Using solar PV, BESS and V2G for grid support

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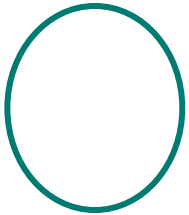

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To join in August 2025

Past members:
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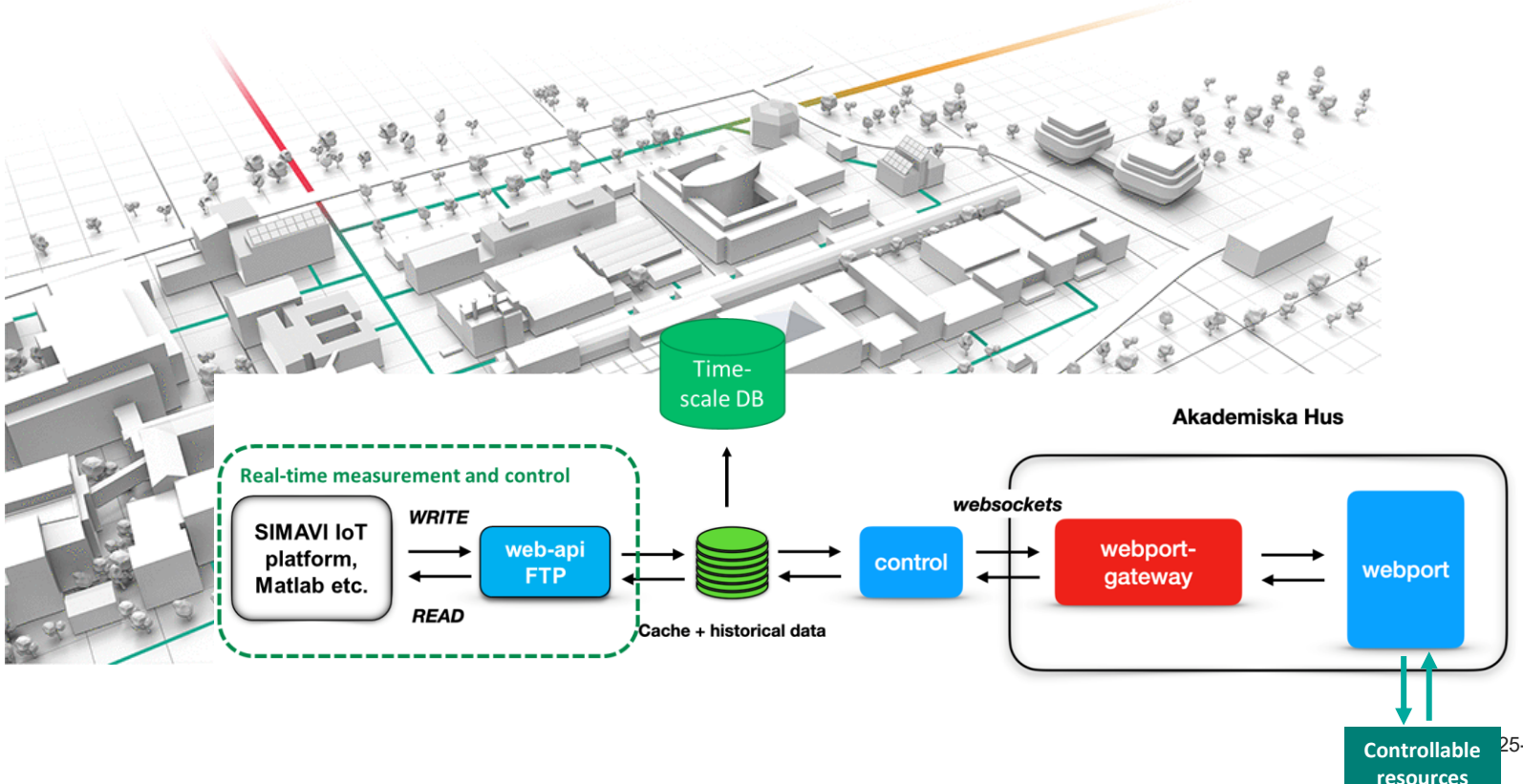
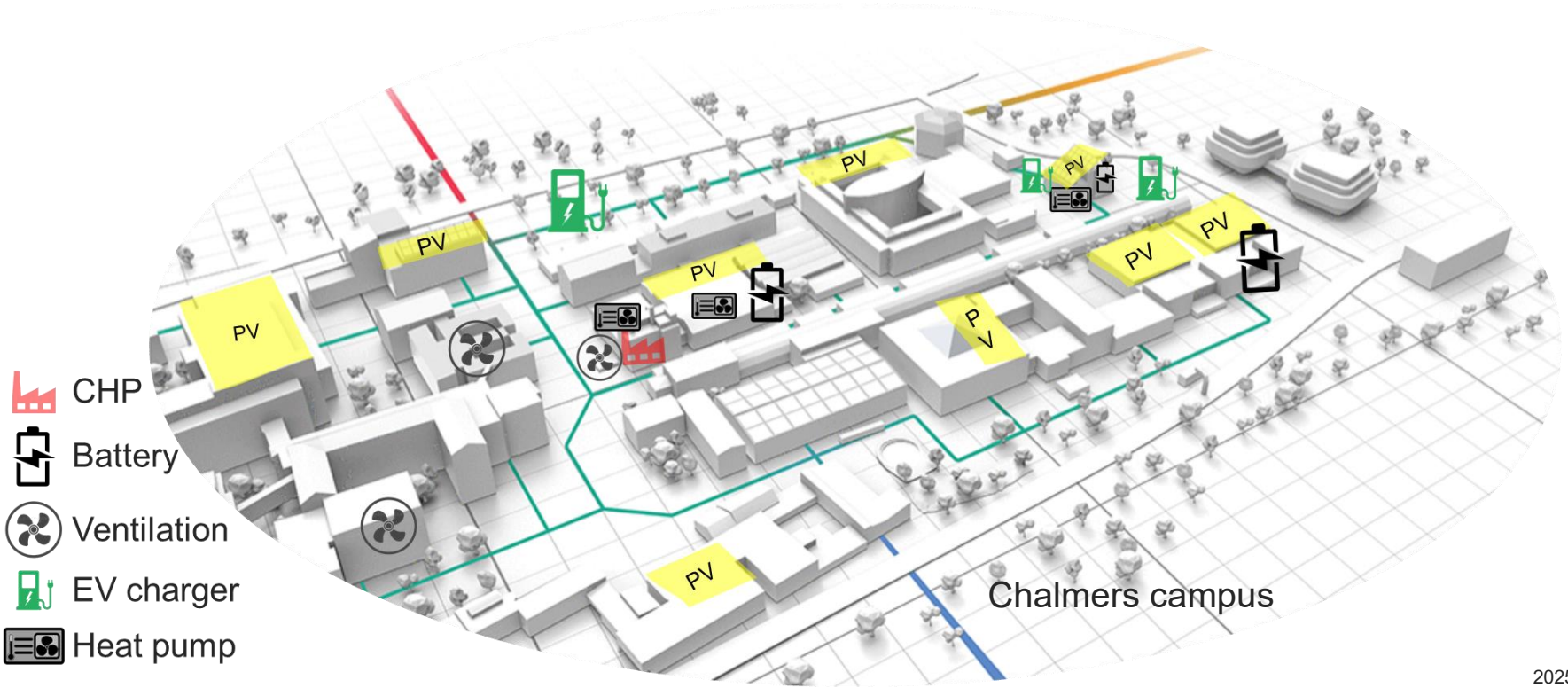
Thanks to all current and past members of the group as well as collaborators!

