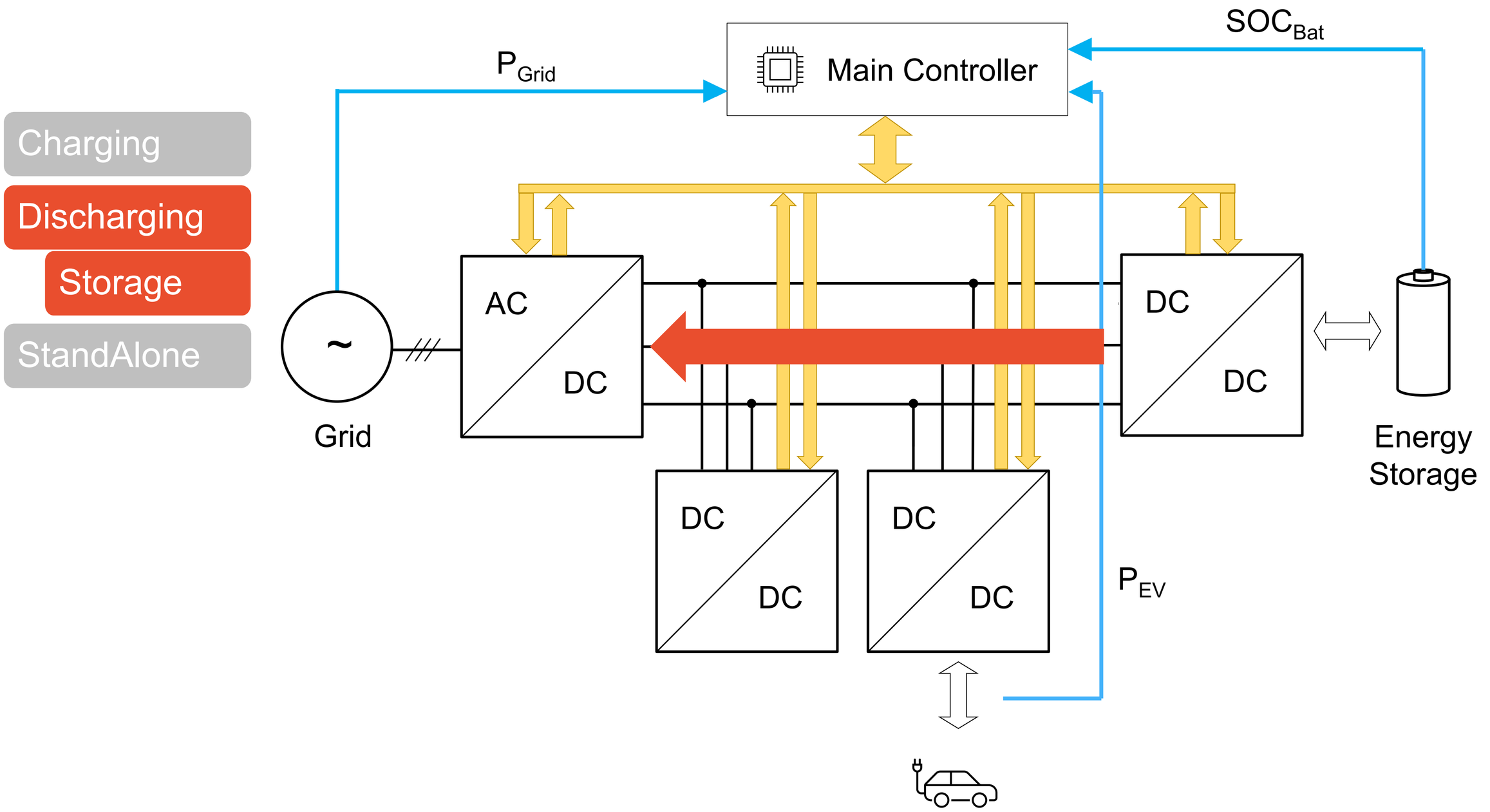


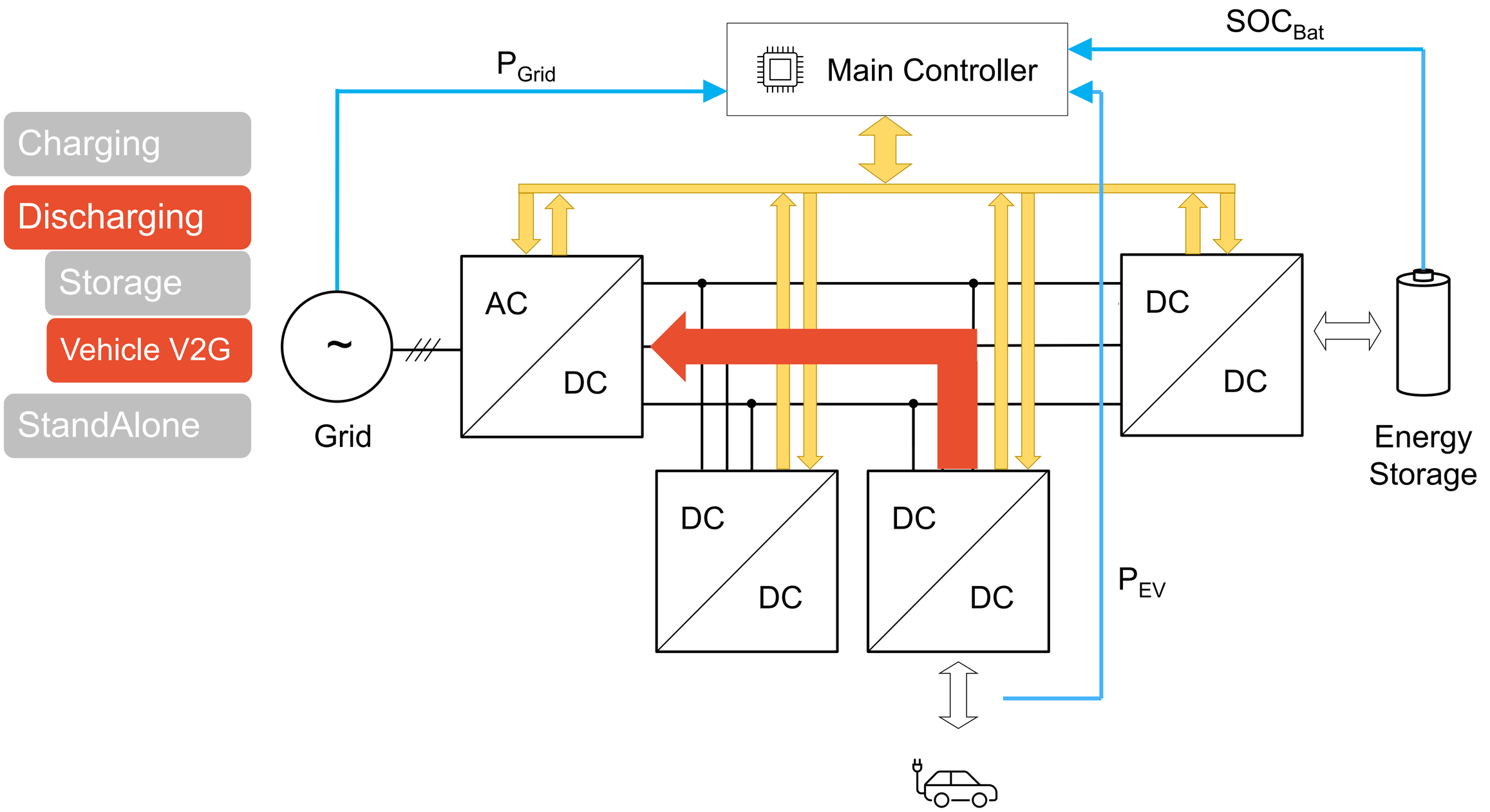
Charging

Discharging

StandAlone




Charging
Discharging
Storage
StandAlone
P_{Grid}
Main Controller
SOC_{Bat}
~
Grid
AC
DC
DC
DC
Energy Storage
DC
DC
DC
DC
P_{EV}
EV


Charging
Discharging
Storage
Vehicle V2G
StandAlone
Main Controller
P_{Grid}
SOC_{Bat}
~
Grid
AC
DC
DC
DC
DC
DC
DC
DC
Energy Storage
P_{EV}
EV

