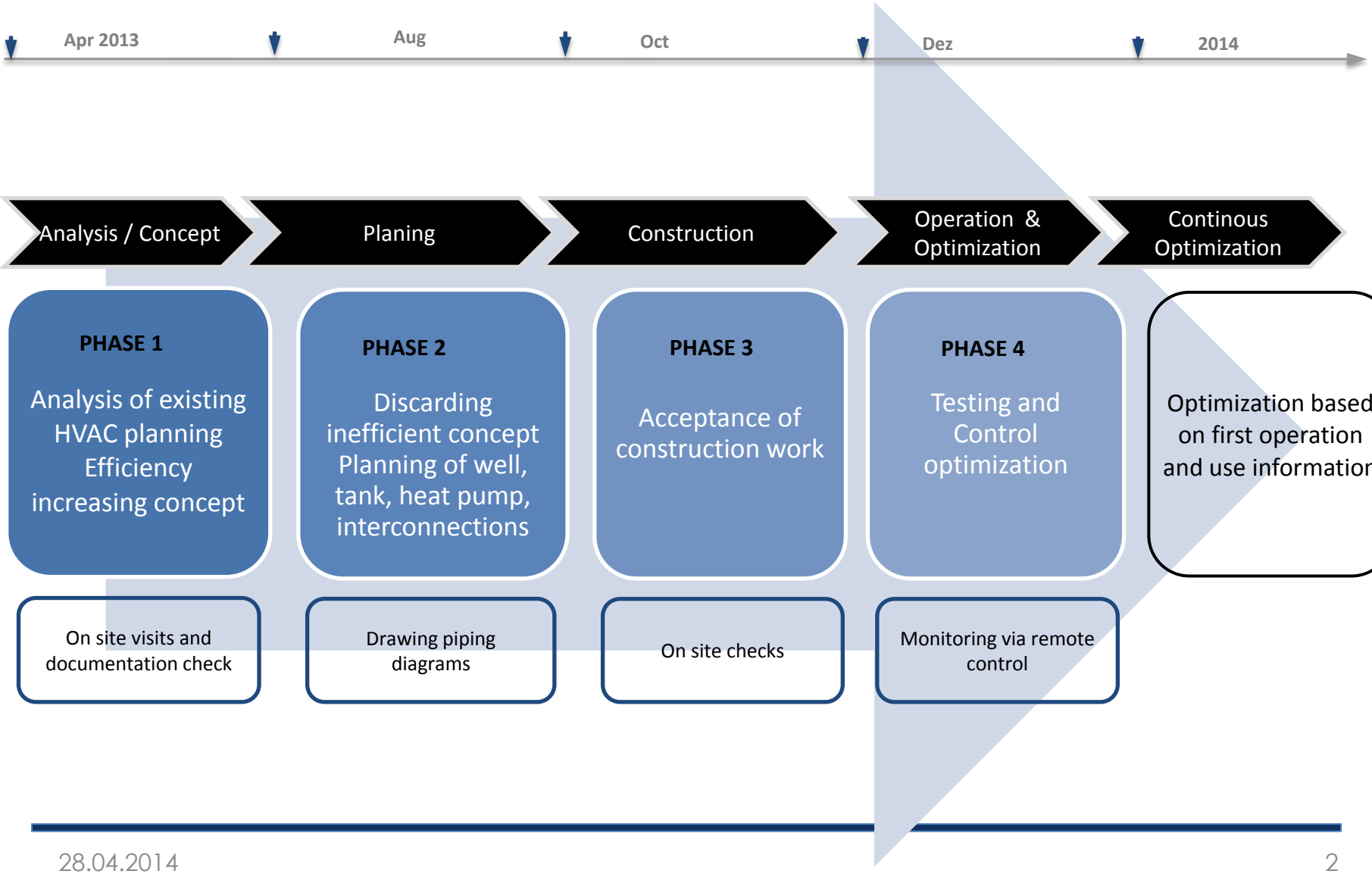
Building Technology Optimization

Paul Blau GmbH

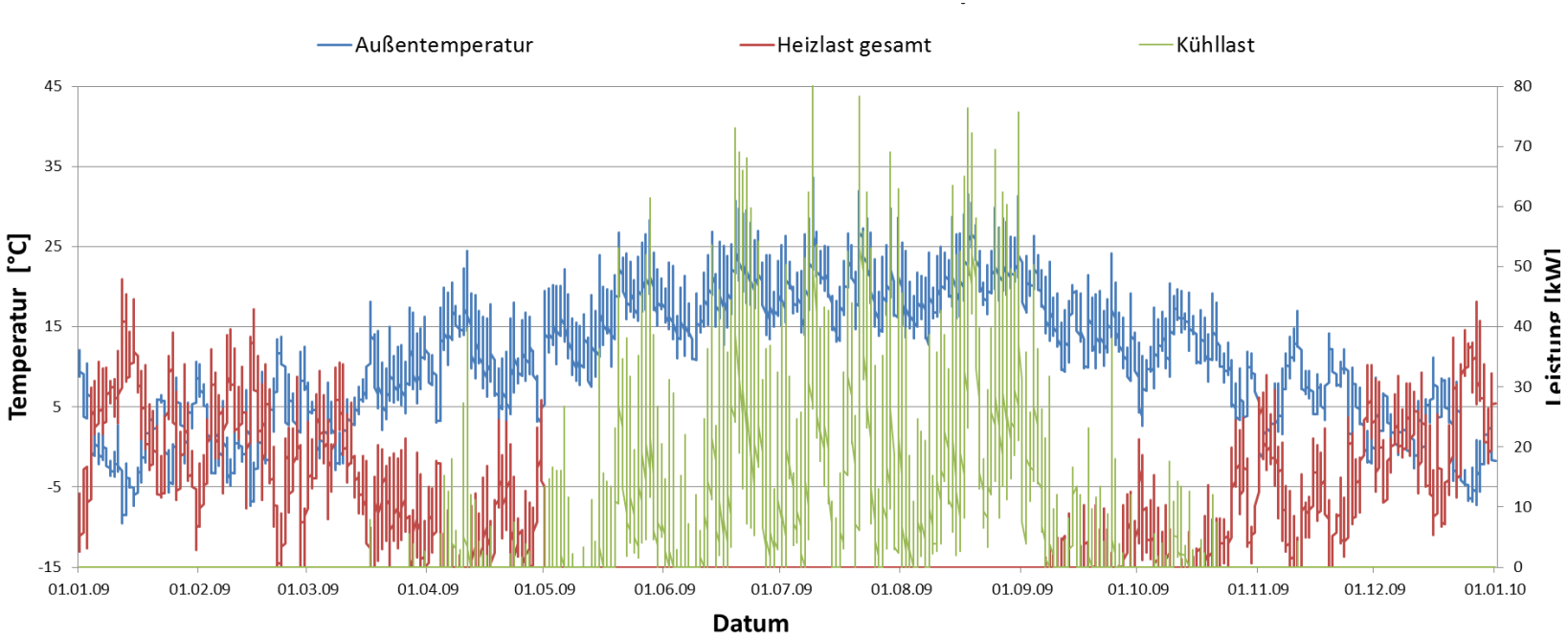
Energybalance

Project course

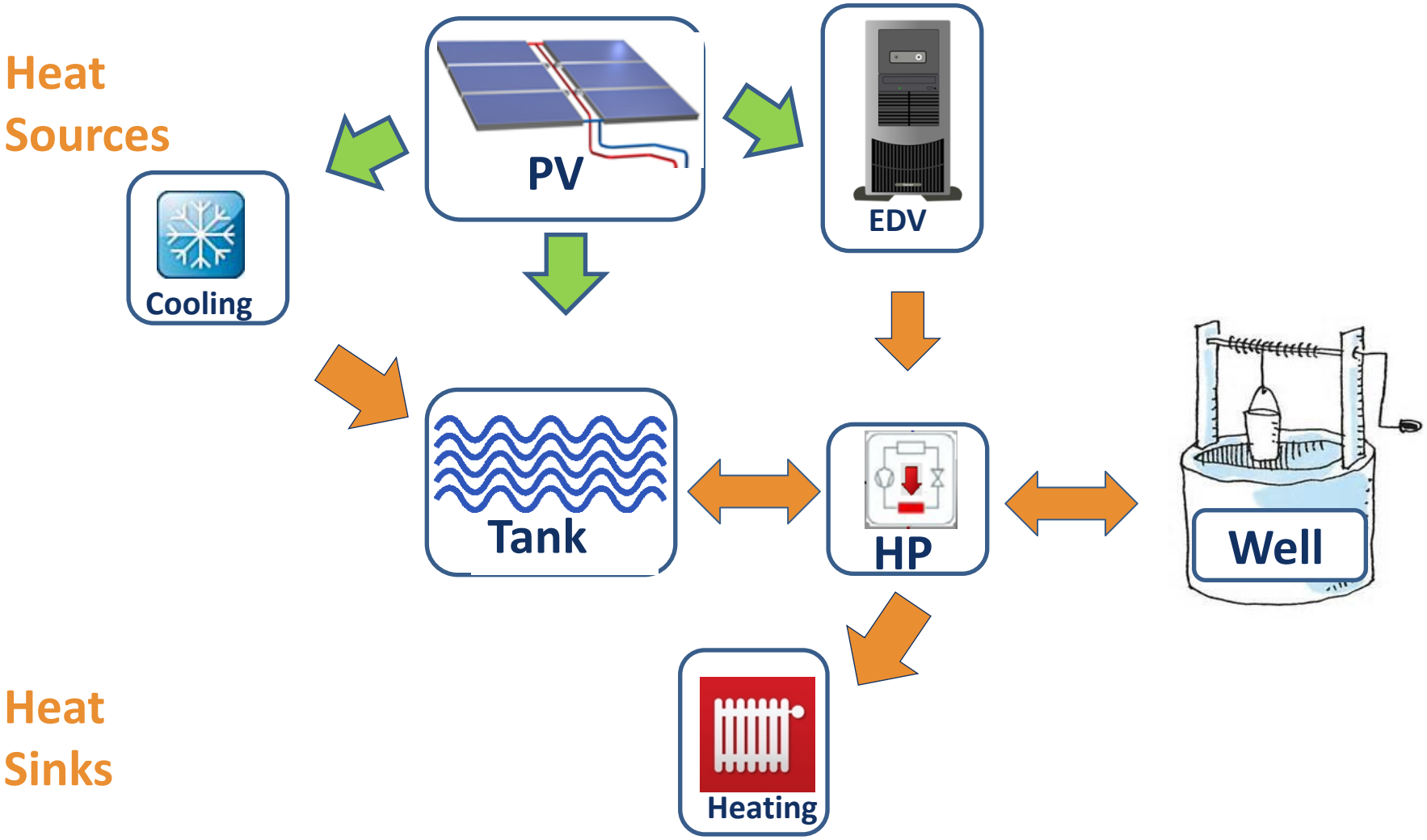


Office Buildings with Opaque Skin demand careful HVAC[1] planning

- Glass surface of building captures radiation
- Concurrence of heat and cool demand in spring and autumn
- Vast amounts of energy can be harvested from radiation on façade and PV[2]
- Both need to be stored
- Facilitate thermal storage to maximize the use of self-generated electricity
- To achieve a minimum of external energy demand and hence costs