Chalmers Testbädd



Chalmers Testbädd



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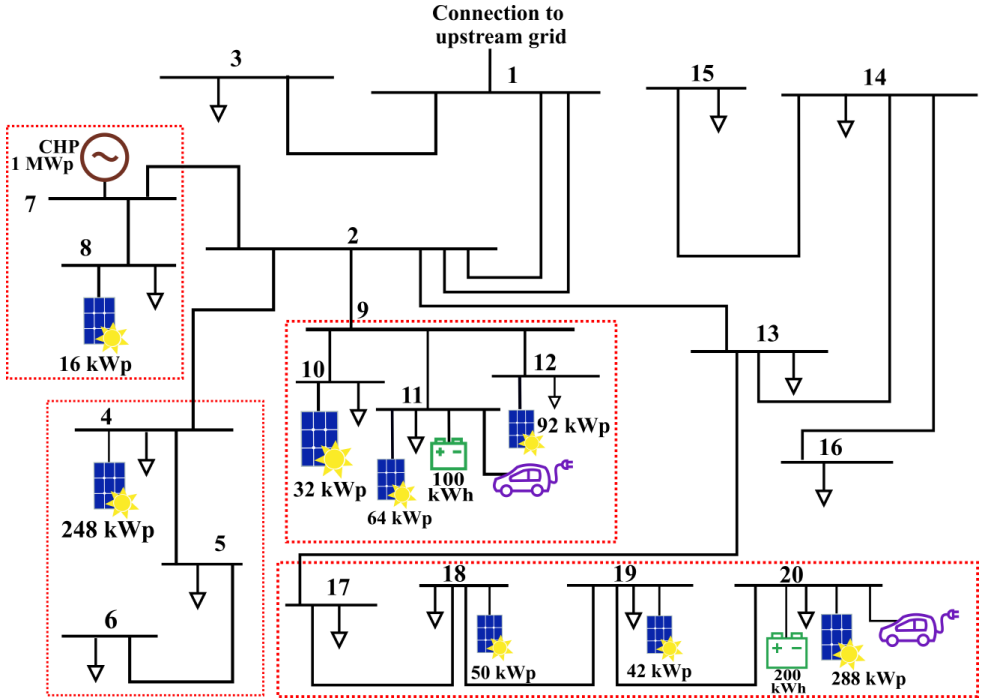

Test case for Swedish demos

- Demonstrate smart grid techologies and flexibility provision

- ✓ Congestion forecast tool
- ✓ Flexibility provision
- ✓ Reactive power control for PVs
- ✓ Dynamic state estimation based protection
- ✓ Real-time visualization of distribution grids