Charging

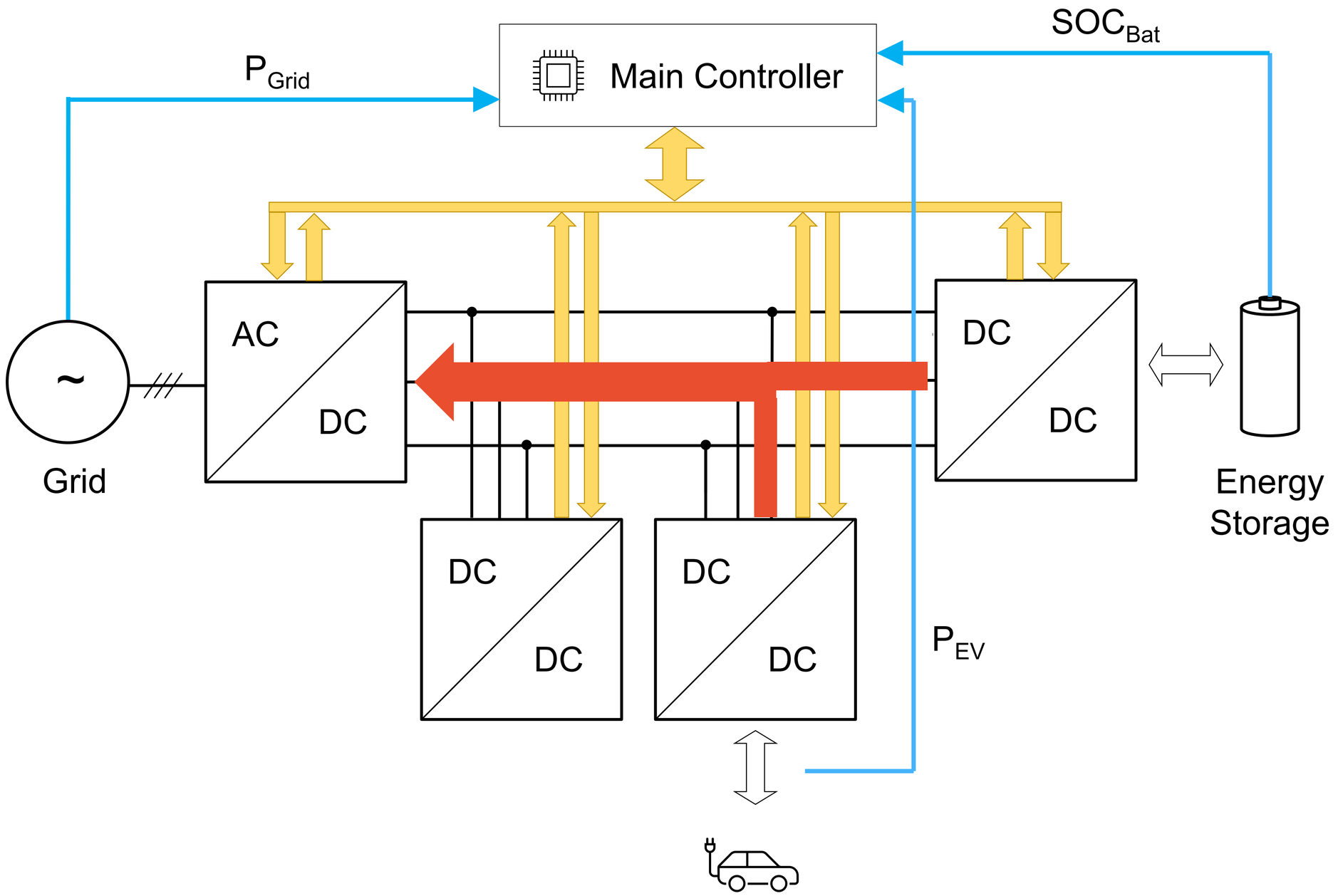
Discharging

Storage

Vehicle V2G

V2G + Storage

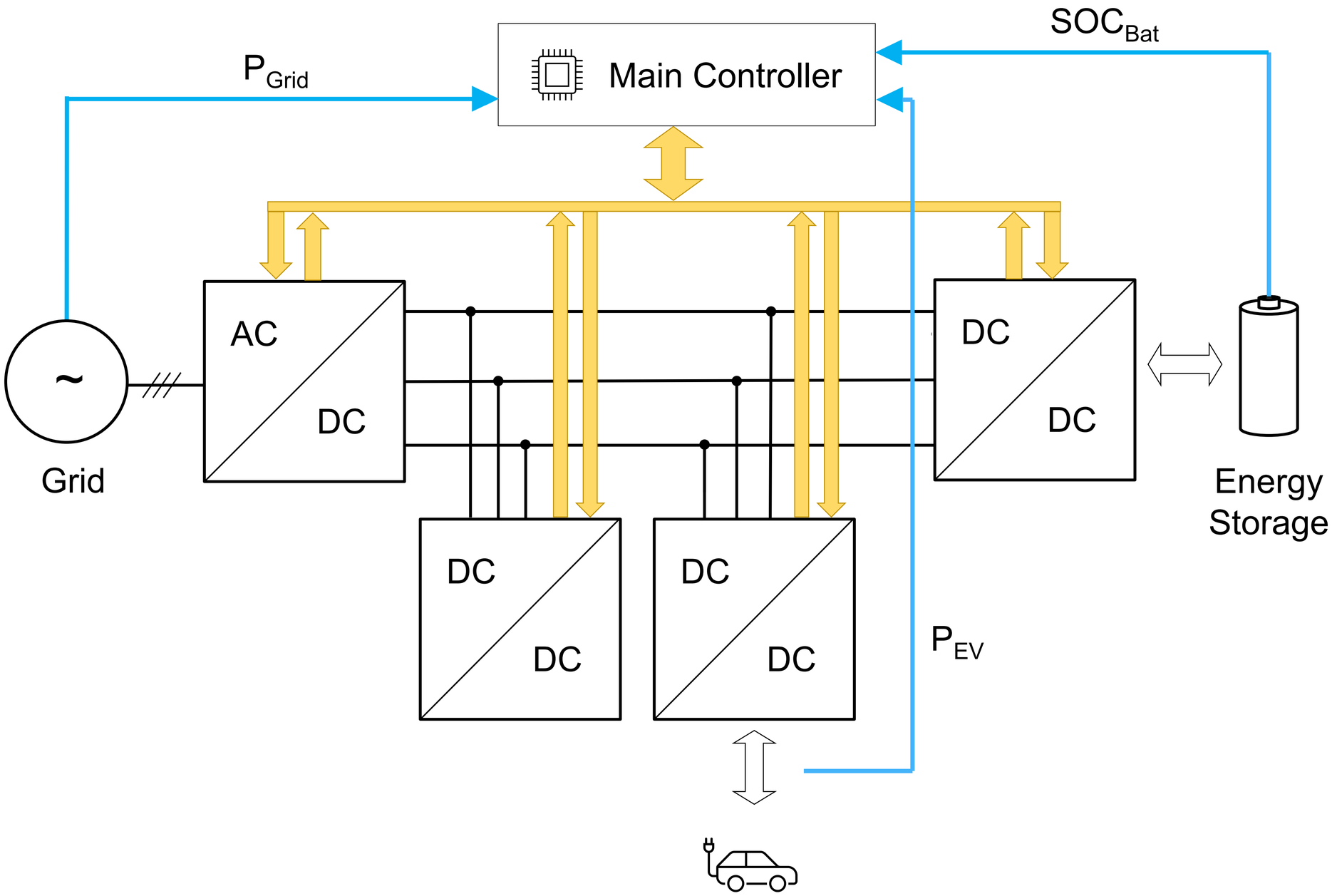
StandAlone



Charging

Discharging

