ABO Wind - Your Partner for Clean Energy

INTEGRATED RENEWABLES Hybrid ENERGY SYSTEMS

Julia Badeda, 22.05.2019

4th International Hybrid Power Systems Workshop, Crete

Contents

- **Company**
- **Hybrid Energy System (HES)**
- **Integrated renewable HES**
  - Office Building in Wiesbaden
  - Living Area in Kelsterbach

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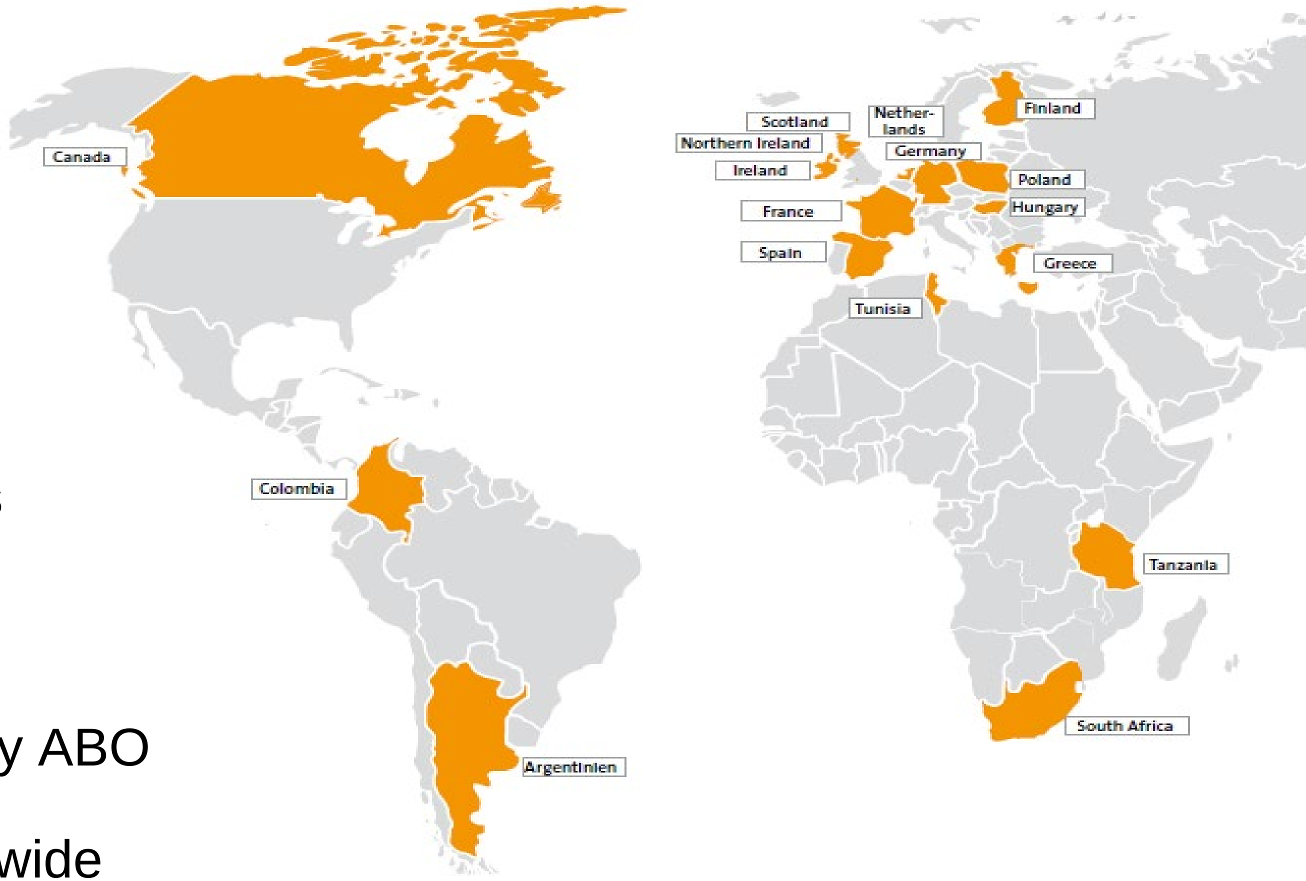
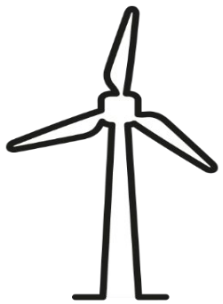
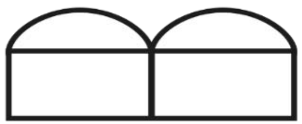
ABO Wind at a glance

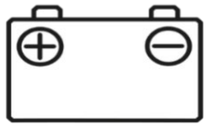
- Founded in 1996 in Germany
  550 employees worldwide
- Annual project volume of around
  EUR **300 million**
- ABO Wind is developing Projects
  in **16** countries
- 2 GW developed and sold,
  of which **1.5 GW** were installed by ABO
- Current pipeline of 6.5 GW worldwide