- Test and demonstrate the market designs
  - Utilizing the developed tools and controls in WP5

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- Local Energy Markets (LEM)

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WP5

- Congestion forecast tool
- Control of flexibility resources
- MPC based voltage control
- Flexibility exploitation
- State estimation based protection
- Real time visualisation

Maskin battery energy storage | AWL battery energy storage | MPC Algorithm | LFM

Current SOC: 69 %

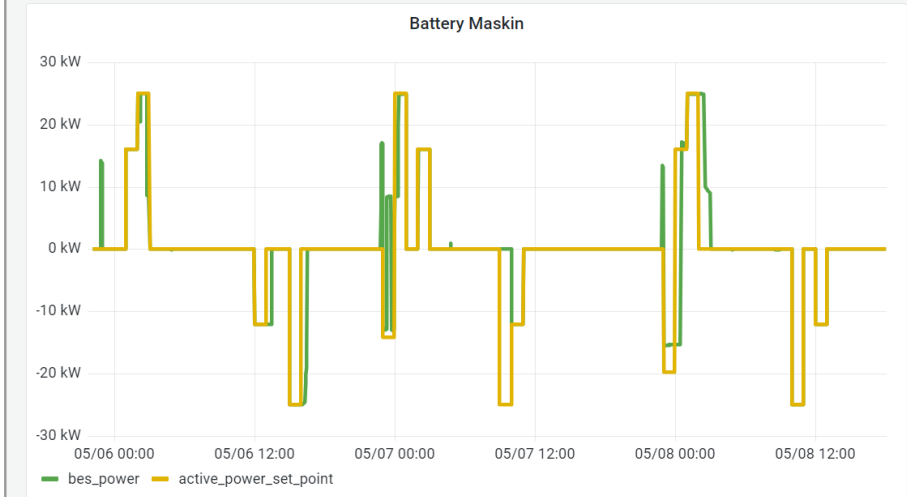
Current power: 0 watt

BES Algorithm: Stopped

Set manual setpoint (negative for discharge):

0 watt

Send Command



WP5

- Congestion forecast tool
- Control of flexibility resources
- **MPC based voltage control**
- Flexibility exploitation
- State estimation based protection
- Real time visualisation

Site Management Dashboard

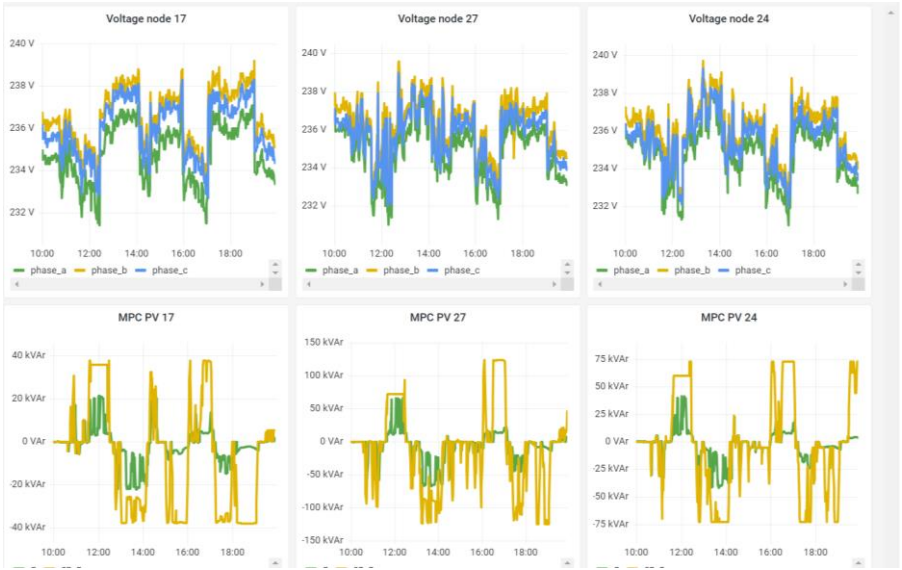
Maskin battery energy storage | AWL battery energy storage | **MPC Algorithm** | LFM

