iDM Energiesysteme

Intelligent heat pump systems in connection with photovoltaic systems

Agenda

- Introduction to iDM Energiesysteme
- Photovoltaic systems and heat pumps
- The potential of overheating buffer & building
- Navigator 2.0
- Outlook: cost – variable tariffs

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WE TAKE CARE OF YOUR WELL-BEING

DIE ENERGIEFAMILIE

Heat pump systems from 2 – 1500 kW

- Development, production and distribution of efficient, regenerative thermal energy systems
- Provider of intelligent energy management in connection with PV systems

AIR / WATER HEAT PUMPS

monobloc outside

AERO ALM
2-8 / 4-12
6-15 / 10-24

iPump ALM
2-8 / 4-12

AL Twin / AL Max
32 / 60

monobloc inside

AERO ILM
4-13

split systems

AERO SLM
3-11 / 6-17

iPump A
2-7 / 3-11

BRINE & GW / WATER HEAT PUMPS

R410A

TERRA SWM
3-13 / 6-17

TERRA SW TWIN
20 / 26 / 35 / 42

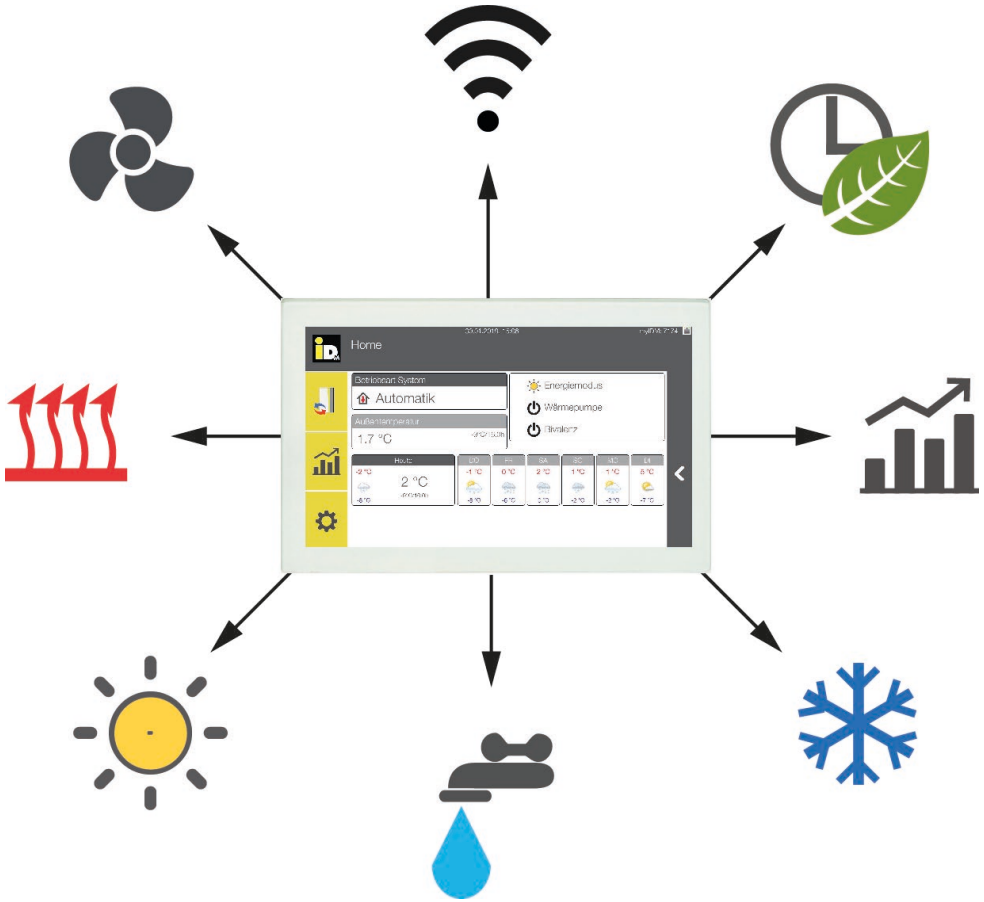
TERRA SW MAX (DUO)
55 / 85 / 110 / 140
(170) / (220) / (280)

R134A with higher outlet temperature

TERRA SW TWIN H
13 / 22

TERRA SW MAX H (DUO)
35 / 50 / 70 / 90
(140) / (180)

NAVIGATOR 2.0



We will see more of that later ...