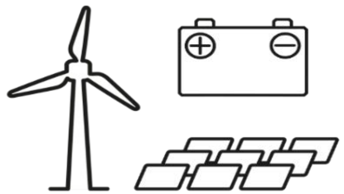



Wind Energy


Solar Energy


Bio Energy


Energy Storage


Hybrid Energy

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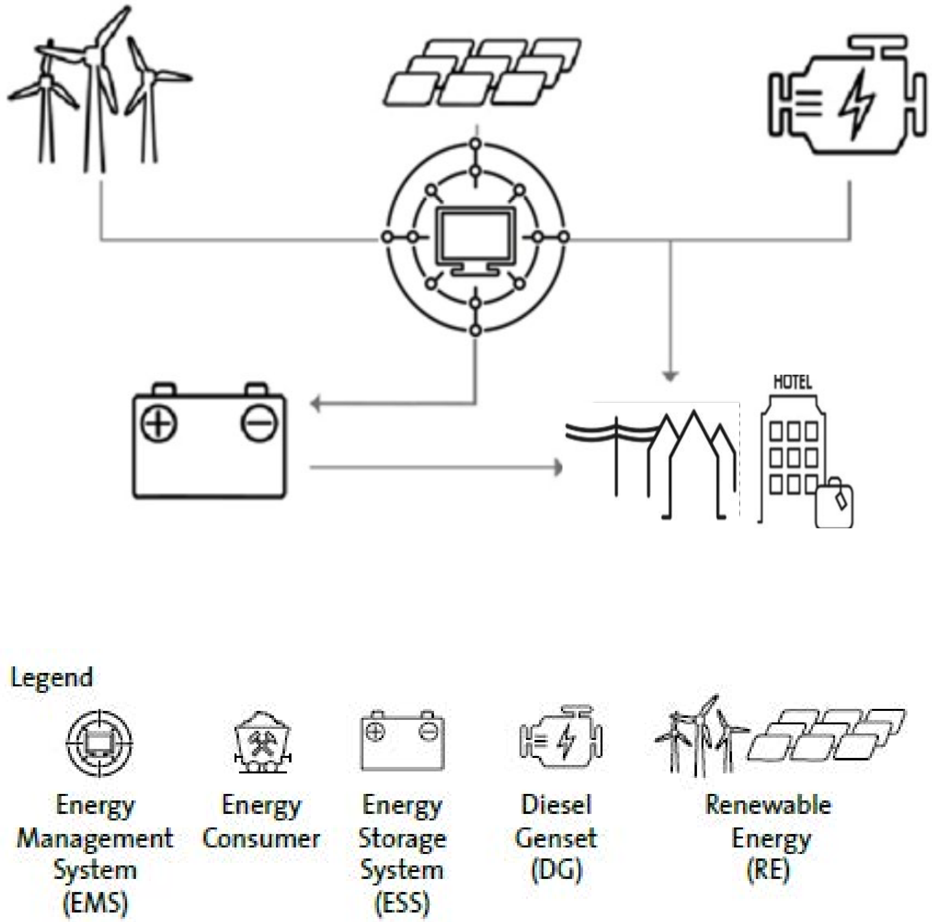
Hybrid Energy System (HES)

HES with Energy Management System

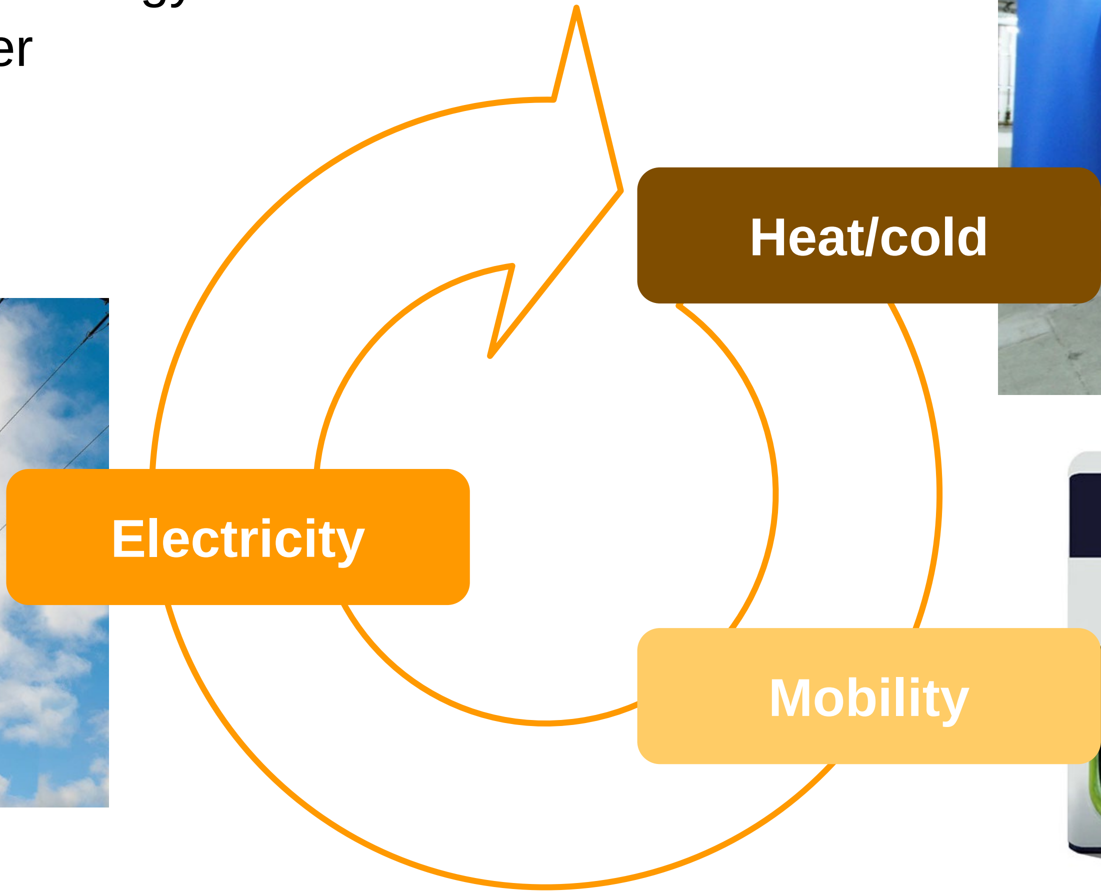


- An energy system is understood as hybrid, if it consists of at least two different energy converters
- ABO Wind offers reliable solutions for various applications either grid-tied or off-/ island grid
- Our customers
  - Infrastructure
  - Remote communities
  - Mining
  - Tourism & Hotels
  - Remote Industries
  - Islands and isolated power grids

Sector Coupling

- The inteconnection of energy stream within the three sectors of energy utilization is understood as sector coupling

- A combined optimization of energy sectors within a micro-grid can offer better economics