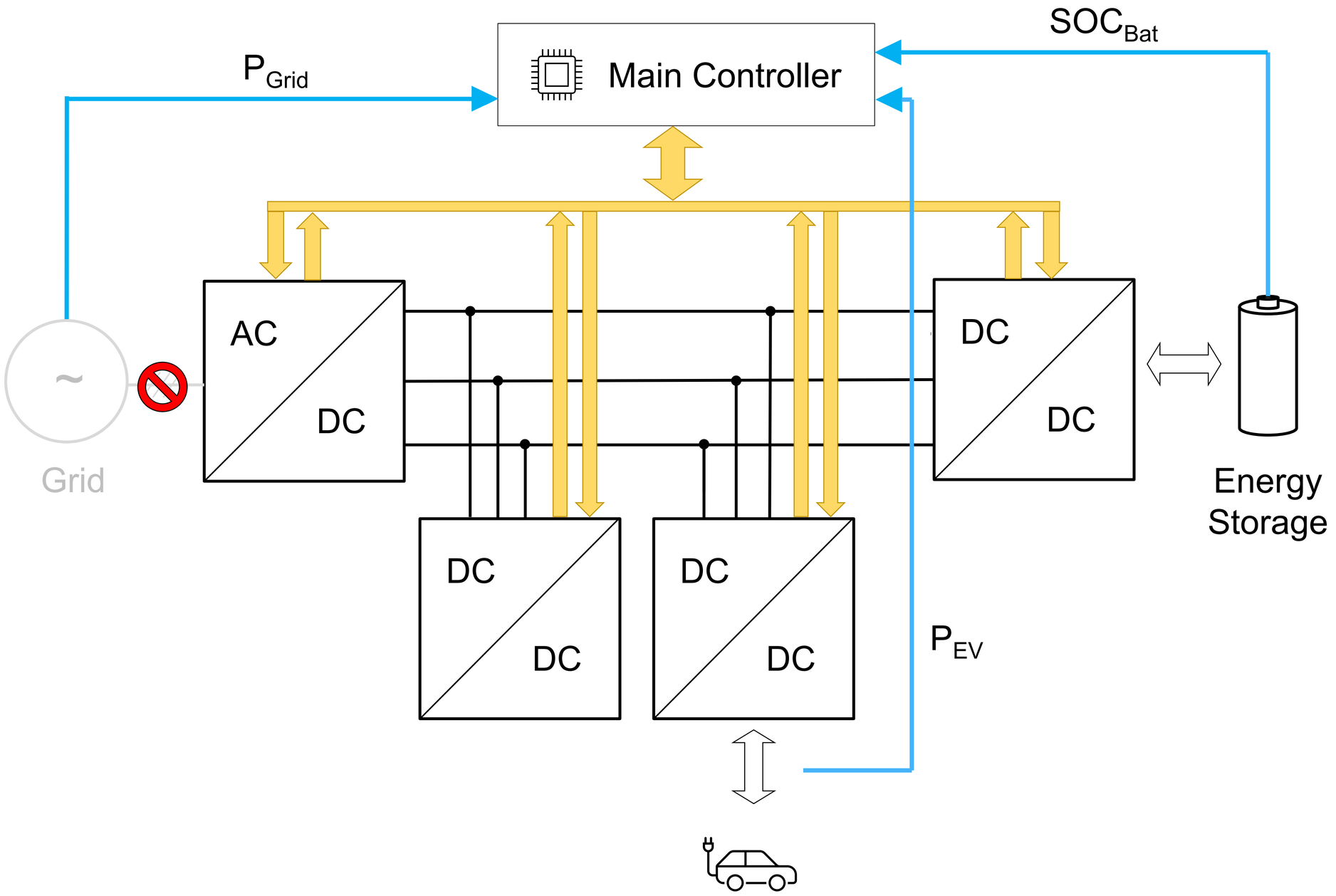
StandAlone



Charging

Discharging

StandAlone

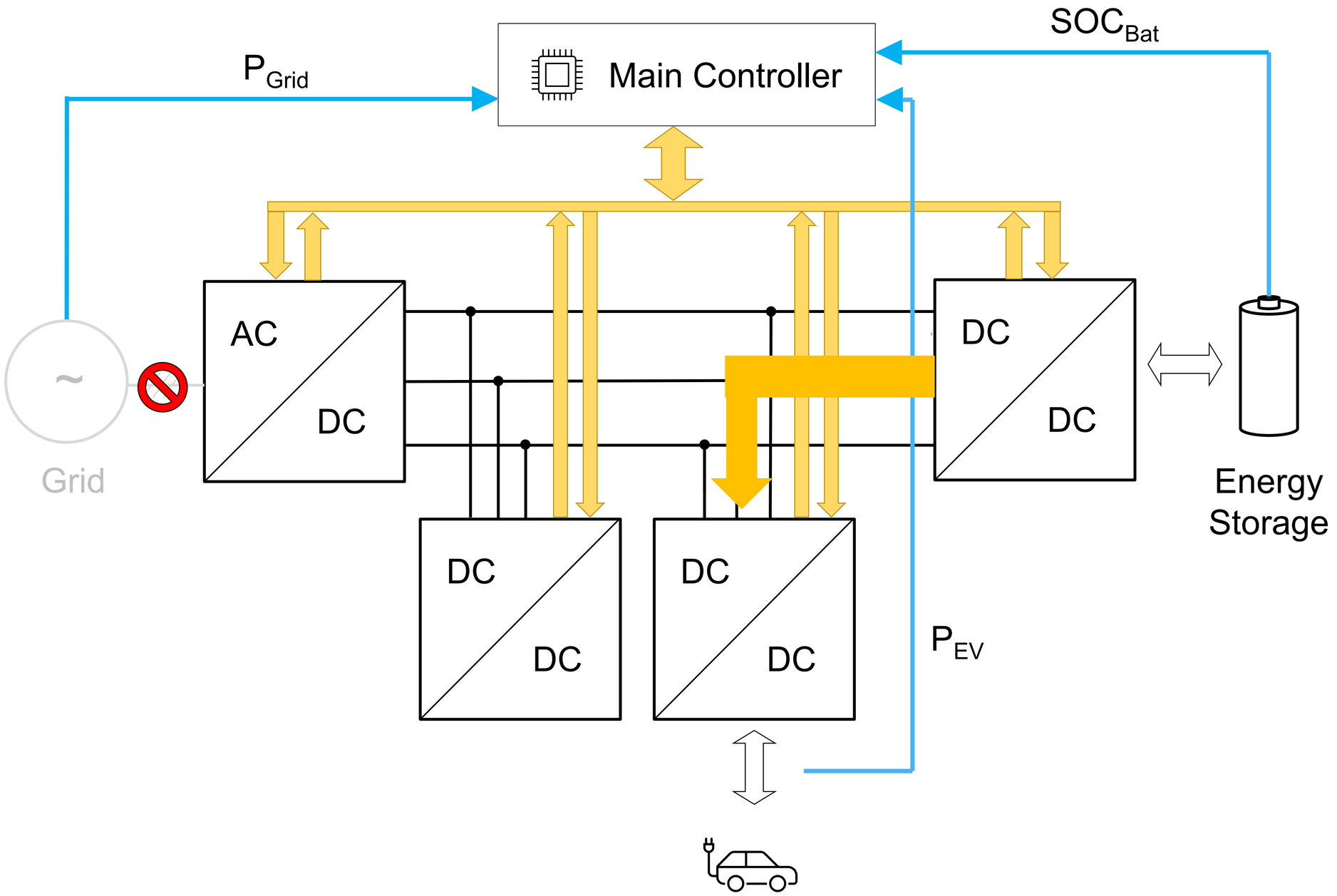


Charging

Discharging

StandAlone