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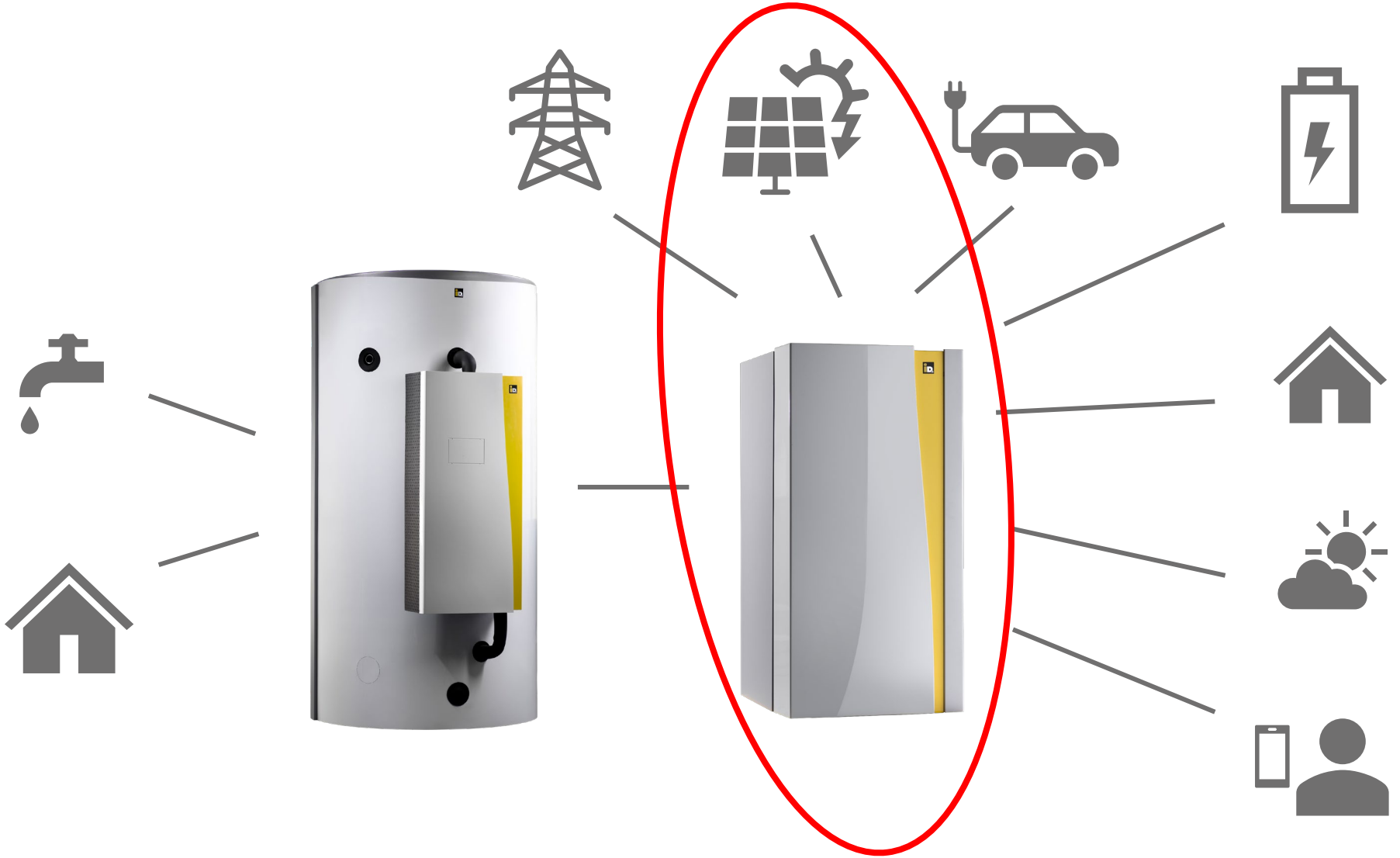
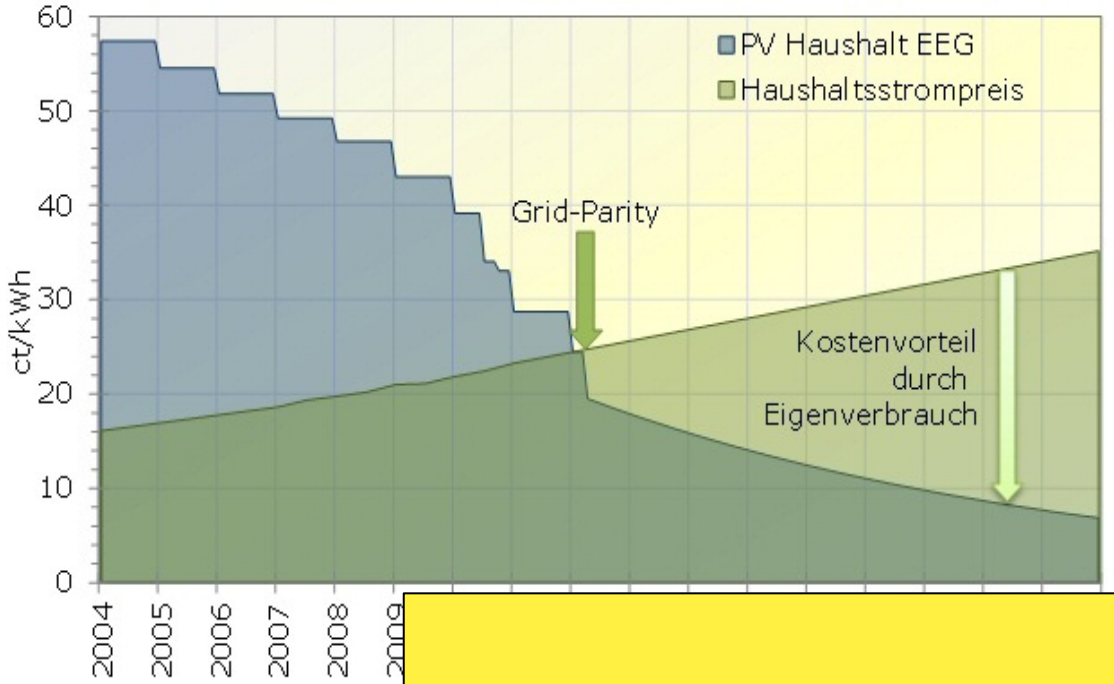
CONNECTIVITY of HEAT PUMPS



THE BENEFIT & MAIN GOAL

Why even connecting the heat pump with the PV system?



Grafik 1: Vergleich der Kostenent
einer installierten Leistung von w
Deutschland.

- Revenues for feeding in decreases steadily
- The price for electricity from the grid is rising
- Use this gap for a cost advantage

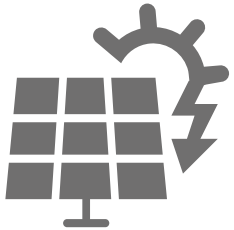
→ FOCUS: SELF CONSUMPTION of PRODUCED ENERGY

& USE OF ENERGY ACCORDING TO AVAILABILITY

Quelle Grafik 1: http://www.volker-quaschning.de/artikel/2012-07-Sonnenstrom-selbst-genutzt/index.php

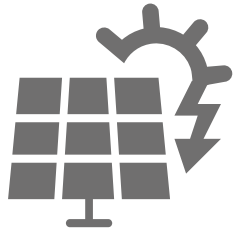
COMMUNICATION between PV and HP

No communication



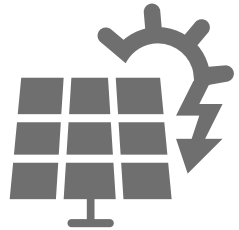
Restricted communication

0 or 1



direct communication

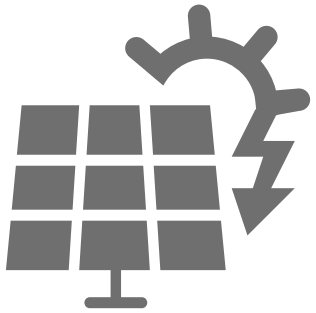
Transmission of PV yield & energy surplus (power meter)



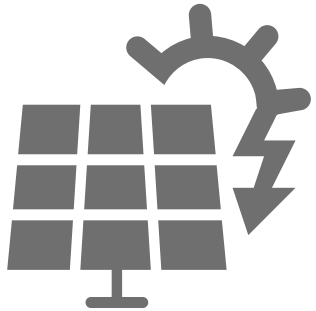
MAXIMIZING SELF CONSUMPTION

direct communication

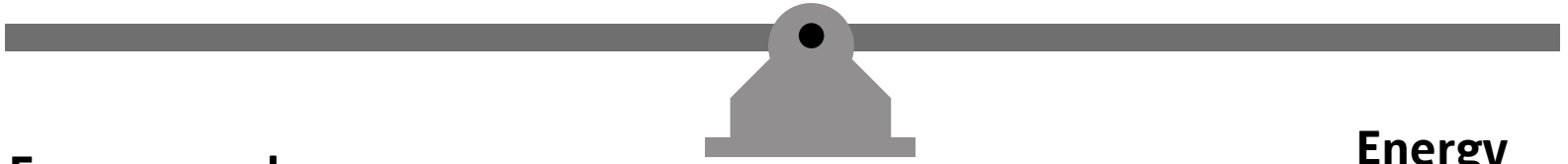
Transmisson of PV yield & energy surplus (powermeter)