State: Running

V Min: 1,01

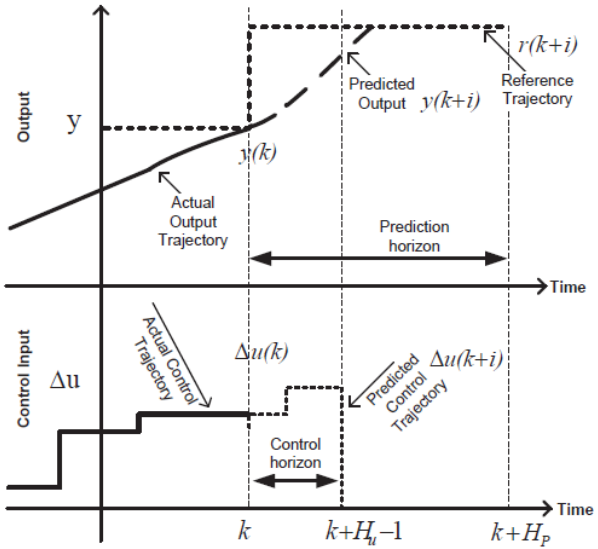
V Max: 1,02

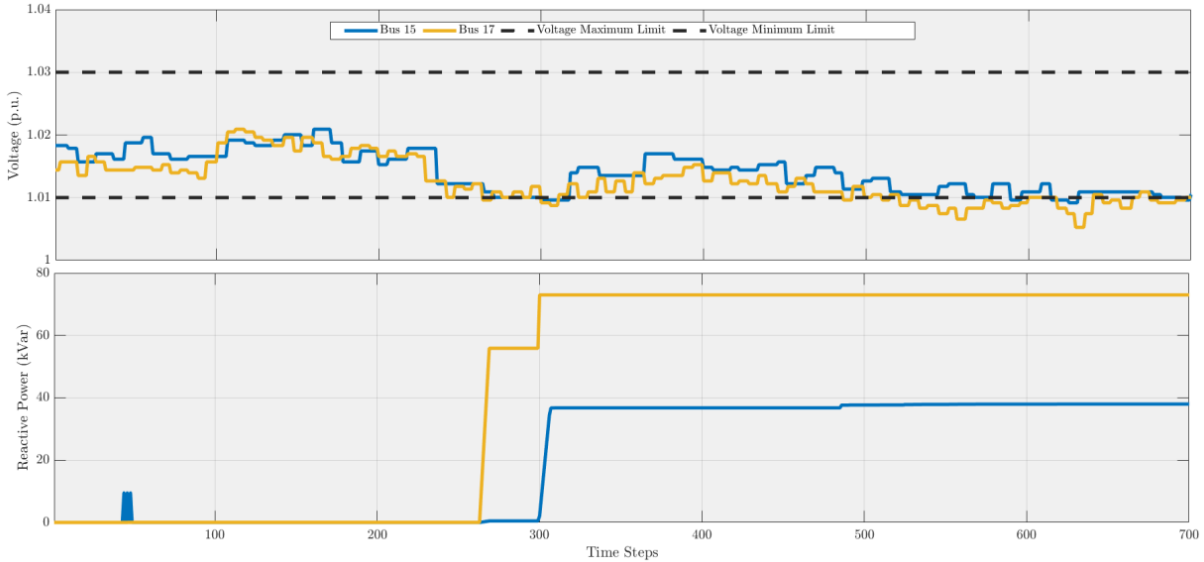
Update V Min/V Max



Voltage support using solar PVs

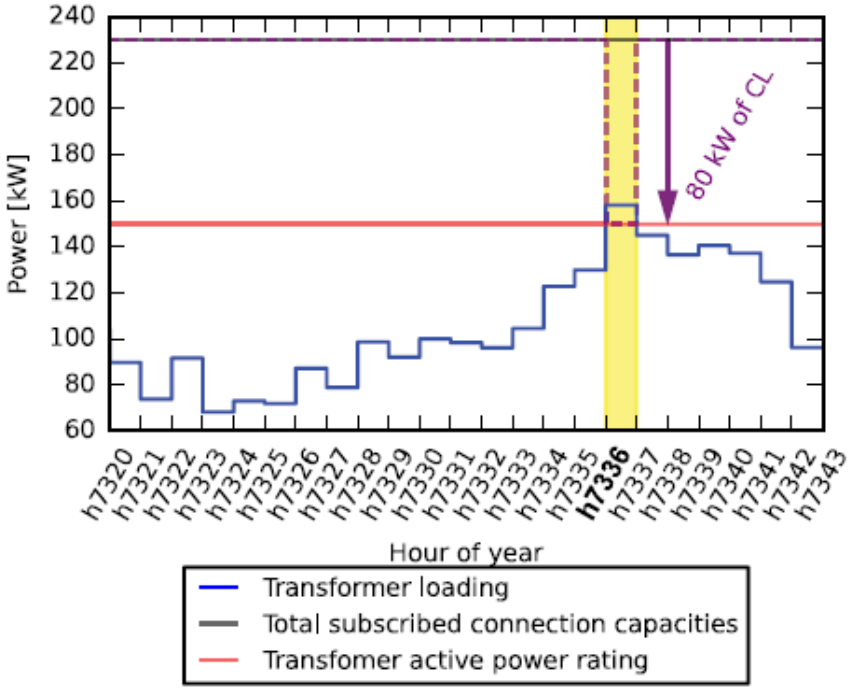
- Voltage variations
  - Control/support from renewable resources, storages etc.