EV charging



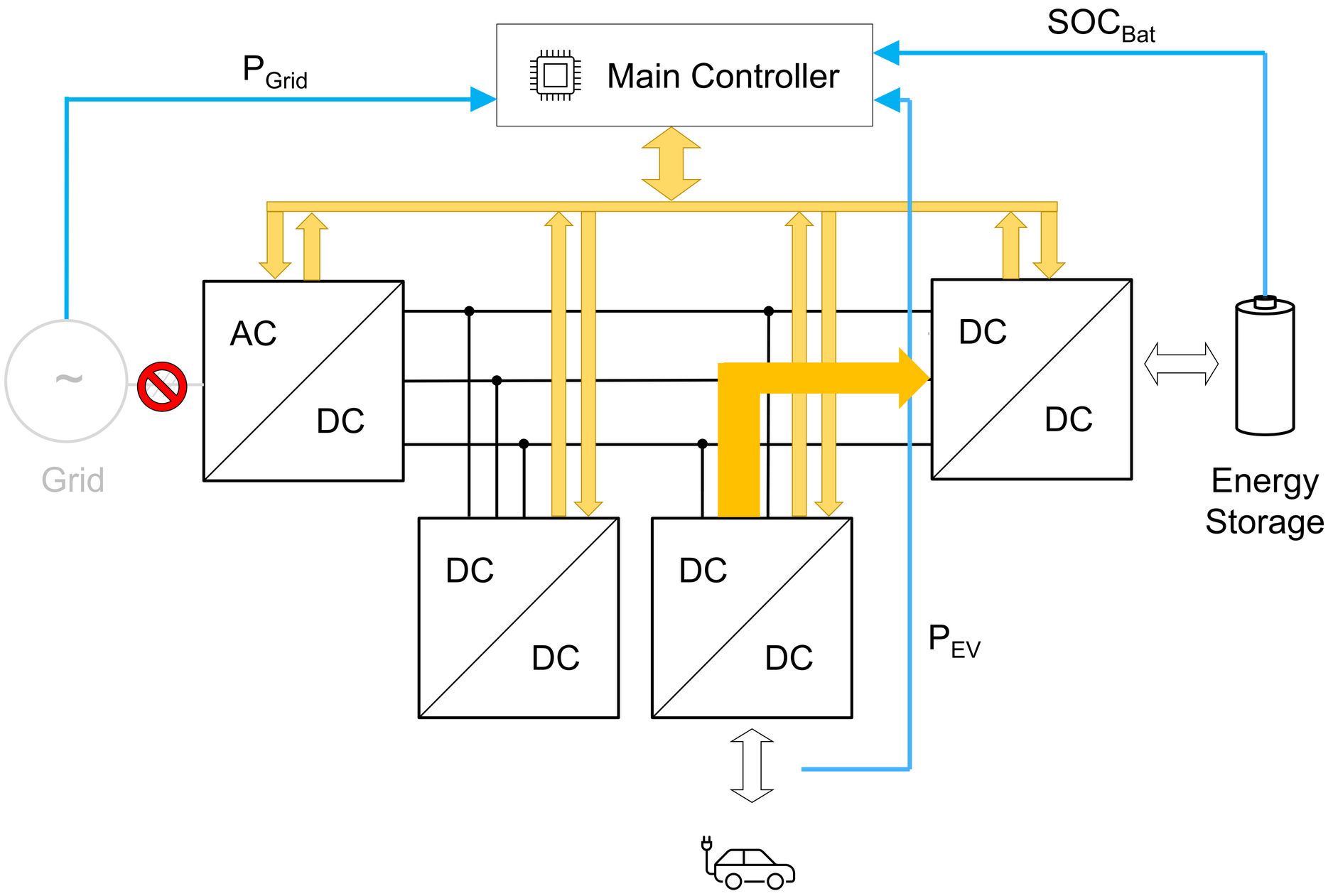
Charging

Discharging

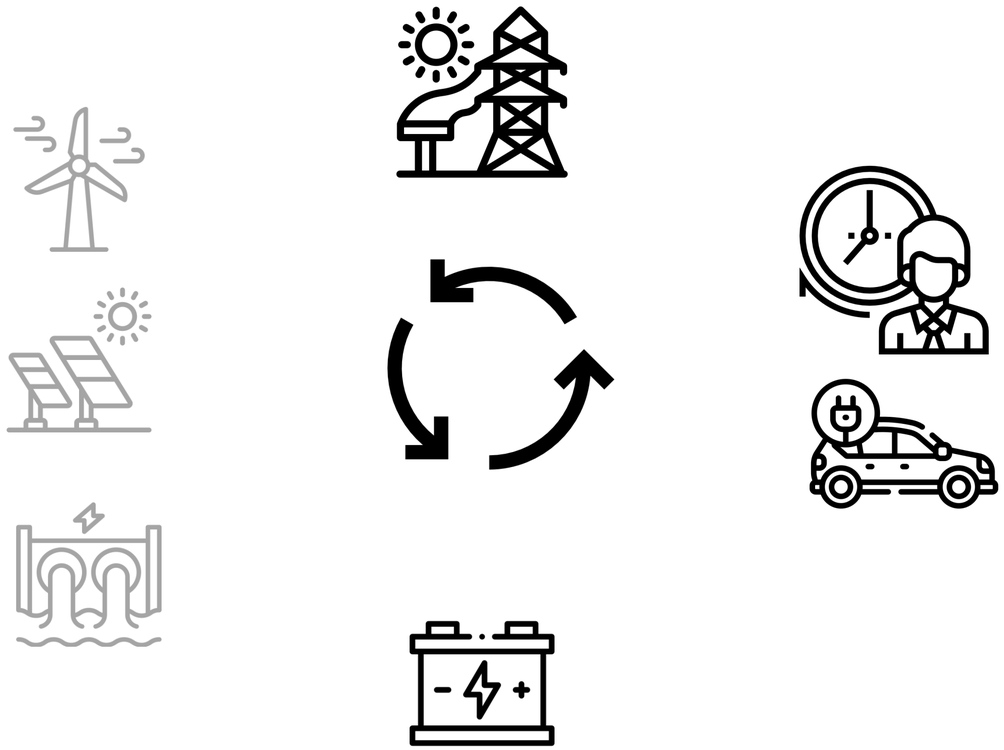
StandAlone

EV charging

EV discharging