Maximizing self consumption:
Keeping the energy surplus near to 0



Direct communication

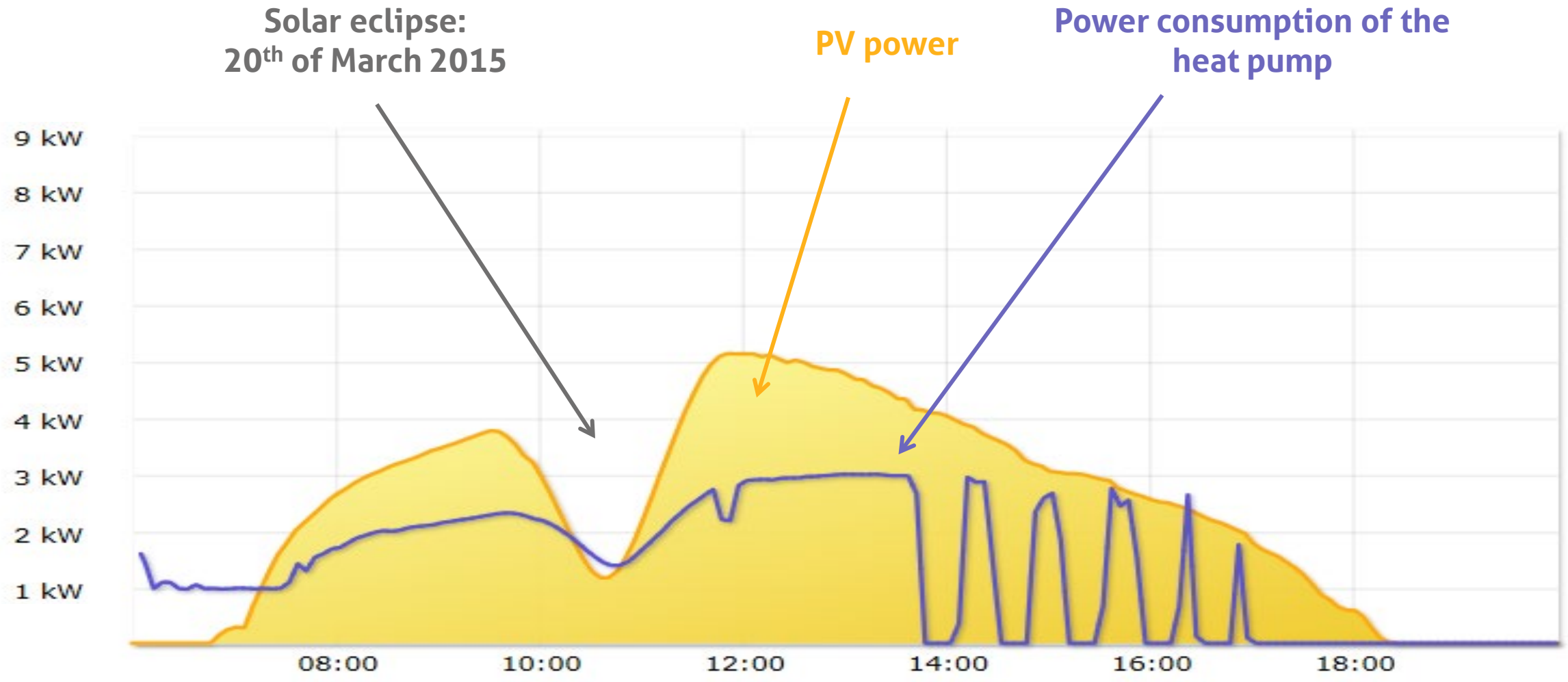


Energy surplus

Energy consumption

→ NEED OF INTELLIGENT, MODULATING HEAT PUMPS

MODULATING HEAT PUMP



WHERE TO STORE THE THERMAL ENERGY?

Using the surplus of energy (PV yield):

- To overheat the domestic hot water storage
- To overheat the heat buffer
- To overheat the building
- To overheat the rooms

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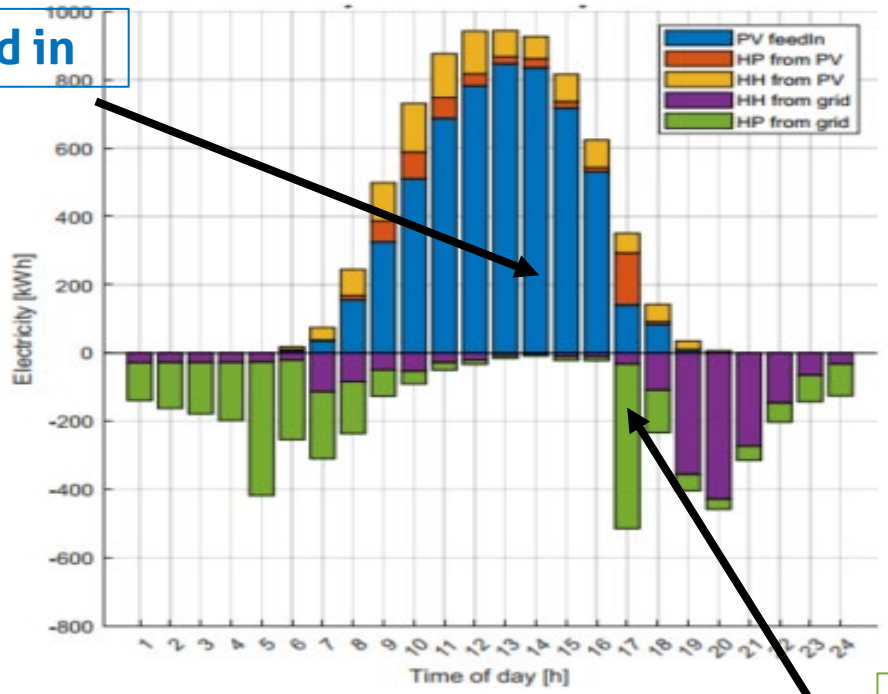
Navigator 2.0

Outlook: cost – variable tariffs

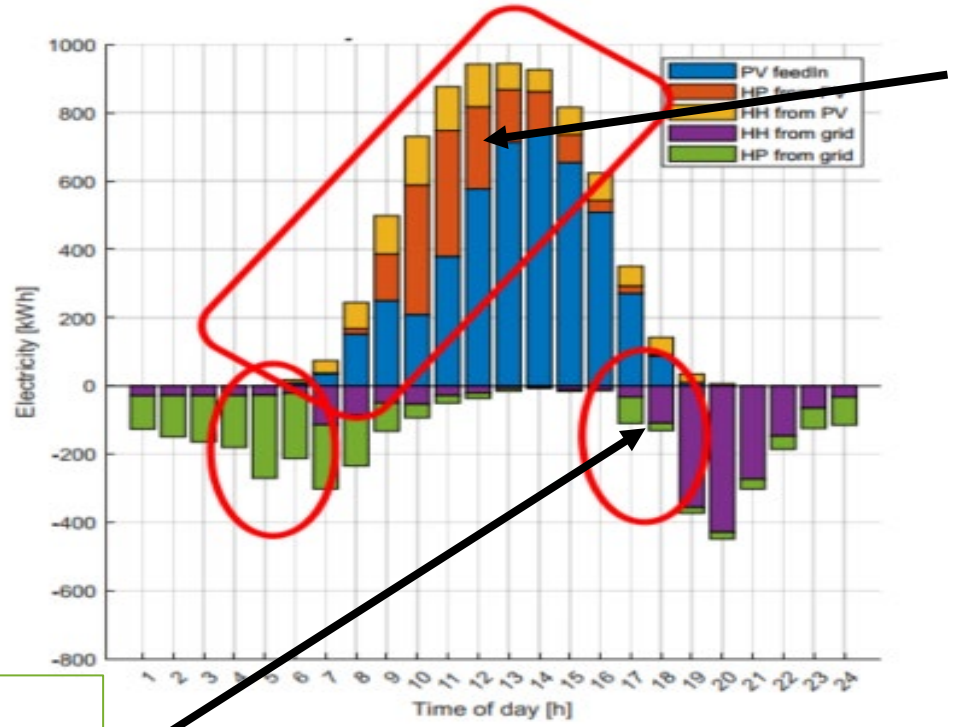
INTELLIGENT OVERHEATING (one year)

PV
Without overheating



Feed in

PV
With intelligent overheating



PV to heat pump

Grid to heat pump

- Less feed in
- Less energy consumption from the grid

RESEARCH - PROJECT

Optimizing PV self consumption:

- Connecting the PV to a modulating air-source heat pump
- Using the storage (buffer) as a thermal energy storage
- Using the building as a thermal energy storage

DESCRIPTION

- Single Family House with a 140 sqm
- Buffer for heating and a freshwater station for DHW
- PV with 5,2kWp