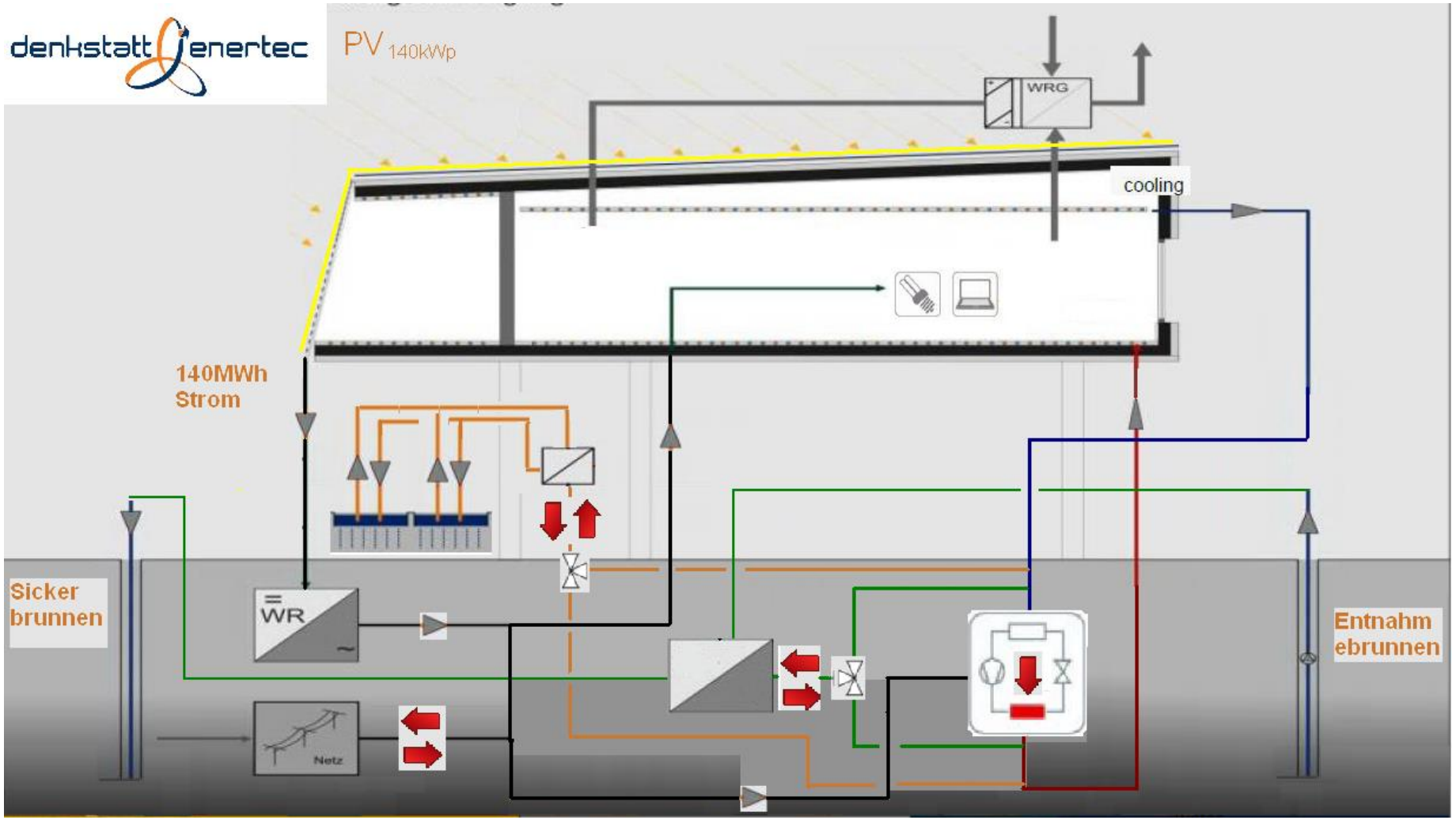


[1]HVAC: Heating Ventilation Air Cond. [2]PV: Photovoltaics

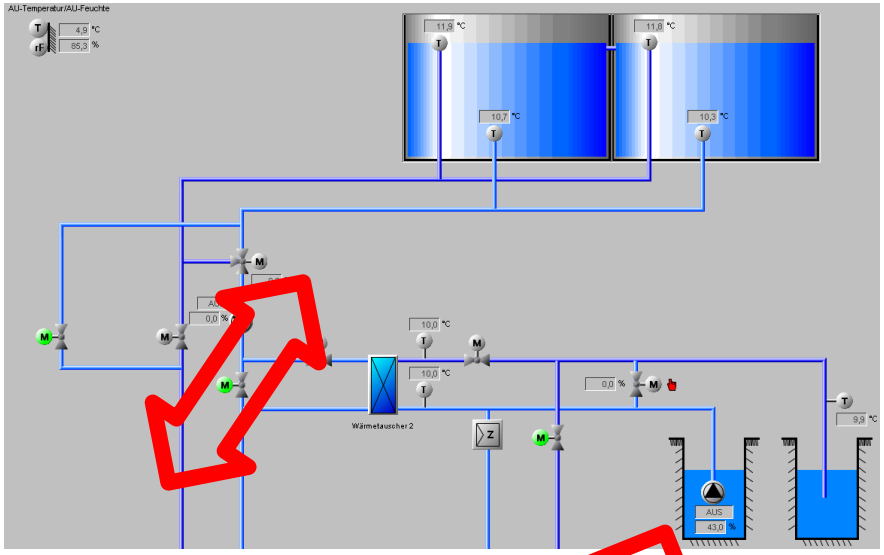


Objective: utilize resources on site as efficient as possible

HVAC Appliances

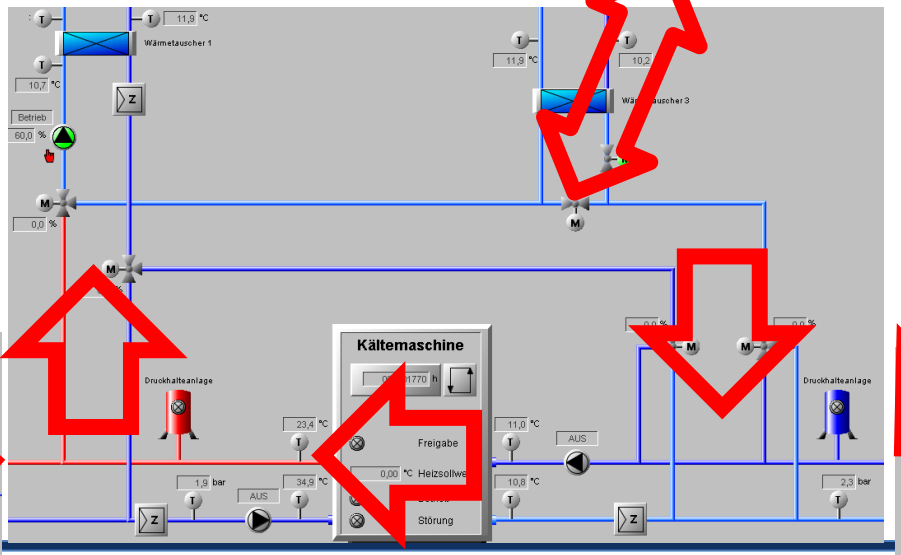


The Actual Hydraulics are Sophisticated



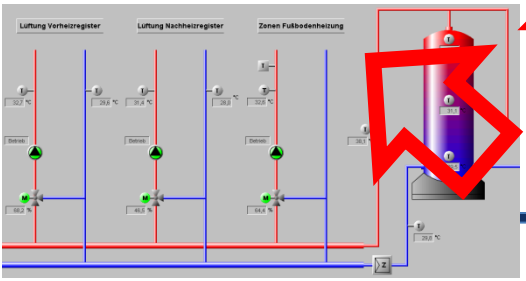
2 sprinkler tanks:
640m³

Source and sink -
water wells



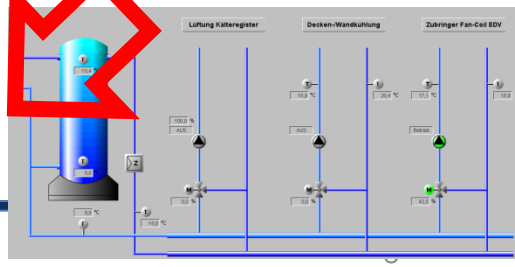
Heat consumers:

- Air Con
- Heated floor



Cold consumers:

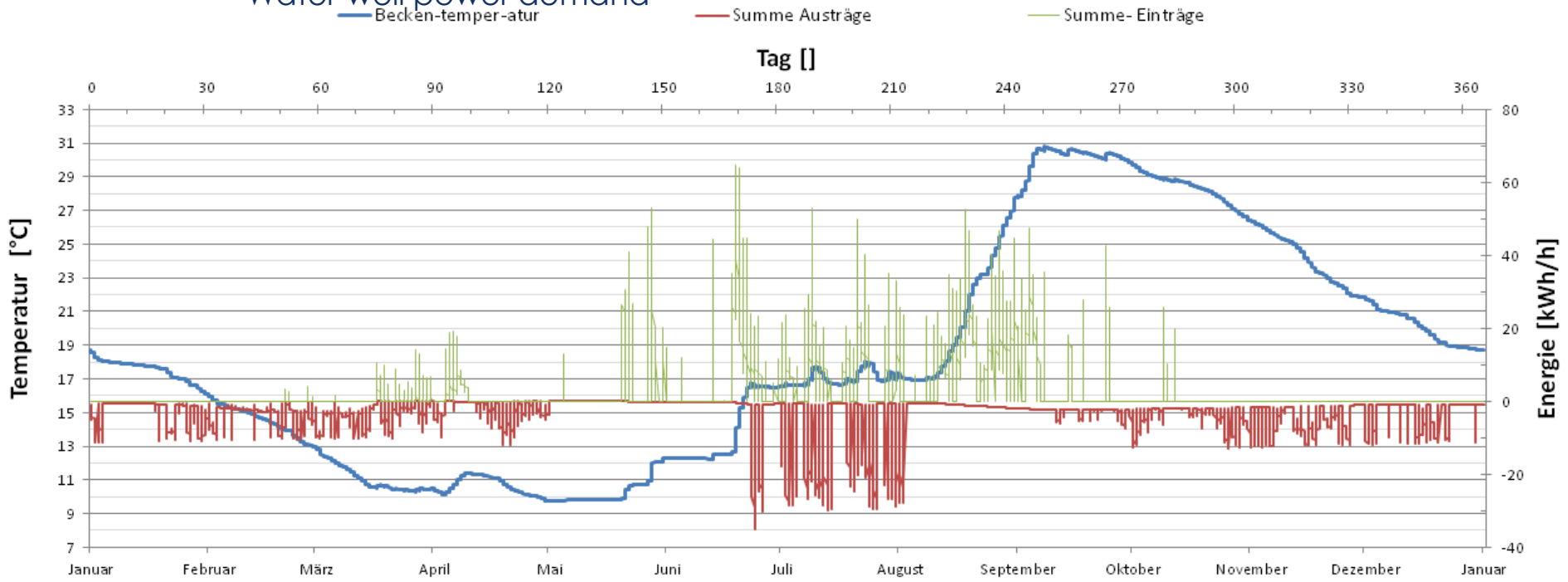
- IT
- Air Con
- Cooling Ceilings



Heat pump

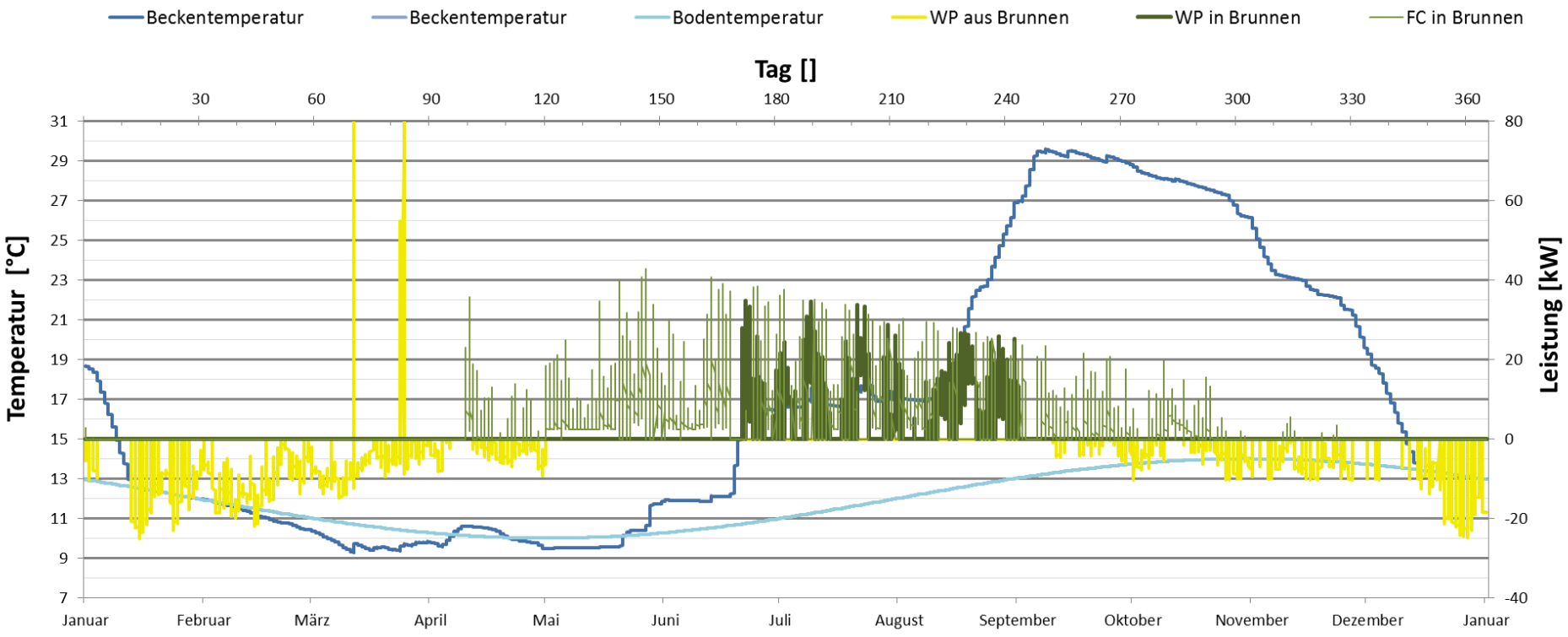
Energy Balance of Sprinkler Tanks corresponds to outside and tank temperatures

- With external supply: design needs to consider only power (not energy)
- With storage: neutral energy balance of tank necessary
- simulation of energy flows and balances (PV, heat, cold) of a whole year gives
  - Energy balances
  - Electricity demand
  - Water well power demand