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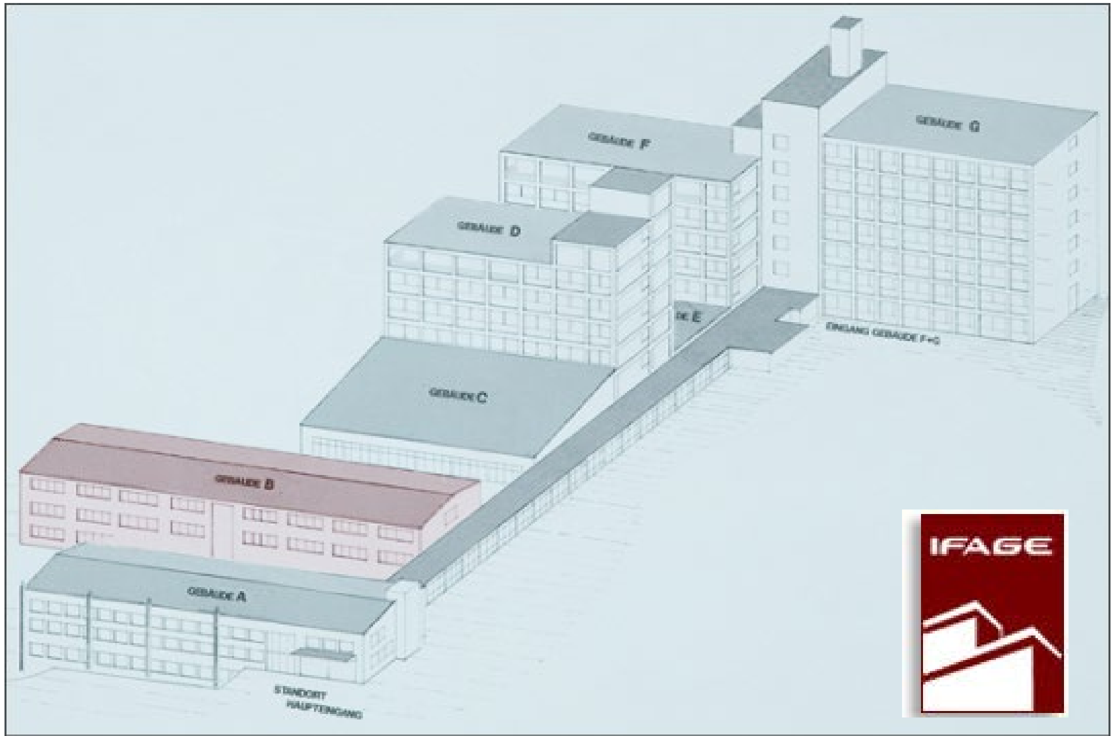
Office Building in Wiesbaden



Source: IFAGE Grundstücksverwaltung

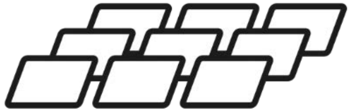
- 40 companies with > 350 employees within the building
- Total floor area 9.000 m²
- Energy consumption
  - Electricity: 350 MWh_{el} (base load of 30 kW_e)
  - Heating: 1.055 MWh_{th}

Office Building in Wiesbaden

Elements of the integrated hybrid system

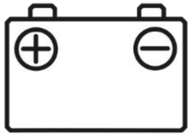
Generation units

2 condensing boiler	790 kW_{th}
2 CHP units	40 kW_e / 80 kW_{th}
3 buffer tanks	4.500 l