- Heating demand 6726 kWh / a
- DHW demand 2980 kWh / a

COMPARISON

FOR AN EASY UNDERSTANDING WE WILL COMPARE:

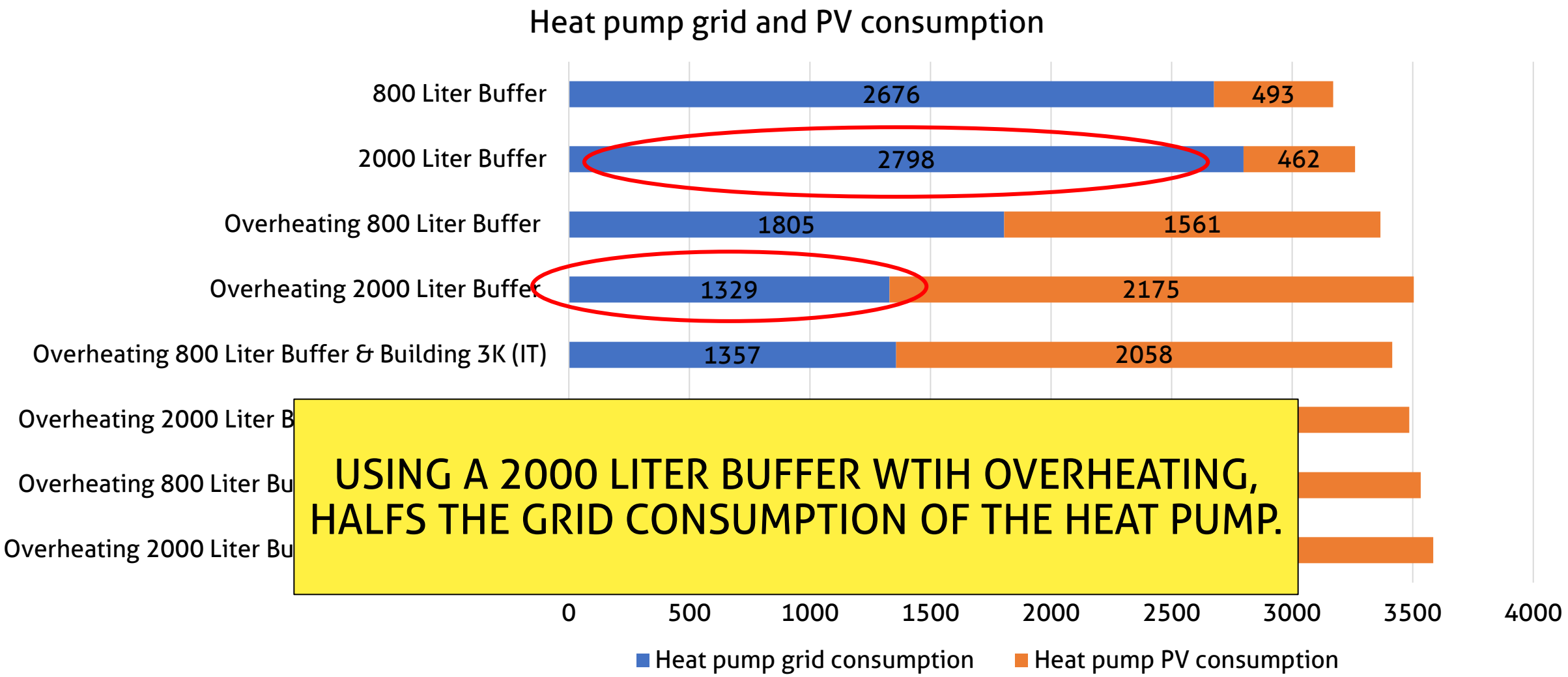
1. Using a 2000 Liter buffer without overheating
2. Using a 2000 Liter buffer with intelligent overheating

WHAT IS OUR BENEFIT?

TIME TO TAKE A GUESS:

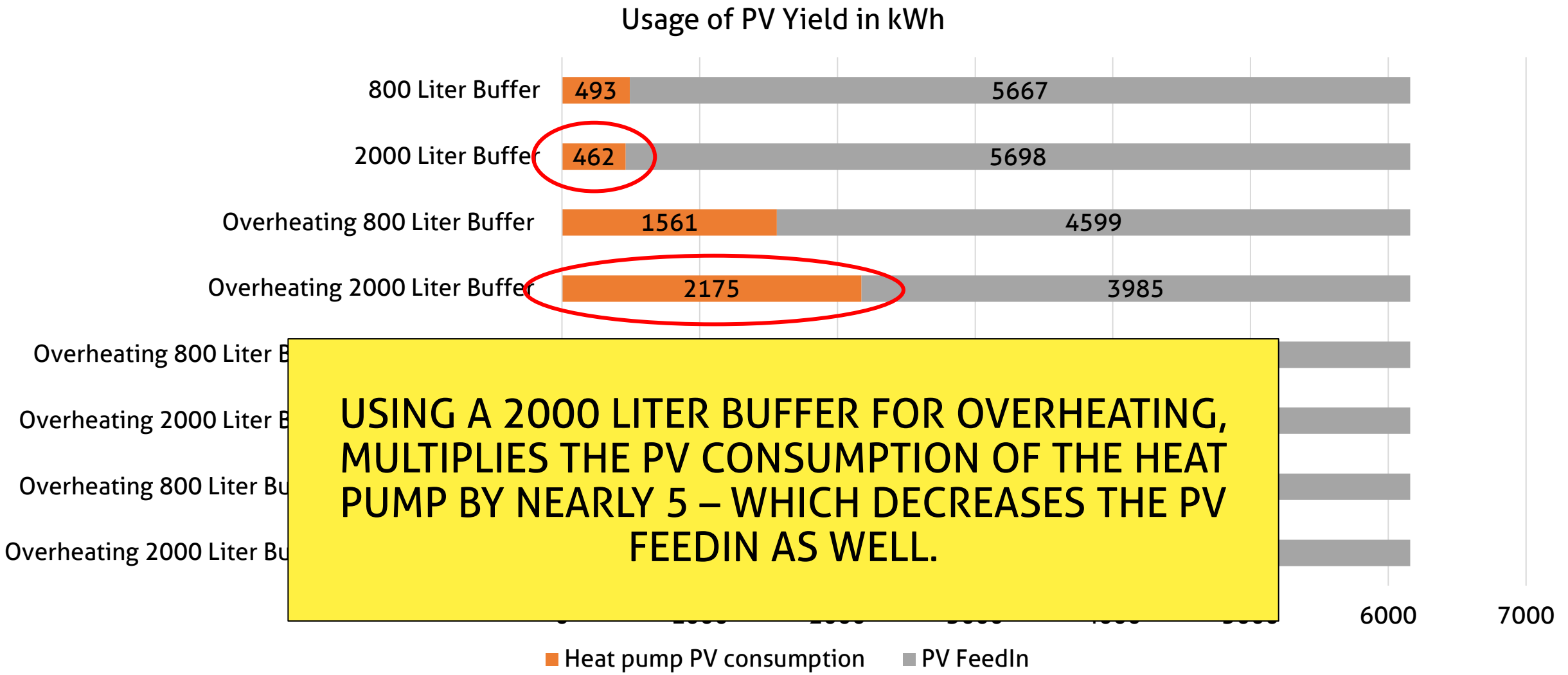
- Can we decrease the grid consumption?
- Can we increase our self consumption of PV yield?