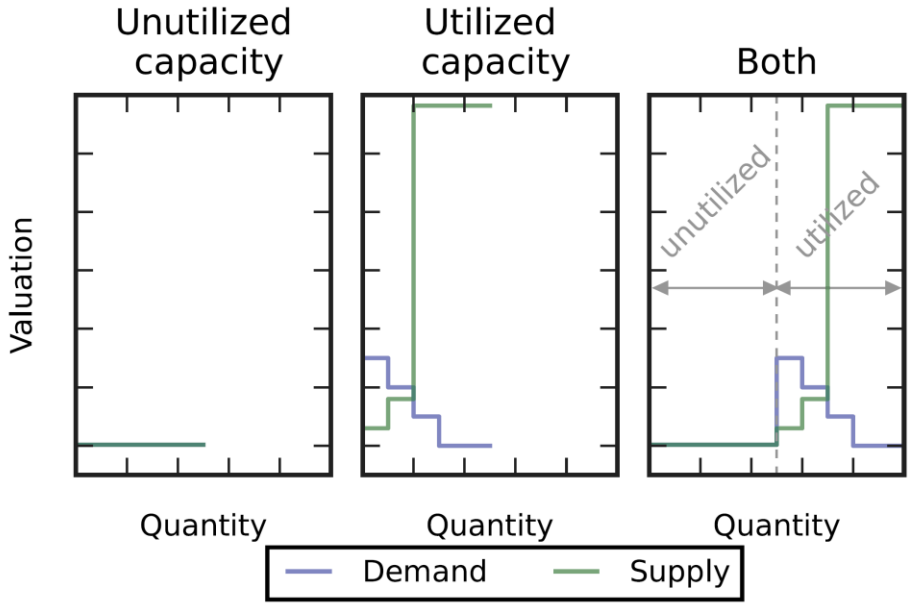




R. Sharma, et. al. Demonstration of grid monitoring, control, and flexibility supported by IoT, report Chalmers

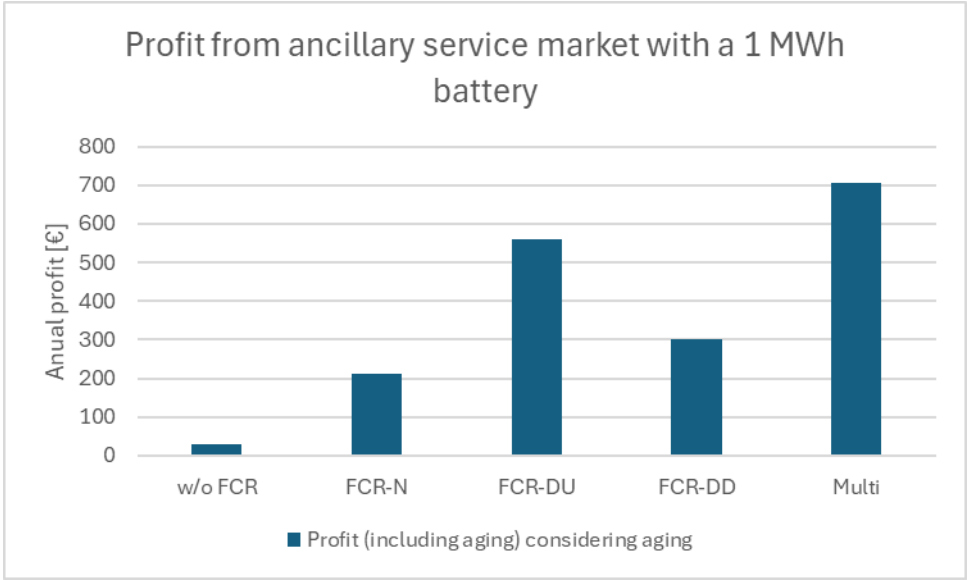
Local flexibility markets – capacity limit