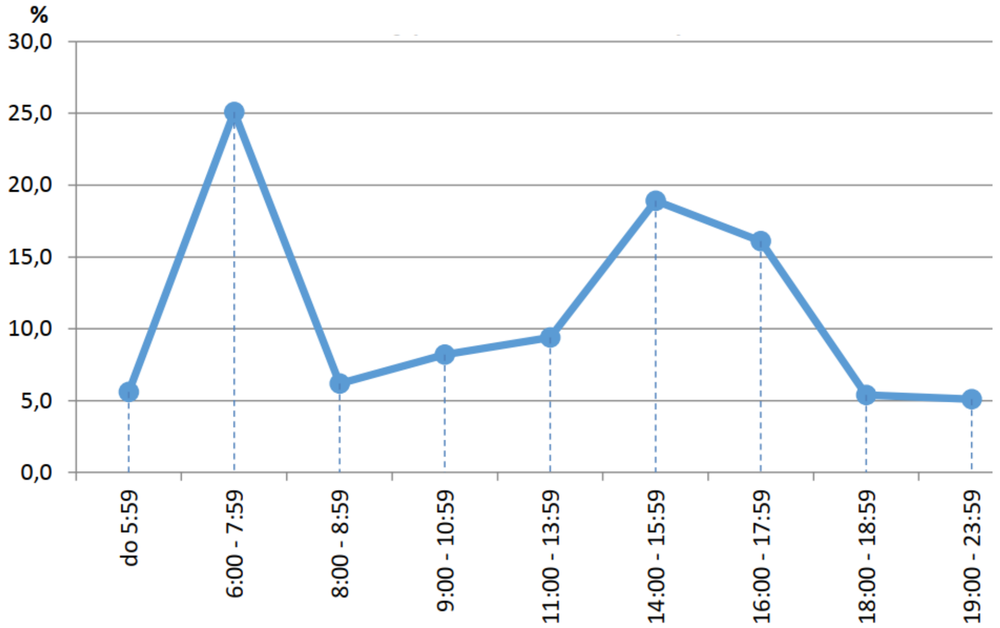


Managing power - the idea

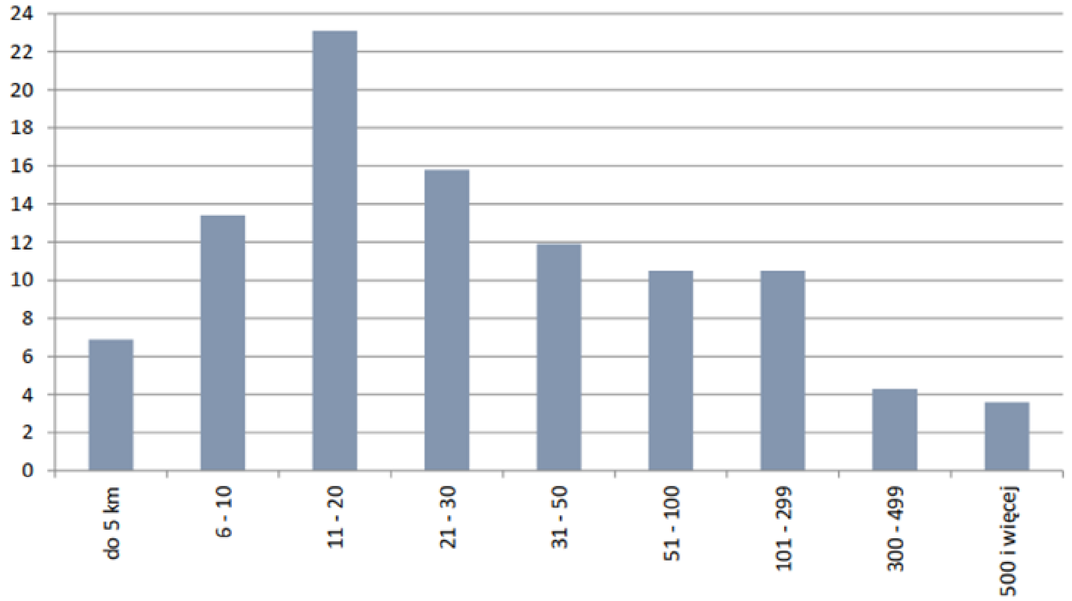


Initial data set

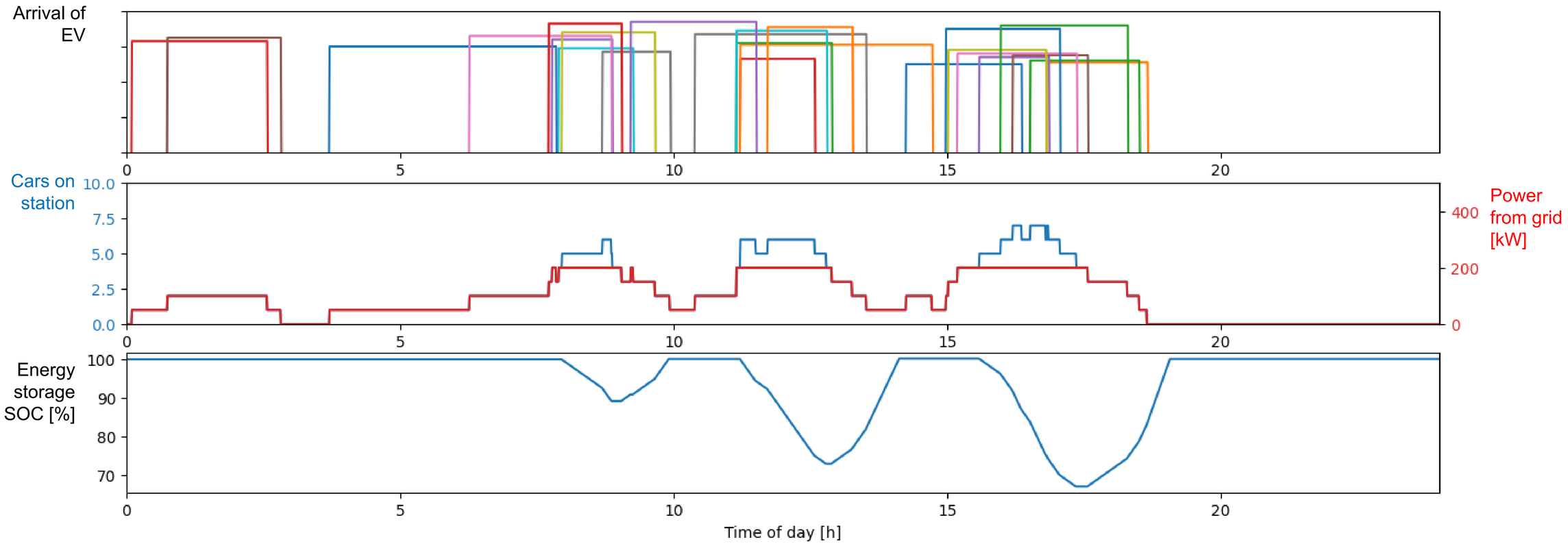
Statistics
Time of travel