LESS GRID CONSUMPTION (HEAT PUMP)



USING A 2000 LITER BUFFER WTIH OVERHEATING, HALFS THE GRID CONSUMPTION OF THE HEAT PUMP.

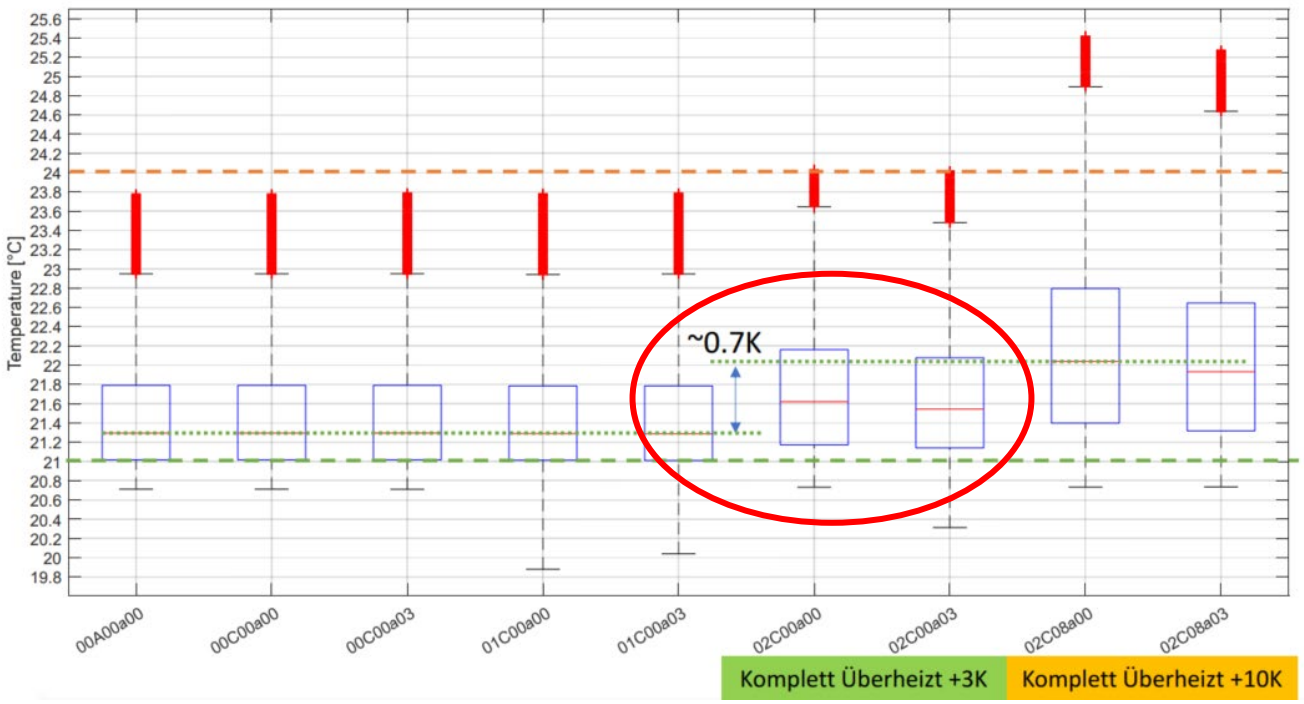
HIGHER SELF CONSUMPTION (PV YIELD)



USING A 2000 LITER BUFFER FOR OVERHEATING, MULTIPLIES THE PV CONSUMPTION OF THE HEAT PUMP BY NEARLY 5 – WHICH DECREASES THE PV FEEDIN AS WELL.

OVERHEATING building = LESS COMFORT?

Overheating the building doesn't really mean that the room temperature is rising. But even when, the rooms will be controlled by a single room regulation.



COMPARISON

1. Using a 2000 Liter buffer without overheating
2. Using a 2000 Liter buffer with intelligent overheating

WHAT IS OUR BENEFIT?

- Can we decrease the grid consumption?
  Yes, by a half.
- Can we increase our self consumption of PV yield?
  Yes, multiplied by 5.