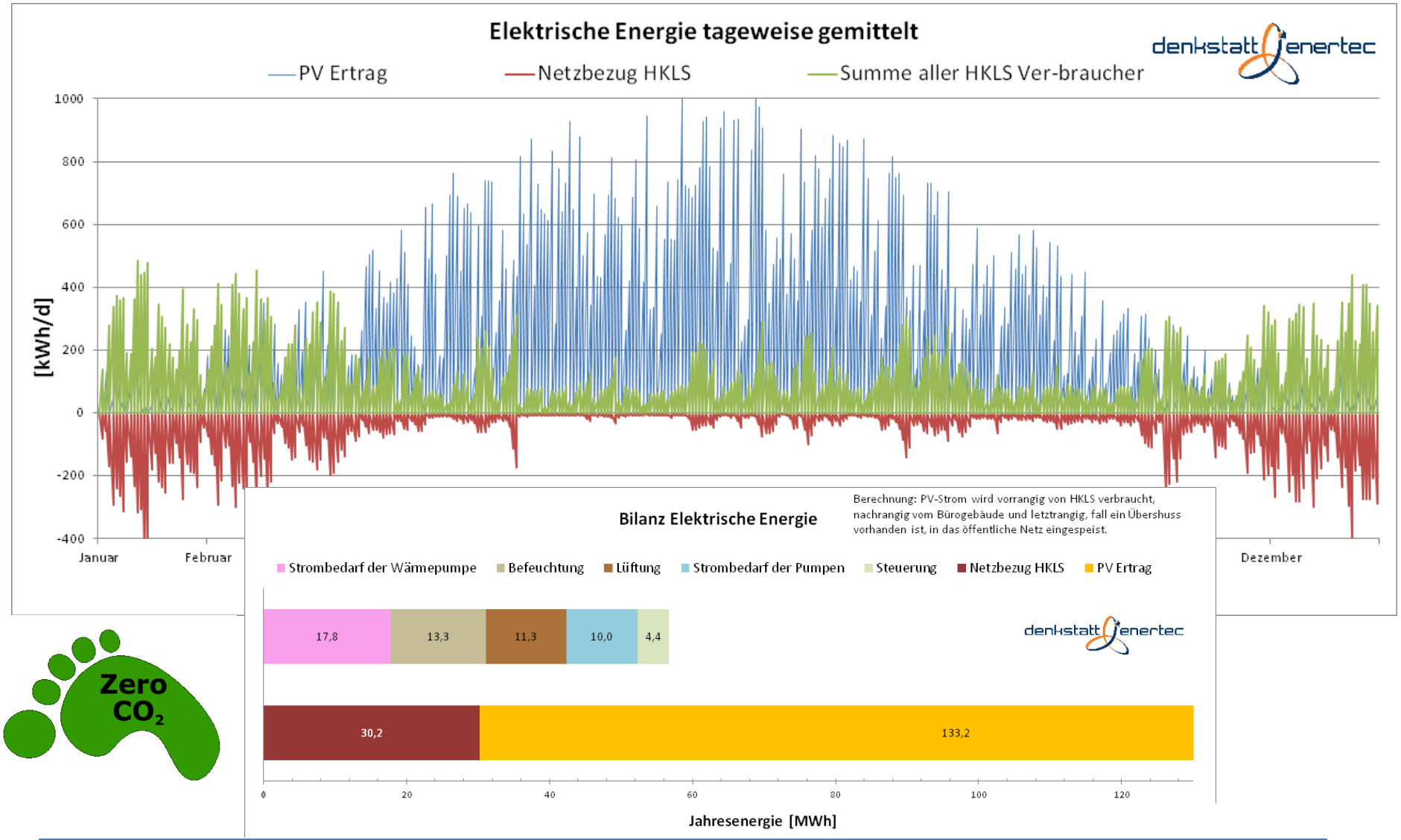


Energy Balance of Water Well provides base load

- Heat extraction off the ground:
  - Heating the building
  - Cooling the tanks
- Heat deposition into the ground:
  - Cooling the building via free-cooling or heat pump