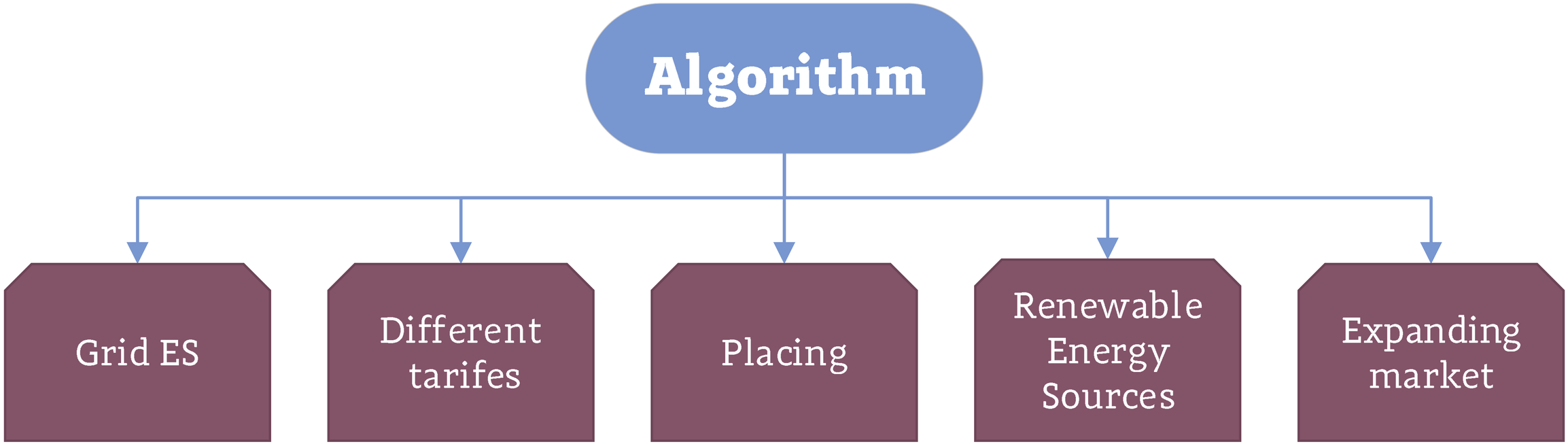
Statistics
Daily distance



Outcomes


Arrival of EV
Cars on station
Power from grid [kW]
Energy storage SOC [%]
Time of day [h]