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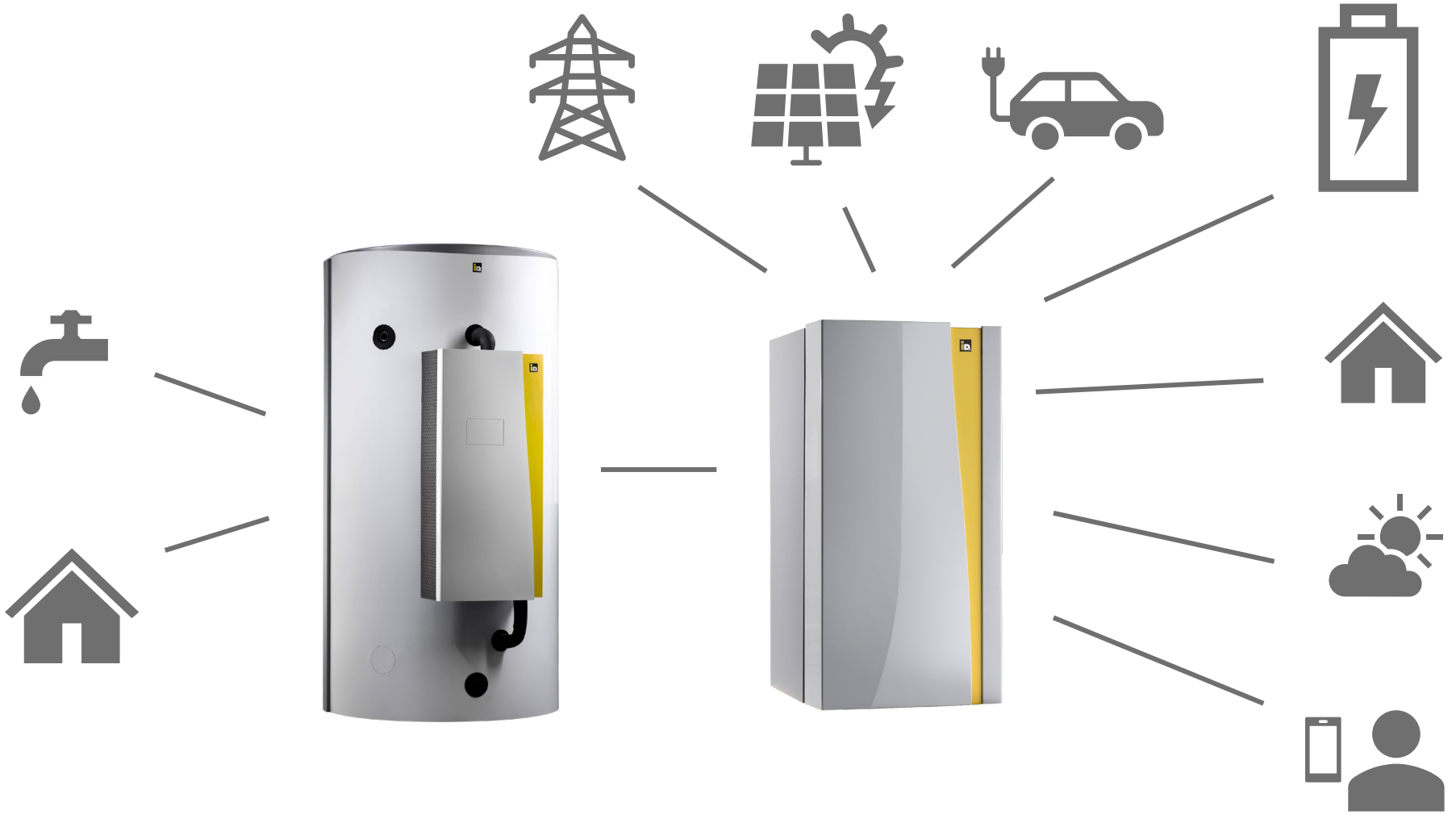
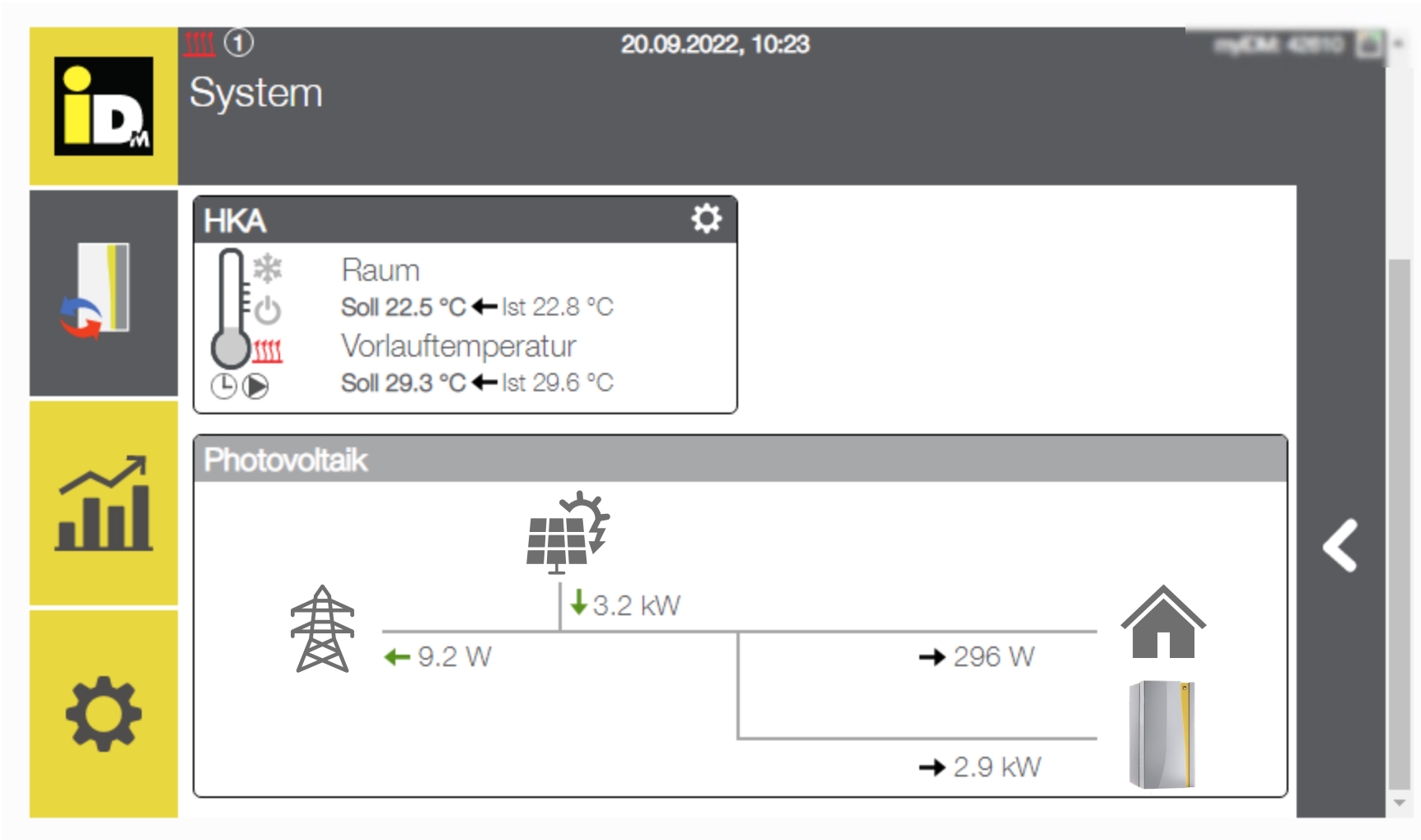
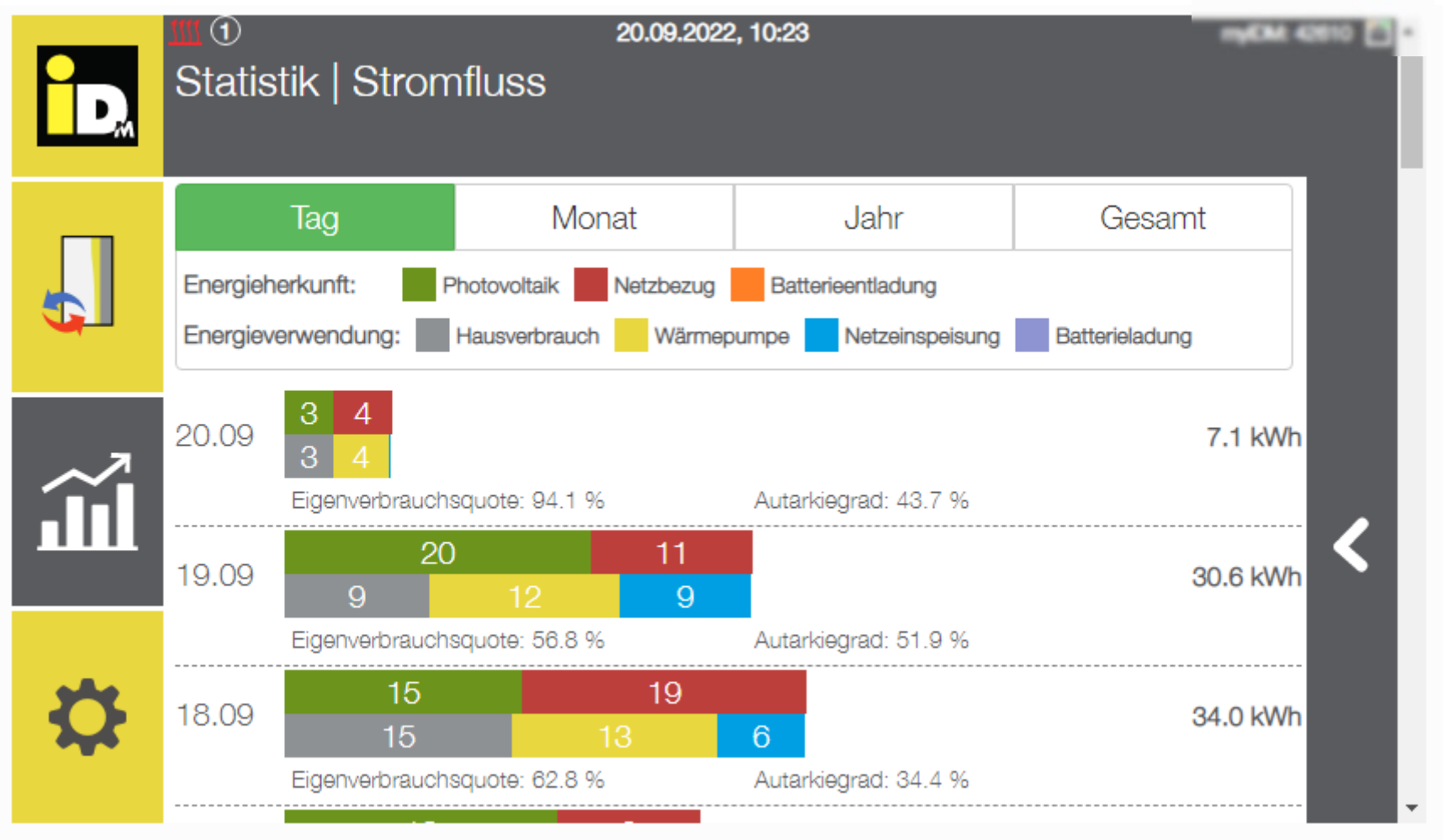
CONNECTIVITY