Electricity Balance:
HVAC completely covered by PV production

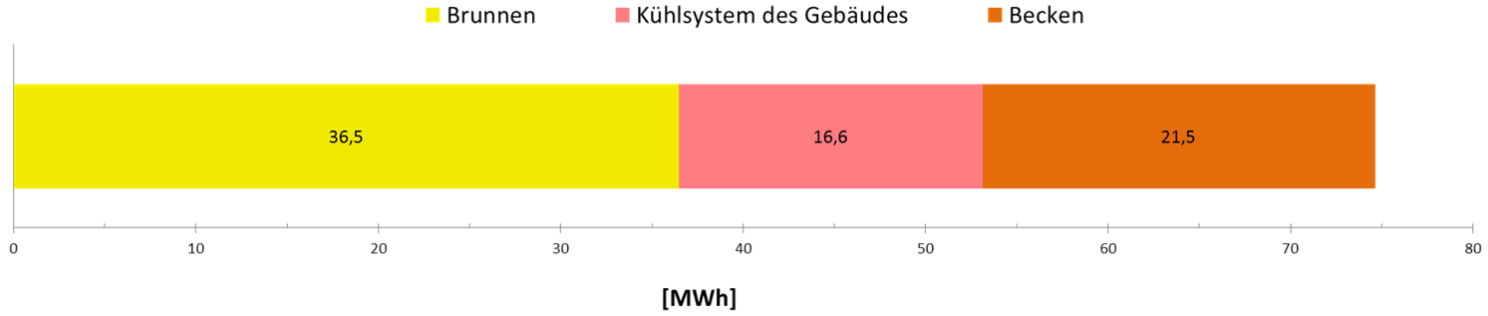


Zero CO_2

Balance of Utilized Energy

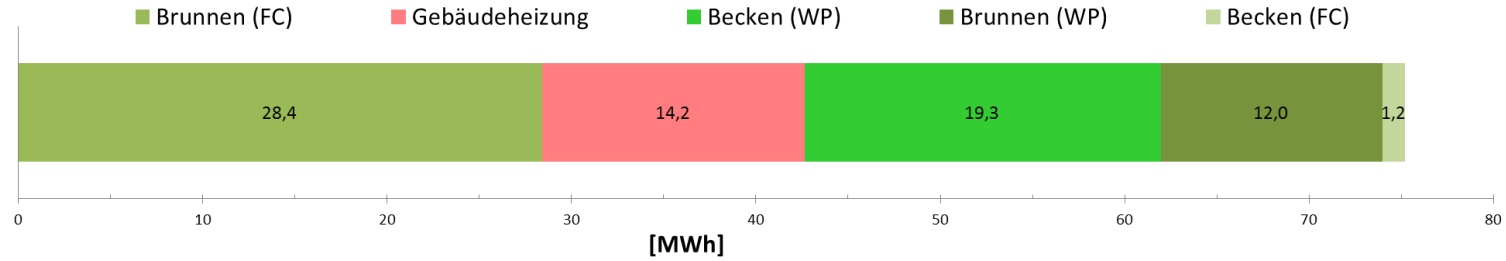
Heat demand of 75MWh is provided by the water well and cooling

Energy stored in the tanks accounts for cooling as well



Heat from the 76MWh cooling demand is either

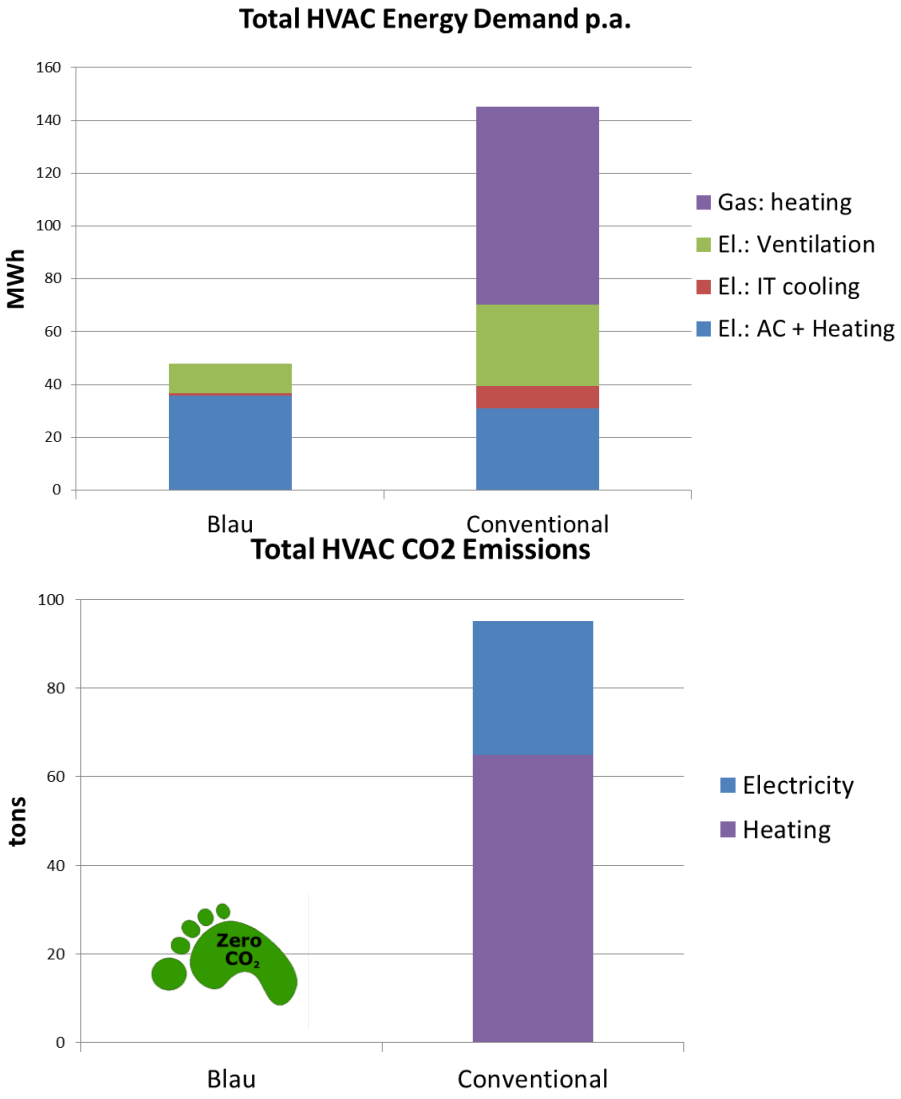
- Used directly in concurrence of heat and cooling demand,
- Stored in the tanks, or
- Dumped in the water well (groundwater current sweeps it away)



Over 50% of heat demand can be covered from cooling heat recovery

Total Energy Demand and Emissions minimized to a fraction of the conventional

- Self sufficient conditioning of the building by storing energy over the seasons
- By using a heat pump this stock can be utilized
- Electricity is converted to heat and stored for later use
- High efficiency enabled by using low temperature heating / cooling devices
- Increase in on site used electricity from PV by optimized heat pump activation



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