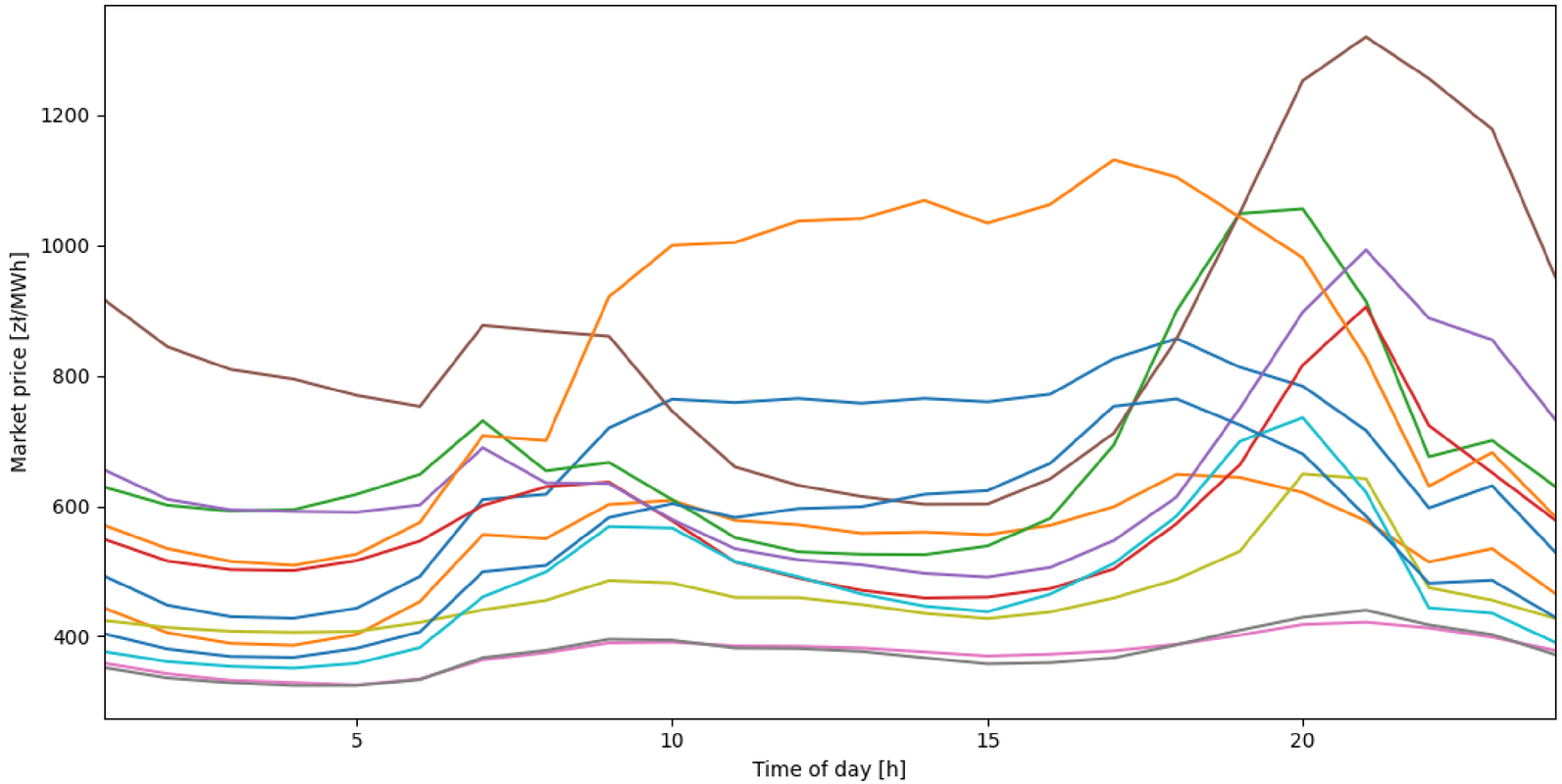
Considerations for sizing the Energy Storage



Working as a grid storage

Different tariffs – day night shifting

- consider difference in month
- Flattening the „duck curve”
- charging the storage/EV at lower prices