LIVE ENERGY DISTRIBUTION



STATISTICS OF ENERGY DISTRIBUTION



FUTURE OF ENERGYMANAGEMENT

- Decreasing load peaks
- Individual control of each component
- Optimized use of energy and efficiency
  - Cost variable tariffs
  - Weather forecasts
  - Optimized PV consumption
- Increased self consumption or even energy autarky

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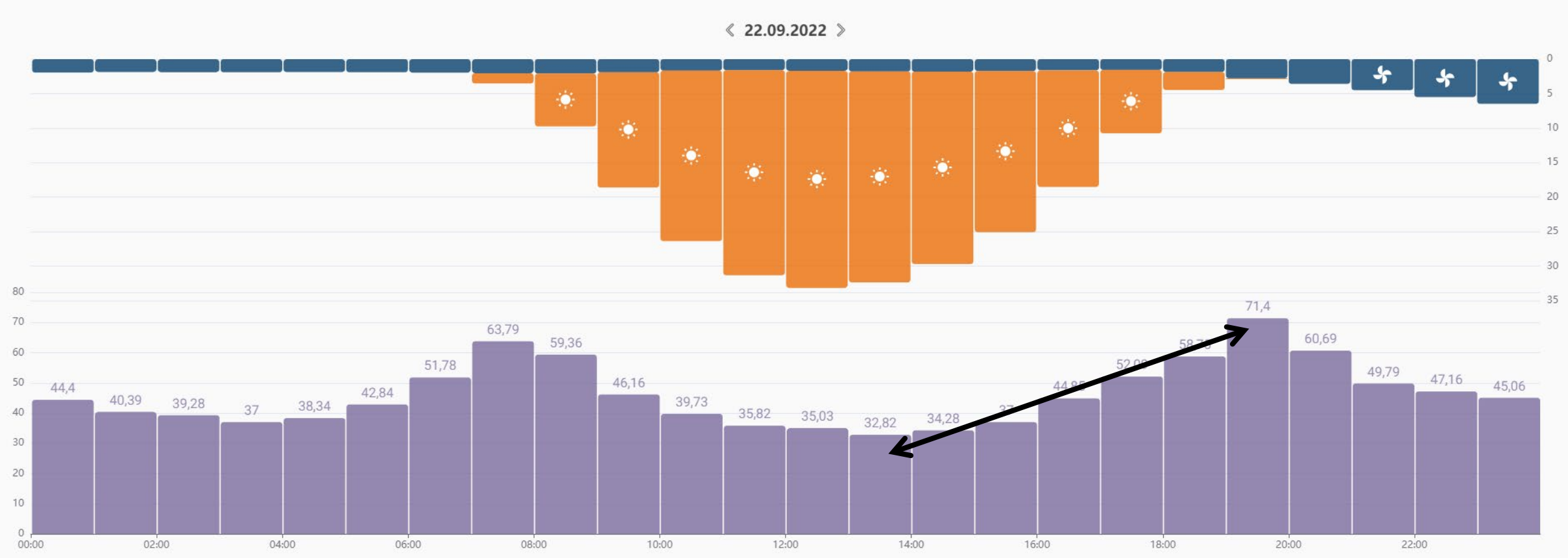
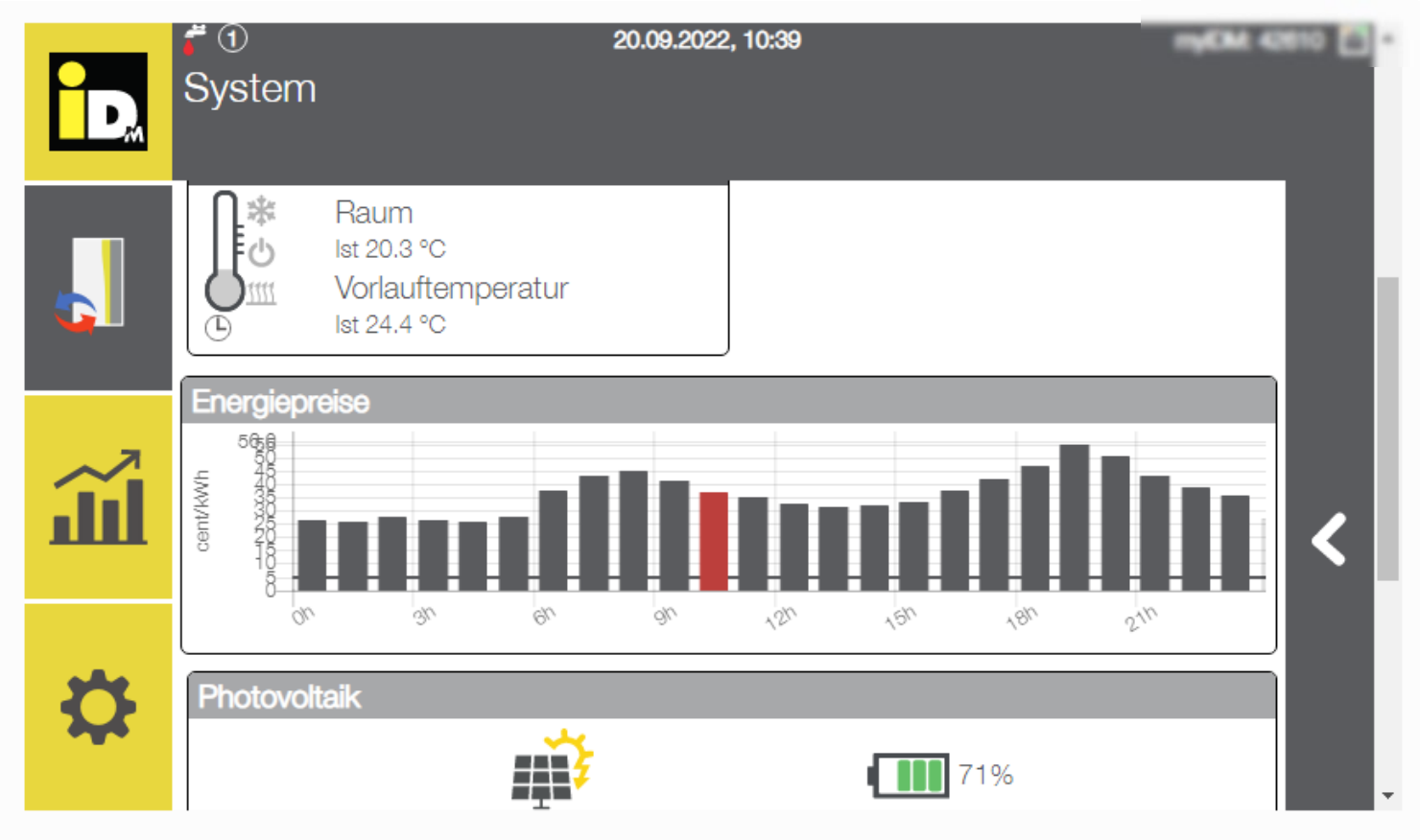
COST – VARIABLE TARIFFS