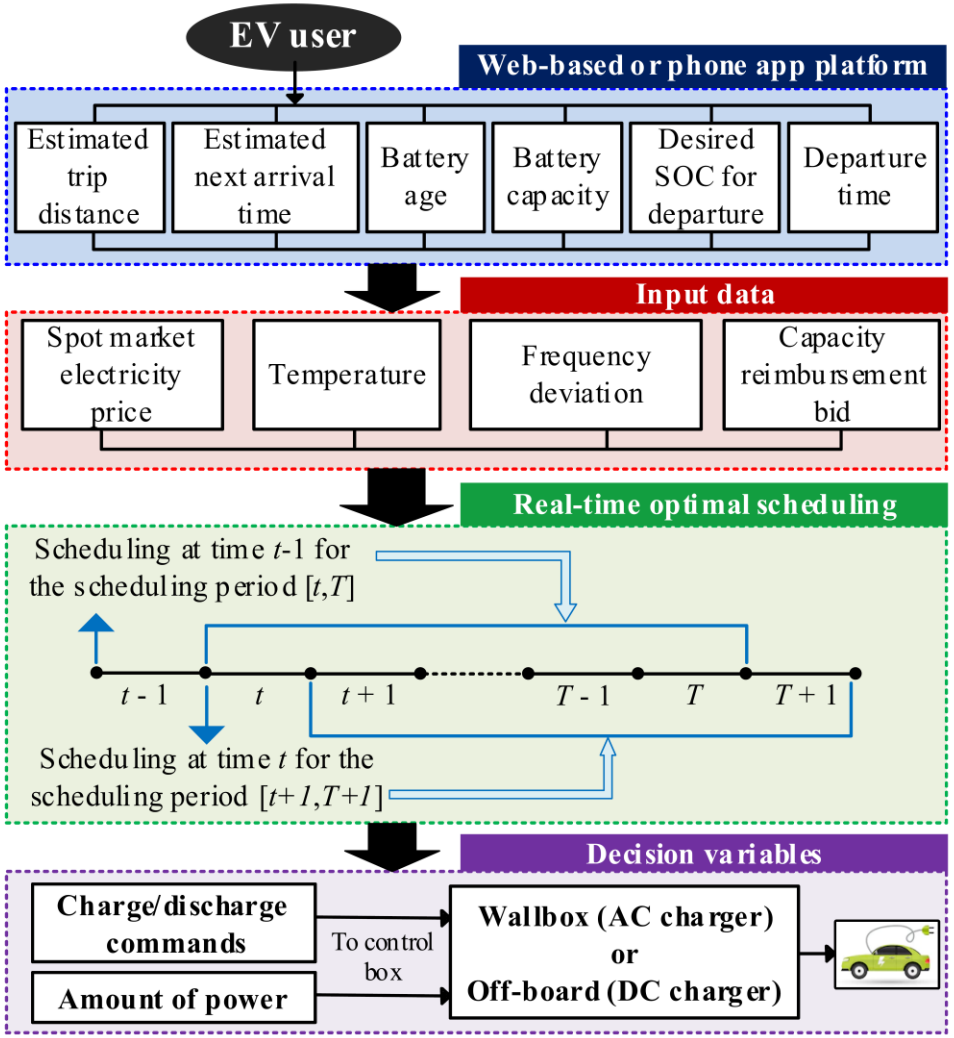
Participating in balancing markets

- Value of providing ancillary services from a 1MWh/1MW battery
  - Only spotprice arbitrage
  - FCR-N
  - FCR-D
  - Multimarket
- How much does the battery aging impact the participation?

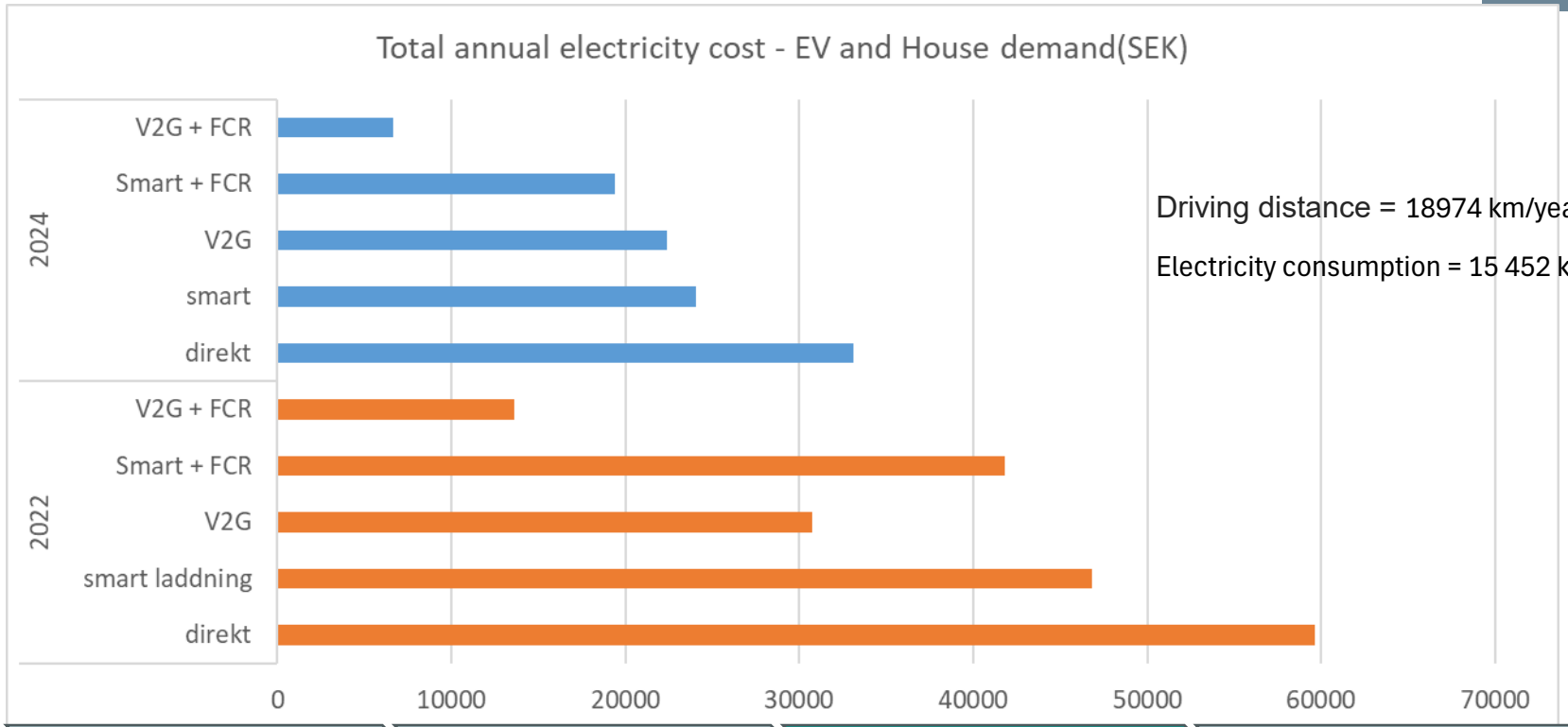


Balancing markets – Vehicle to Grid

- Does V2G create any value for the EV owner or any other stakeholder?
- How does V2G impact the battery aging?