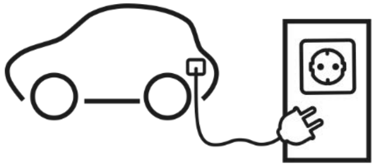
PV unit	55 kW_{Peak}

Storage



redox-flow	2 kW_e / 10 kWh_e

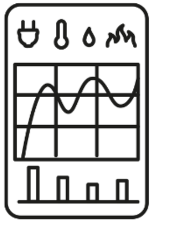
Electric mobility



3 charging points	11 to 22 kW_e

hybrid plug-in and battery electric vehicles

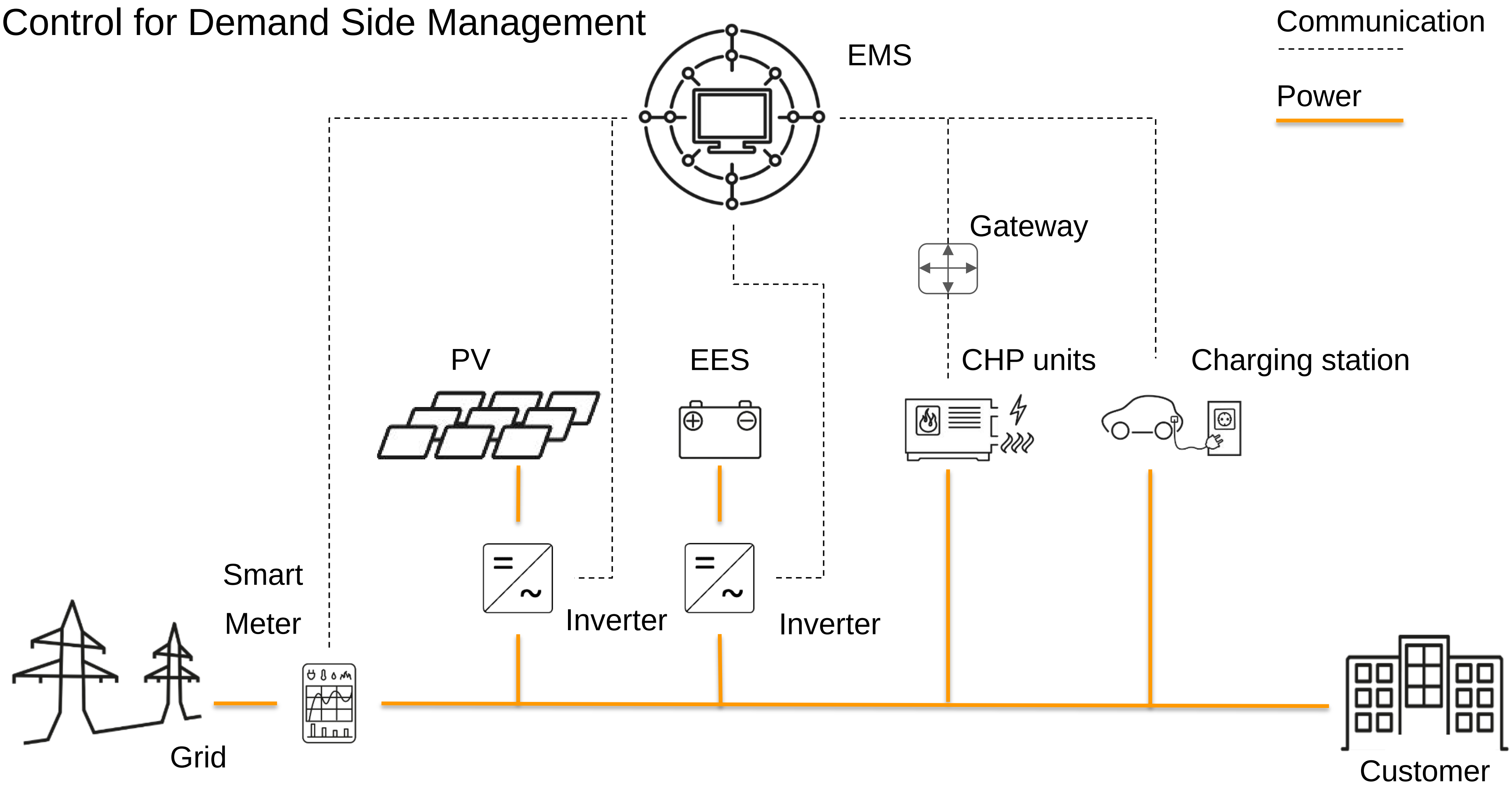
Energy Management



25 smart meter

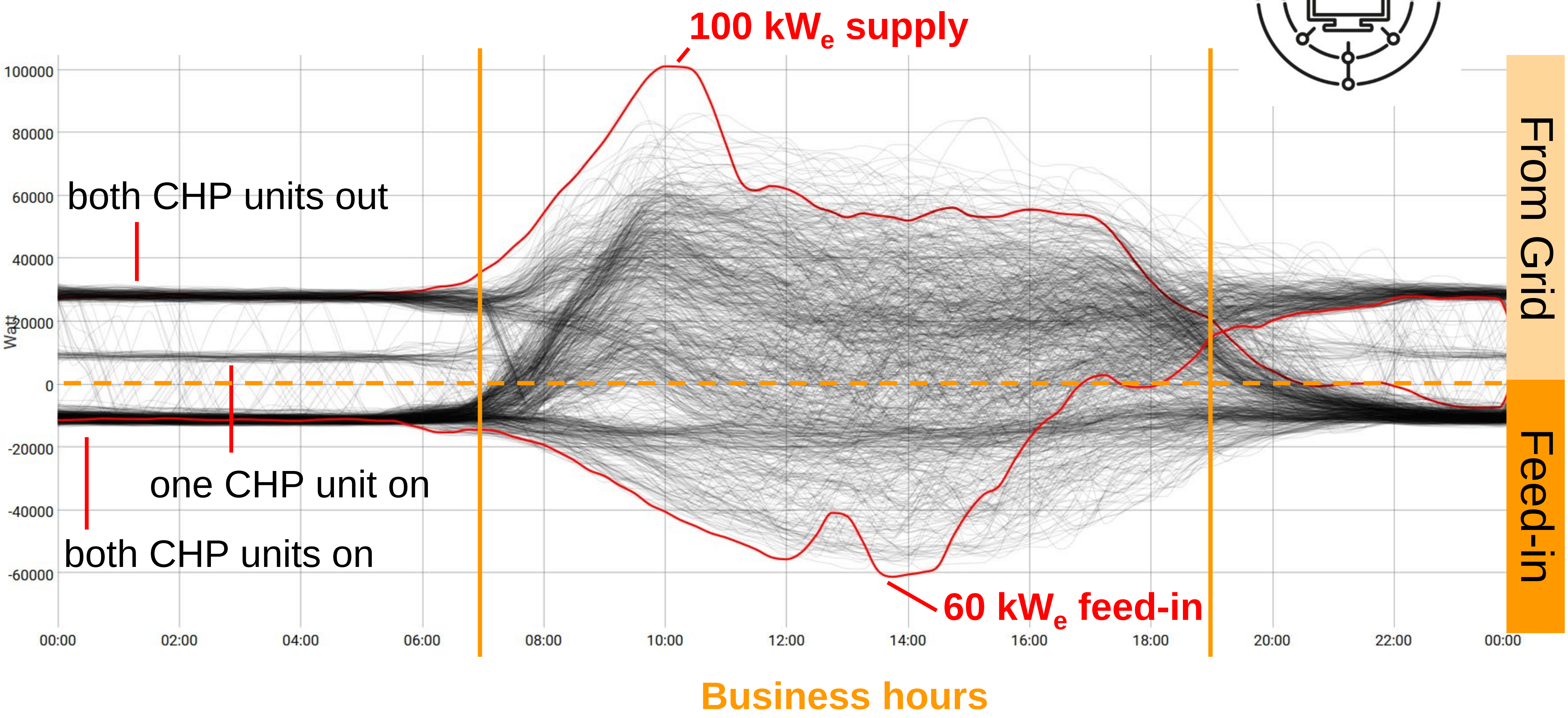
Energy Management System (EMS)

Control for Demand Side Management



Office Building in Wiesbaden

Analysis of power profile over two years



CHP units are steered based on heat demand

Office Building in Wiesbaden

Why integration of mobility makes sense

- Assumptions:
  - Driving range of 20,000 km per anno
  - Two cars

	Conventional	Electric
CO_2 emissions	140 g/km	53.4 g/km[1]
Fuel costs	2.860 €/anno[2]	1.800 €/anno[3]

- Benefits
  - CO_2 emission reduction by 3.5 t/a or 62 %
  - Fuel cost reduction by 500 € per car or 37 %
  - Multi-use application: Battery of EV = additional buffer for the system

[1]:267 g/kWh as a mix of PV and grid electricity and 20 kWh_e/100km

[2]: Price per l diesel = 1.30 € and 5.5 l/100km

[3]: 22.5 €cent/kWh_e

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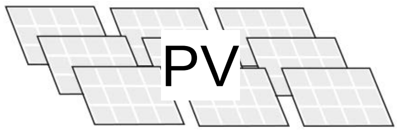
Living Area in Kelsterbach: QUARTEER ONE

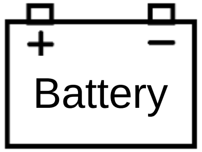
total floor area:	23,700 m²
Electricity:	653 MWh_e
E-cars:	80 MWh_e
Heating:	684 MWh_{th}
Cooling:	167 MWh_{th}

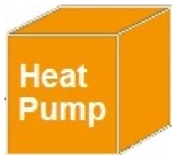
Choice of system for energy provision

- Conventional option
  - Electricity from the grid
  - Heat through natural gas condensing boiler
  - Cooling through HVAC system