- A gap up to 40 c / kWh - on a normal day (exactly one week ago)
- Big potential for the heat pump: a lot of consumption (in HH), whilst being dynamic

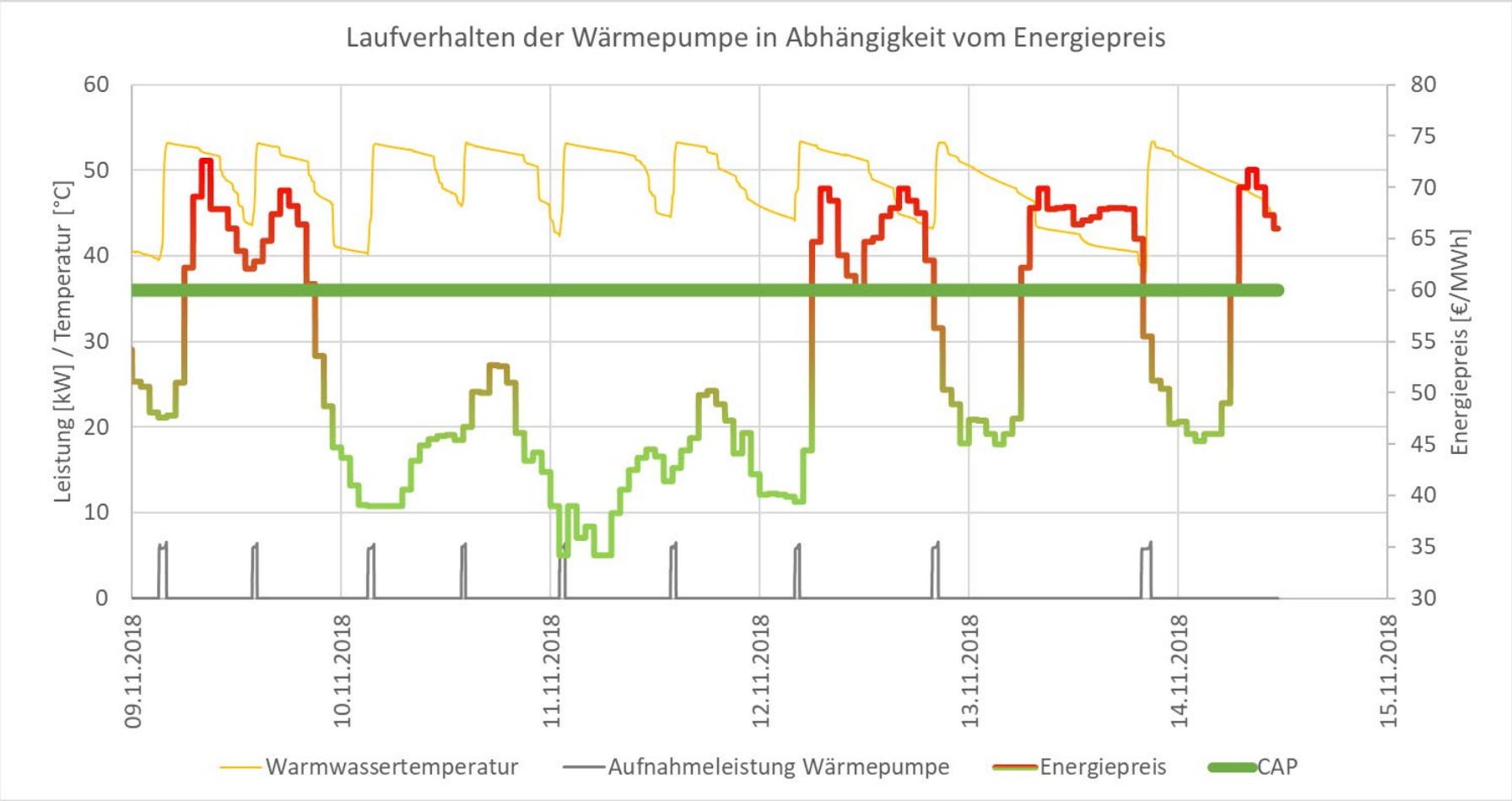
USE OF ENERGY ACCORDING TO AVAILABILITY
& USE OF ENERGY ACCORDING TO THE PRICE

HEAT PUMP REGULATION



iDM already implemented cost variable tariffs – to decrease the price for energy

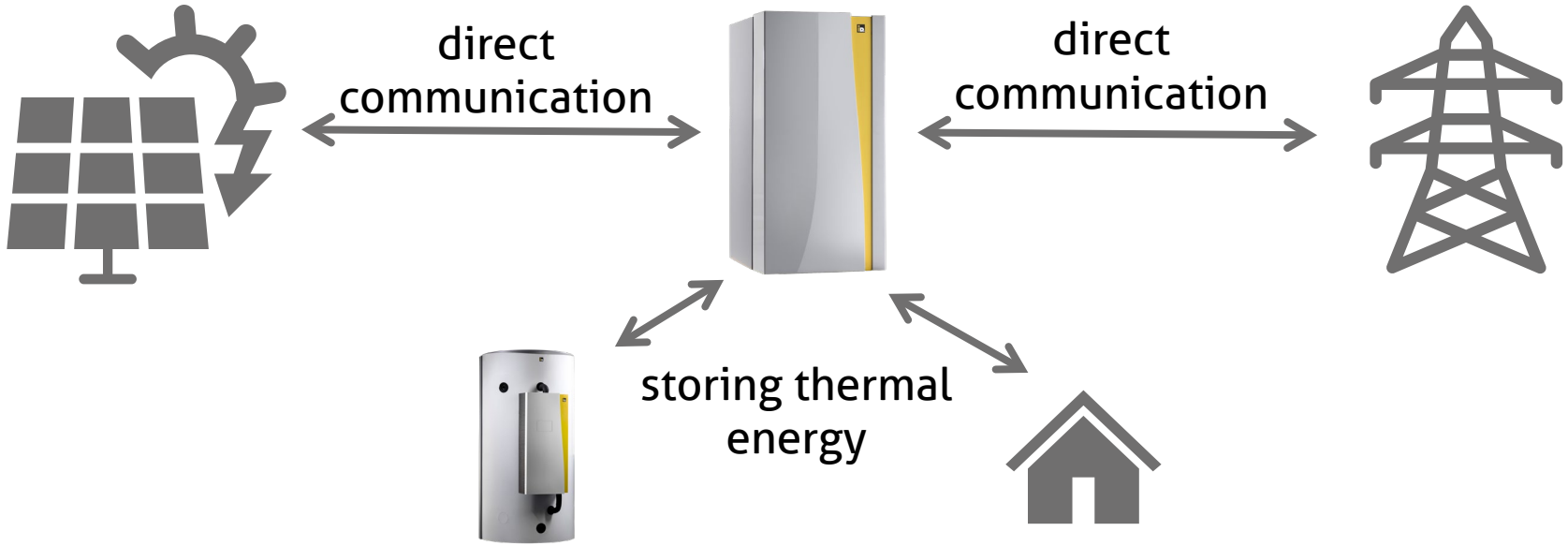
PRICE DEPENDEND OPERATION (1 WEEK)



We can see the starts of the heat pump in the local minima of the energy price

CONCLUSION

- PV systems need a direct communication to the heat pumps for optimized self consumption
- Heat pumps are intelligent and can use the energy surplus to overheat buffer & building
- An intelligent communication to the grid is needed for decreasing peak loads & gaining advantage in terms of prices for energy



There is no PlanetB

Intelligent heat pump systems in connection with photovoltaic systems