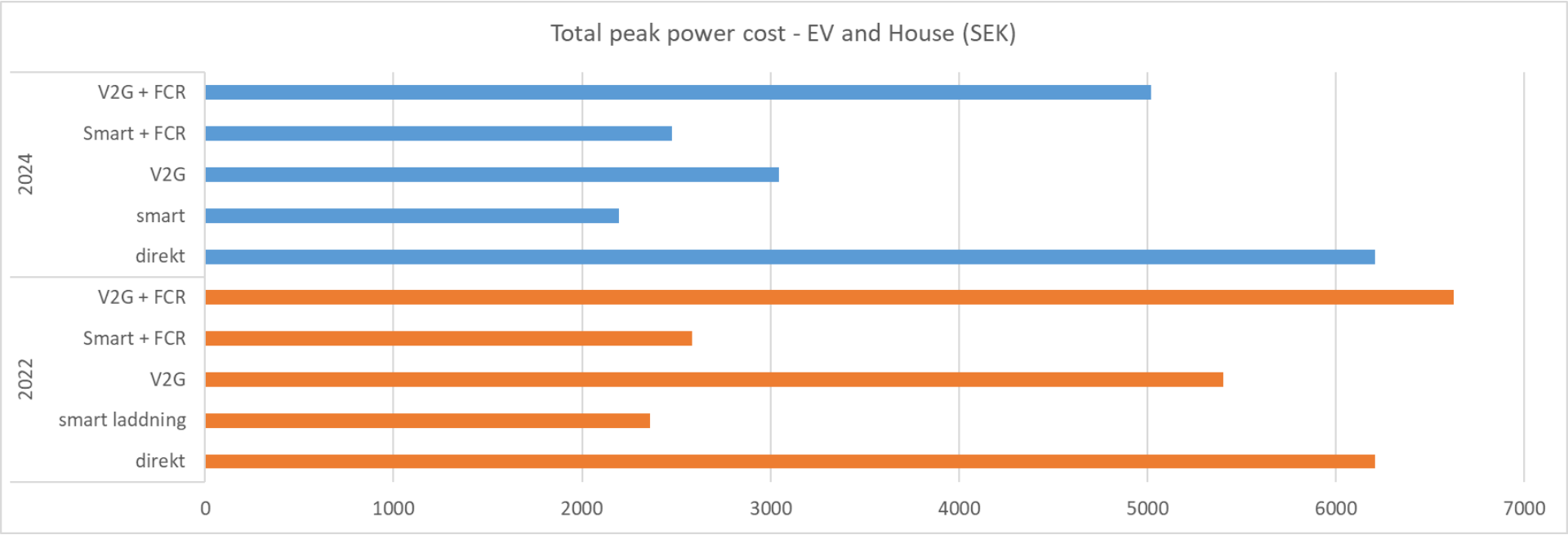
Electricity cost for different charge scenarios