- Renewable energy options
  - Base components

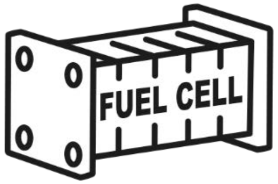






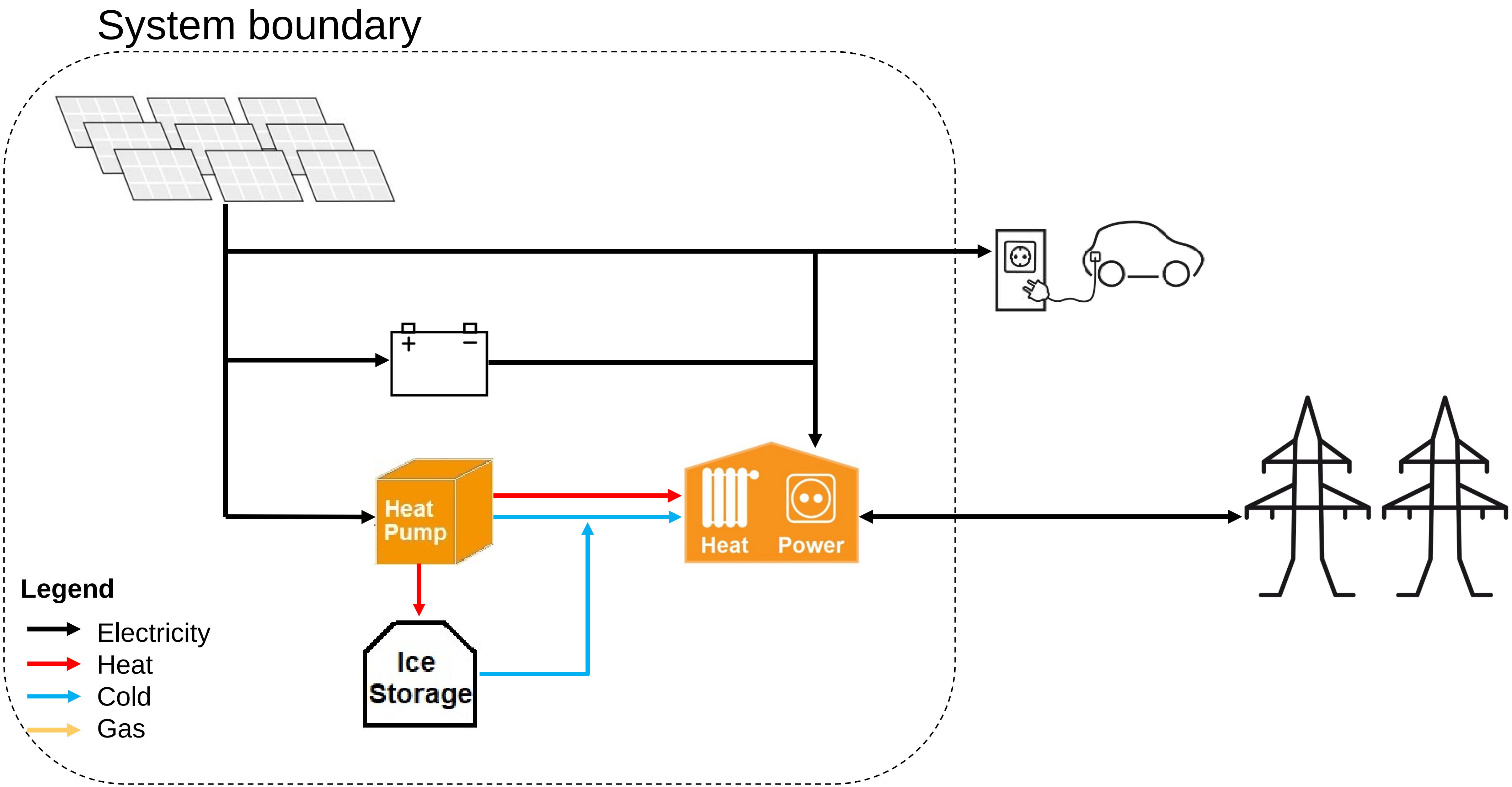
  - Additional components

Combined Heat & Power

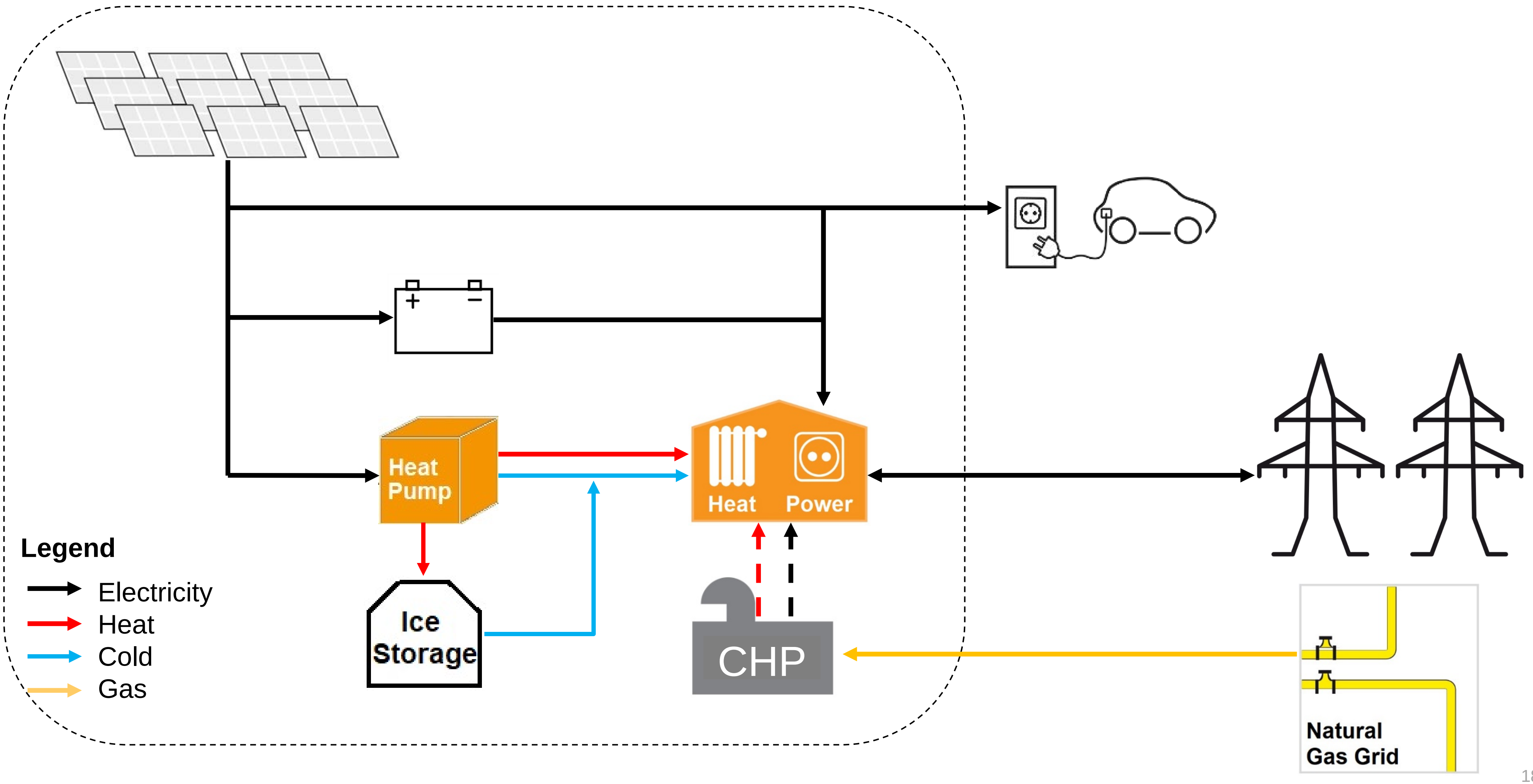