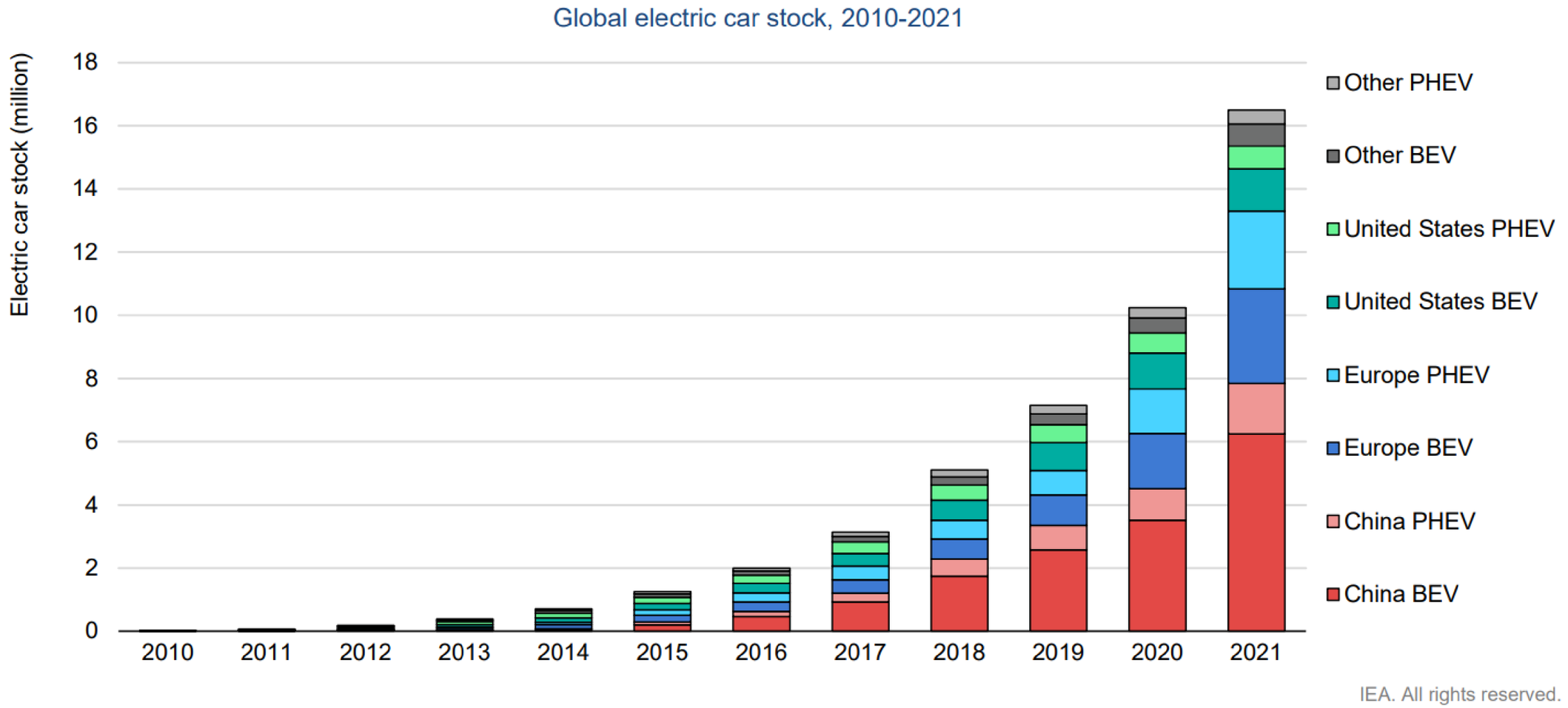


Placing – City / Highway

- Small EV (smaller batteries)
- Possibility of longer charging
- V2G

- Larger batteries
- As fast as possible

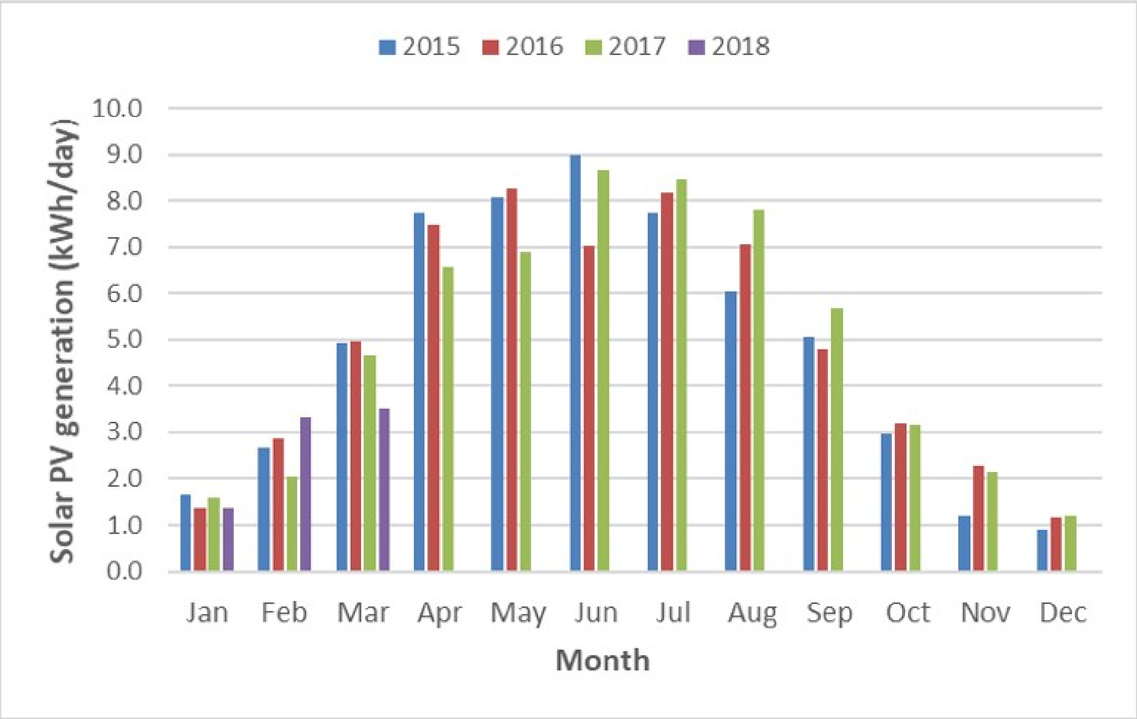
Expanding market



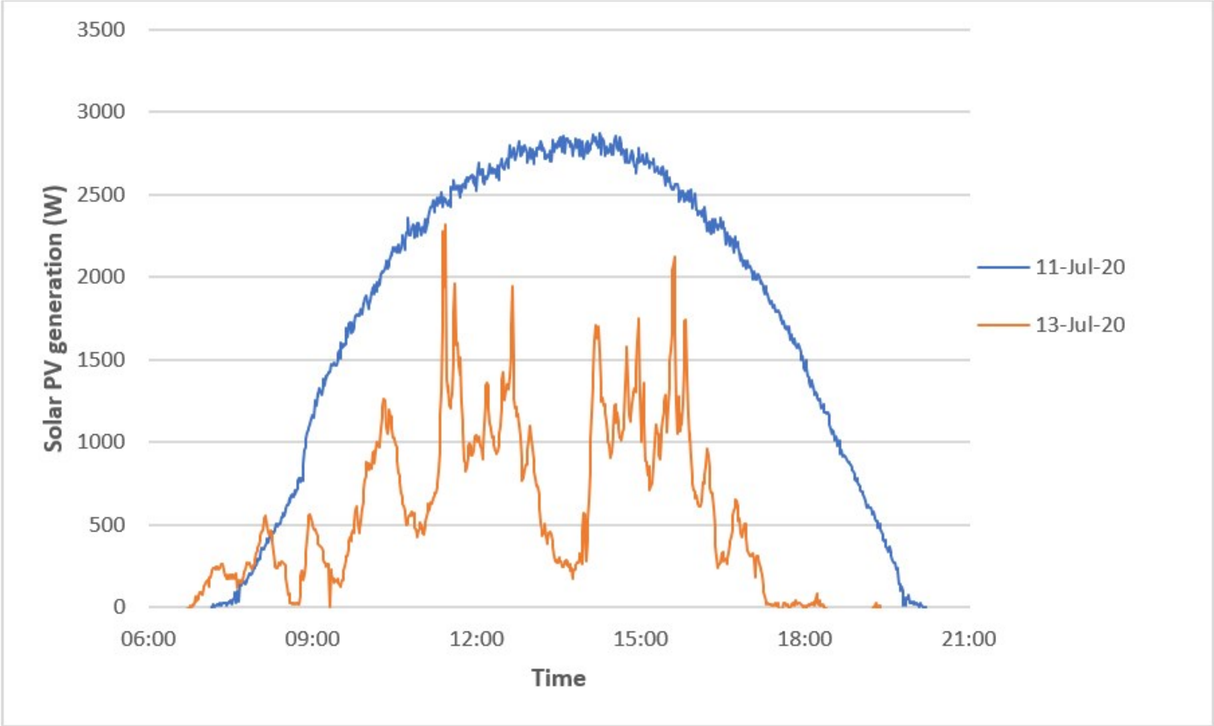
IEA (2022), Global EV Outlook 2022, IEA, Paris https://www.iea.org/reports/global-ev-outlook-2022

Renewable Energy Soureces – Solar Power

Average per month



Daily change



https://www.nea.org.uk/

Norway grants

Thank you!

1st Workshop on Advanced Charging Systems

Gdynia 2022

moresic-project

https://www.ee.pw.edu.pl/moresic-project/

Warsaw University of Technology

NTNU Norwegian University of Science and Technology

MARKEL energoelektronika to nasza pasja

AREX GRUPA WB