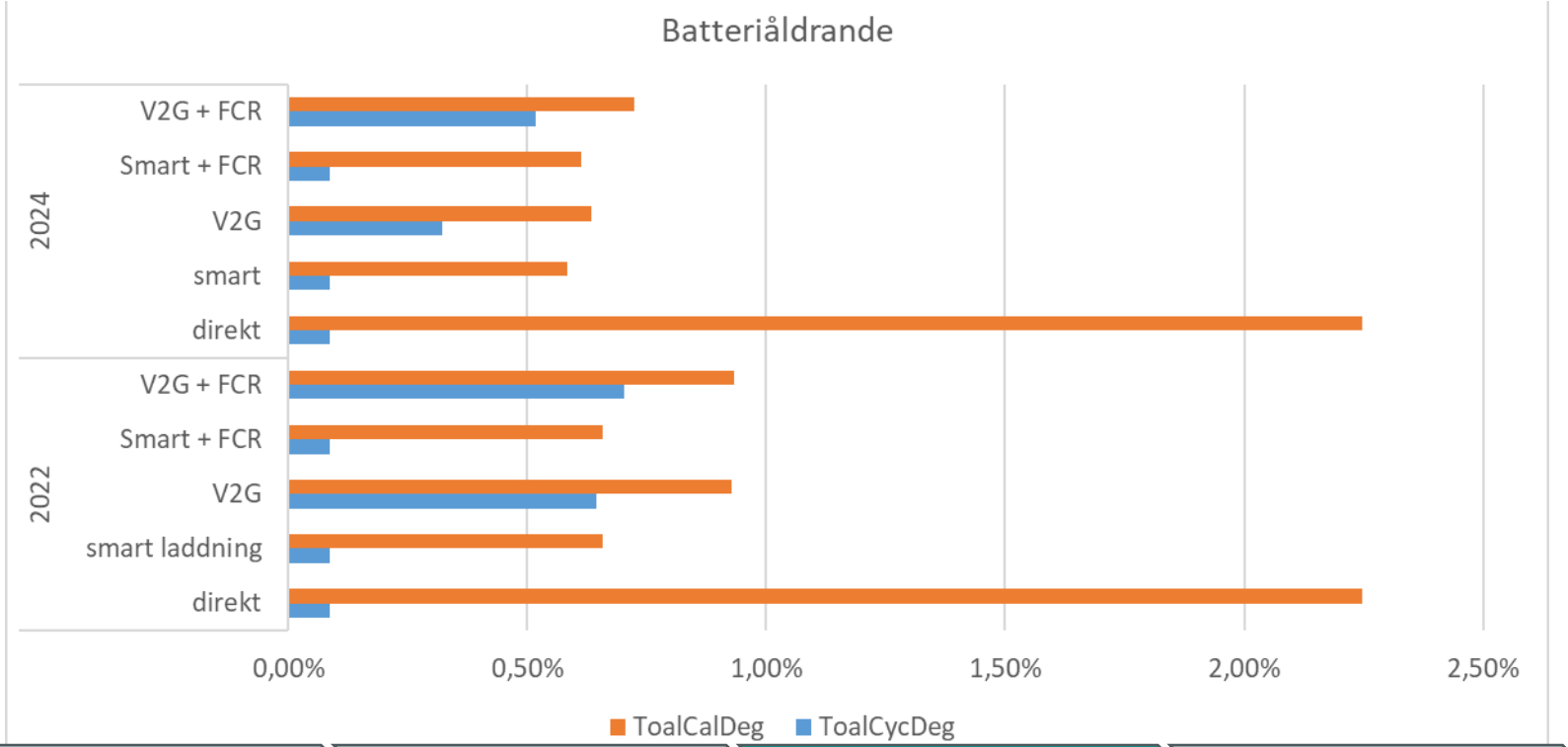
Driving distance = 18974 km/year

Electricity consumption = 15 452 kWh/year

Peak power cost



Battery aging



V2G demonstrations

EV Charging Station of HSB Living Lab

Your ID:

Outlet

1 2

Parking duration [h]

1 hour

1 hour

Energy demand [kWh]

1 kWh

1 kWh

Maximum charging current [A]

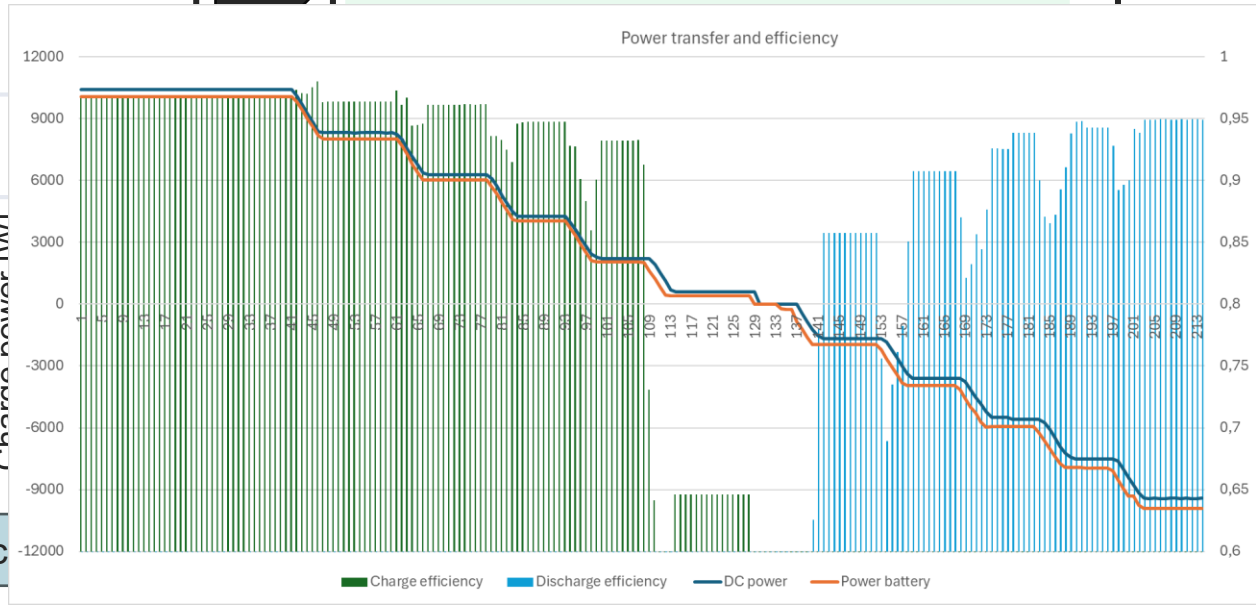
6 A

6 A

Next >

EV Charging Station of HSB Living Lab

Please select one of following plans!



Background

Loc

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