Electrolyzer

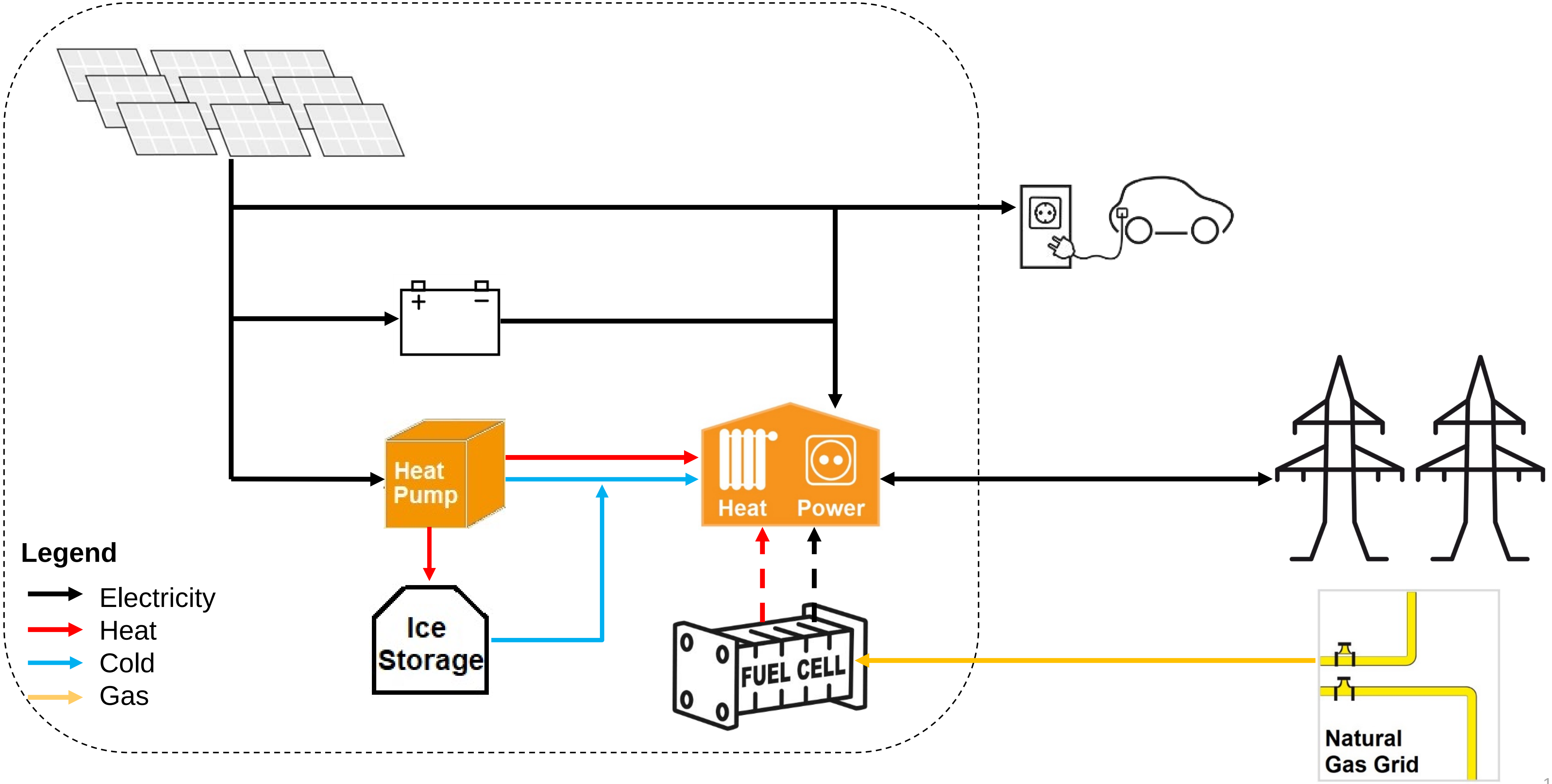
Option 1: using the base components



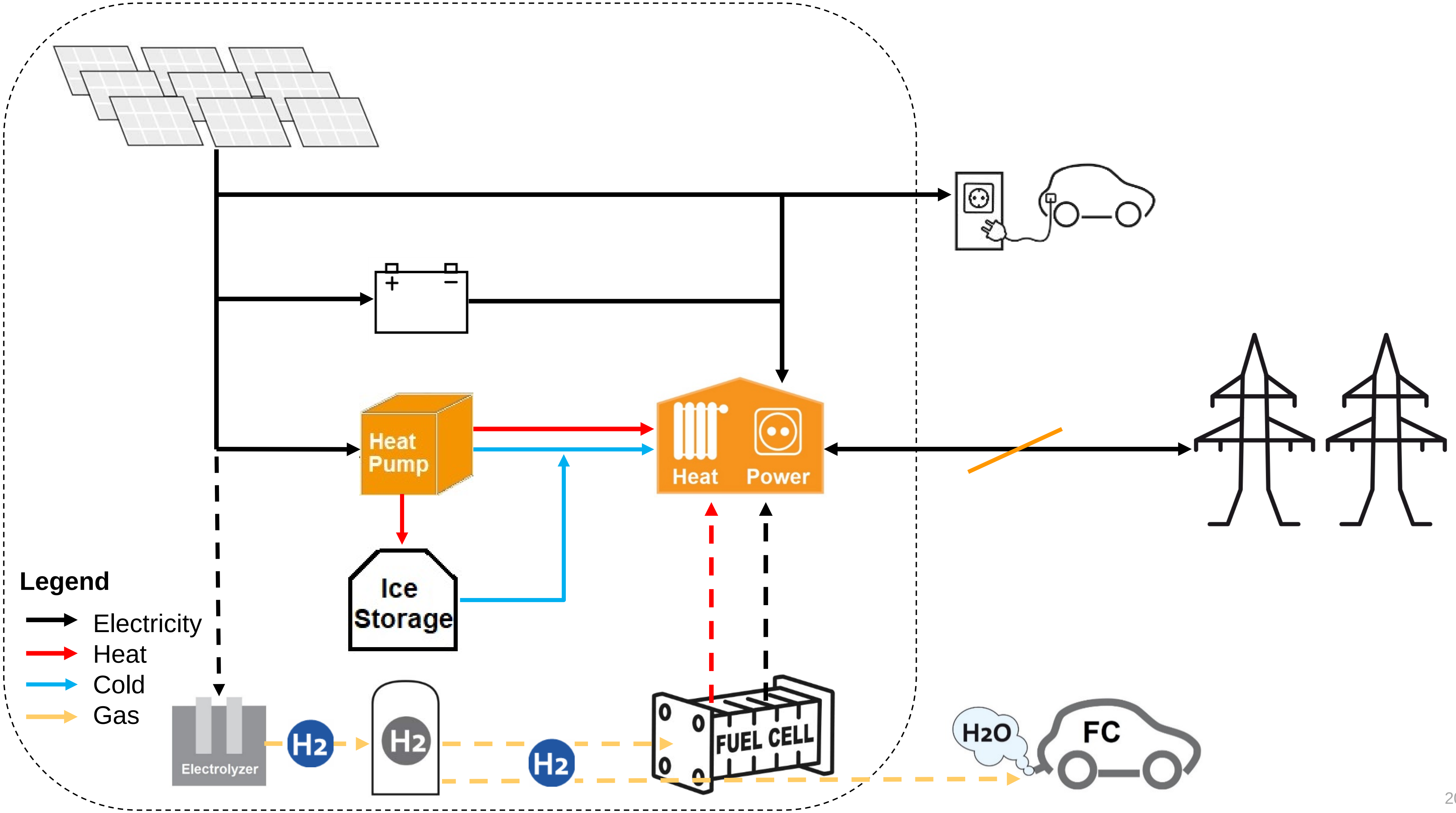
Option 2: incuding a CHP with gas grid connection



Option 3: using a natural gas fuel cell

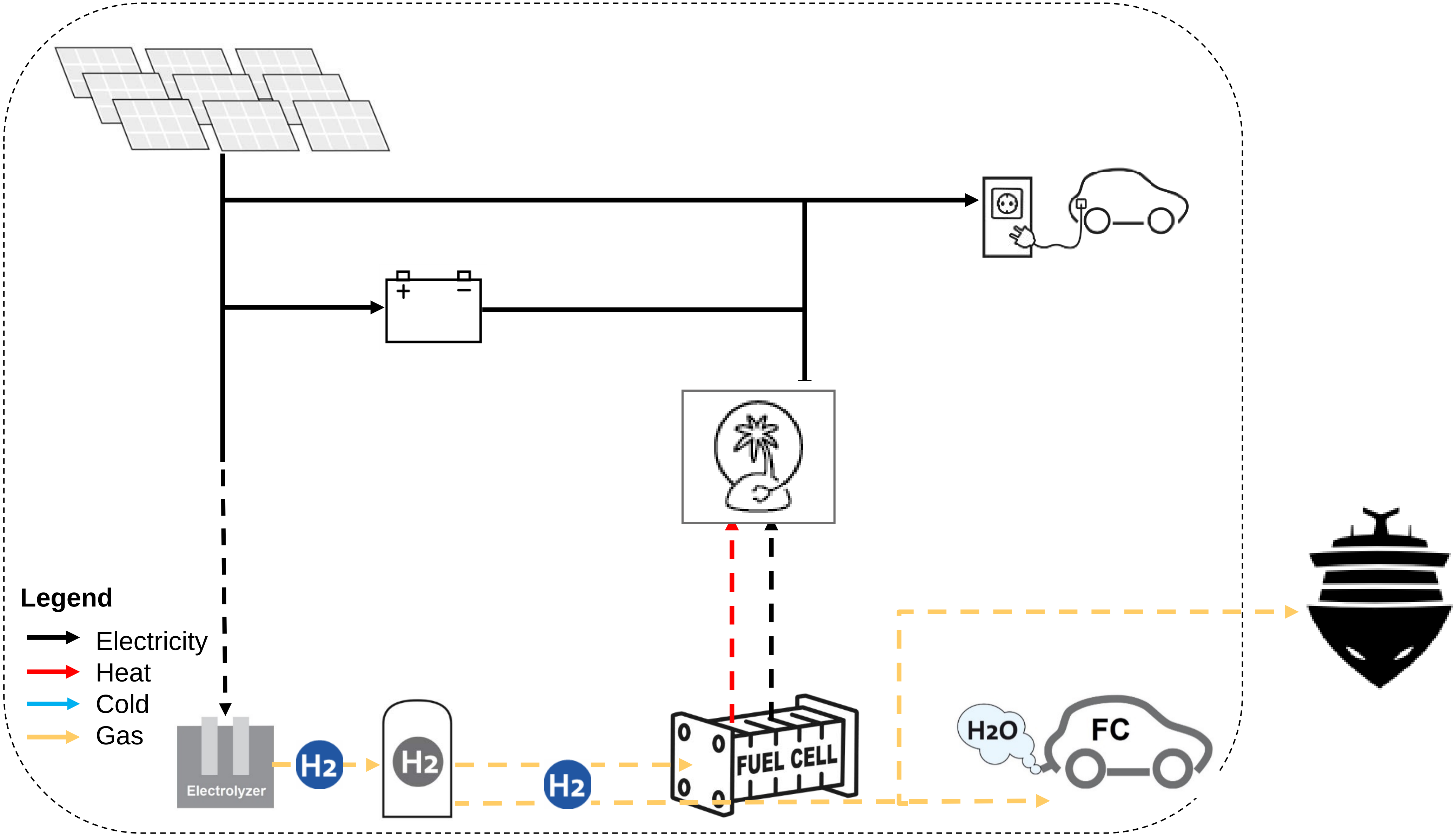


Option 4: adding a hydrogen infrastructure to the system



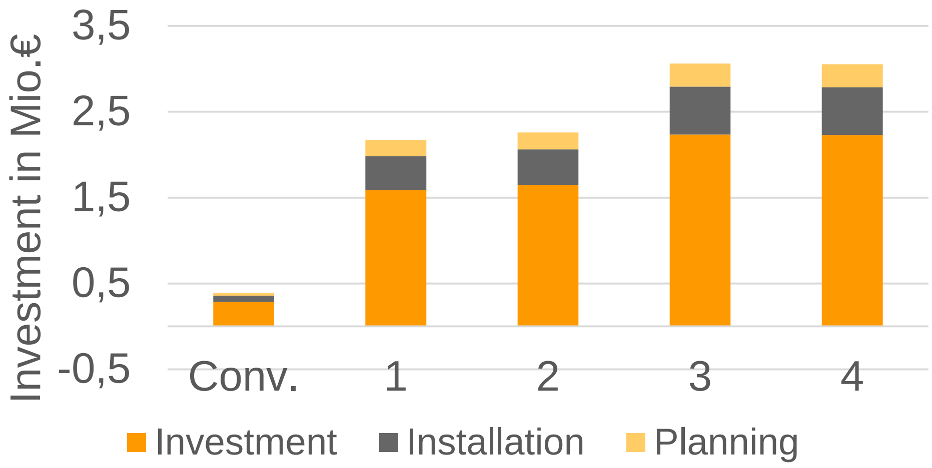
ABO WIND

Offering netto export also to vessels

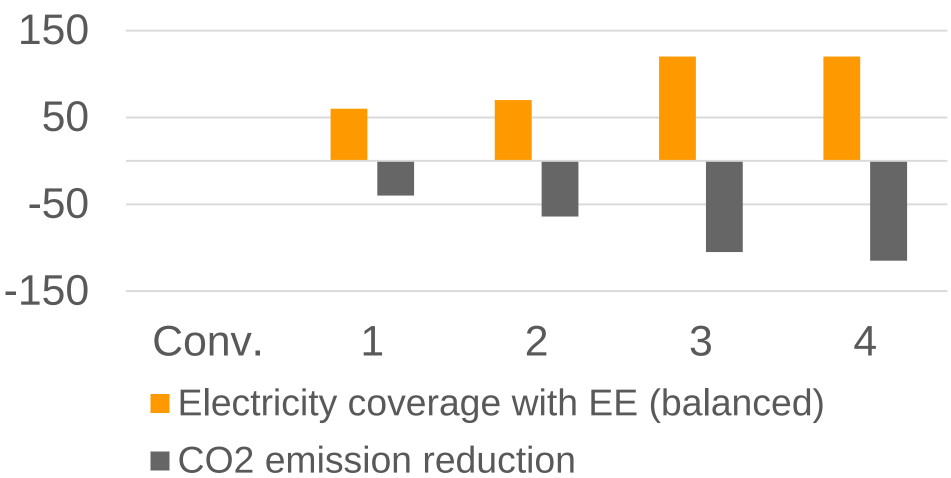


Basic economic evaluation

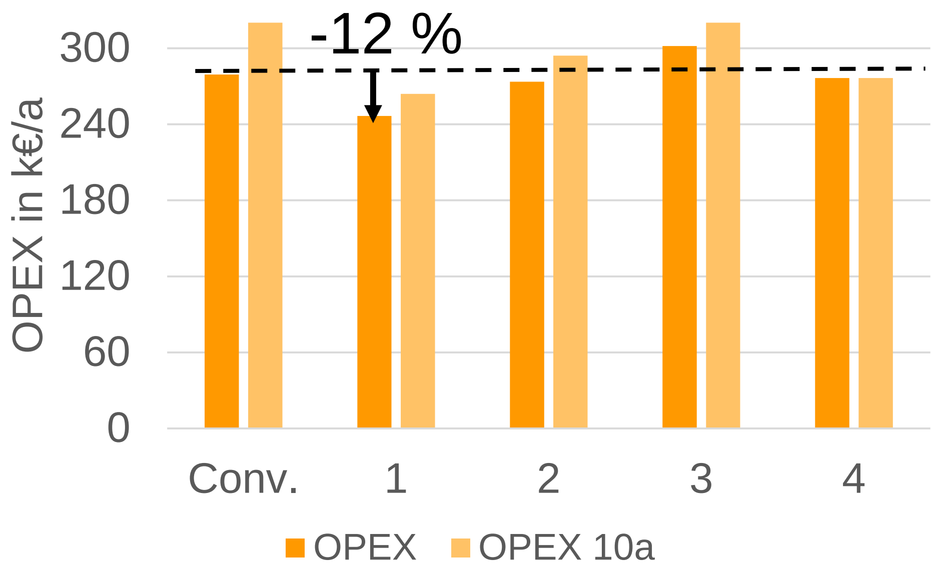
- CAPEX



- Electricity coverage and CO_2 reduction



- OPEX
  - Today and in 10 years*
  - Sale of electricty overproduction not included



- 24€cent/kWh$_{el}$ and 5.77€/kWh$_{th}$
- with 1.5%/anno price increase for gas and electricty price

Summary and Conclusion

Main benefits of integrated HES and sector coupling

- Reduction of energy costs
  - Reduction of the peak supply = additional reduction of electricity costs
  - Integration of mobility opens additional value streams
  - Secure local supply and hedging against rising electricity costs

- Increased local consumption of renewable energy
  - Coverage of 60 % of the electrical energy consumption is achievable with EE solutions
  - Larger shares can be reached with storage and sector coupling

- Reduction of CO_2 emissions
  - Integration of renewable energies substitutes CO_2 emitting sources
  - Sector coupling allows the emission reduction in all relevant sectors

Get in contact to find your optimal solution

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