

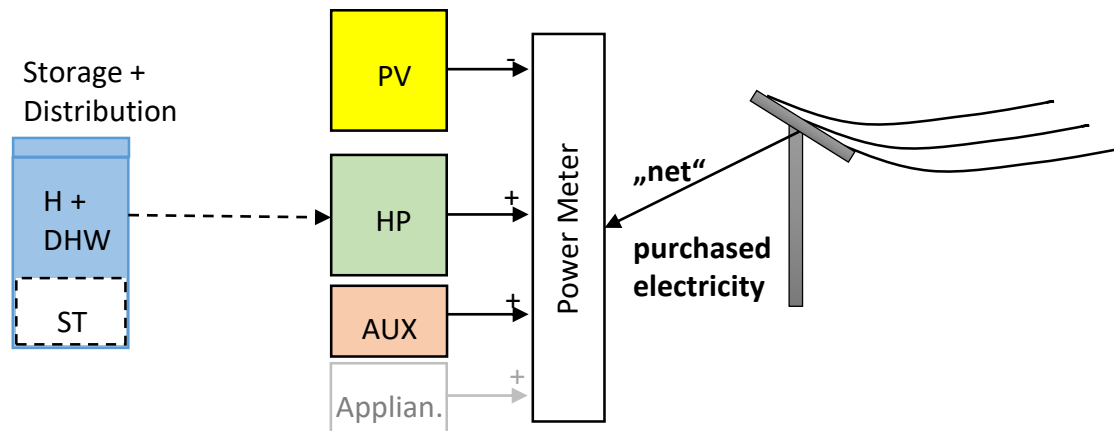


Vögelebichl Innsbruck – Monitoring and simulation of two multi-family houses with heat pump, PV and collectors

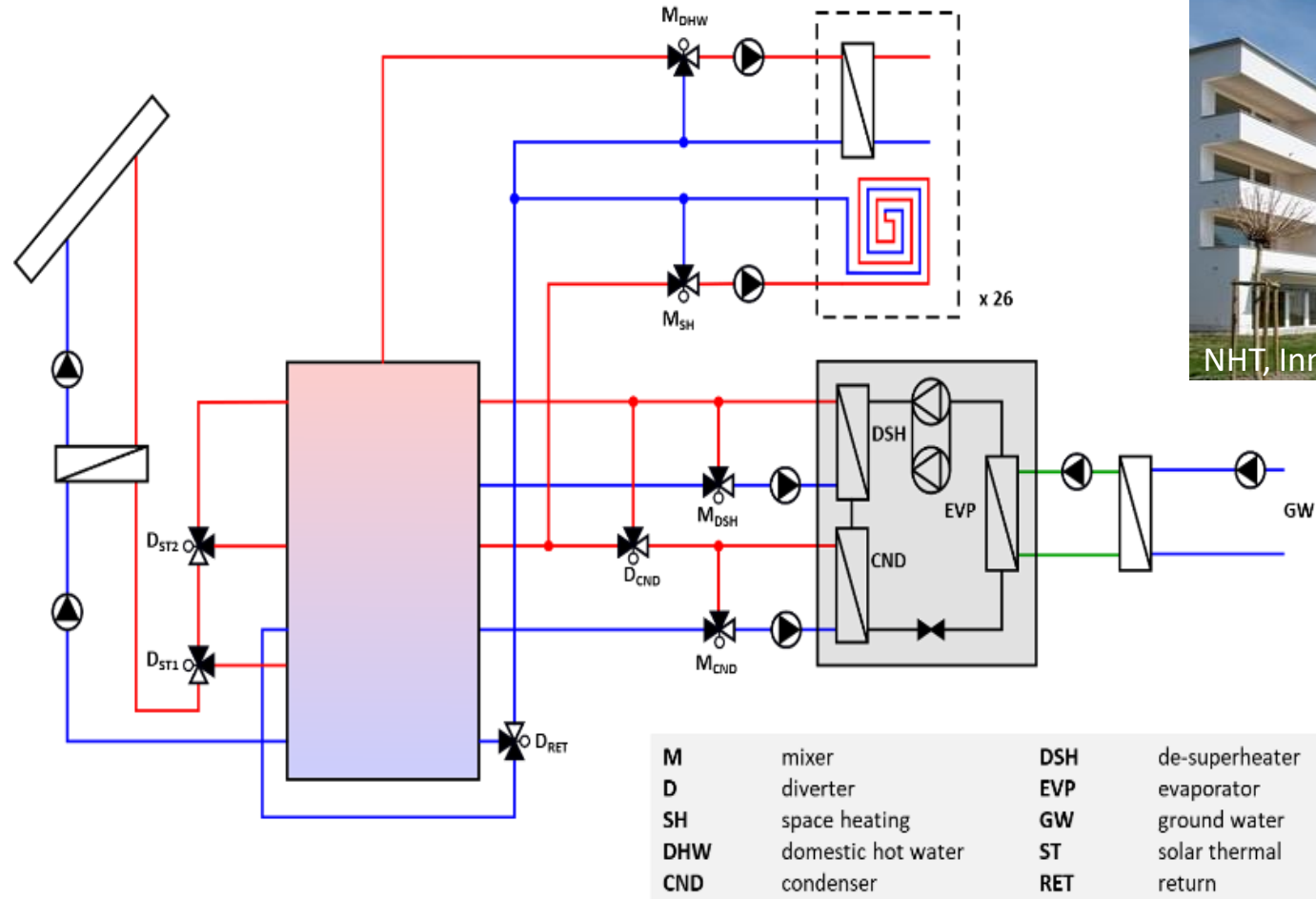
Fabian Ochs, William Monteleone, Nicola Franzoi, Georgios Dermentzis

Net Zero Energy Buildings (NZEB)

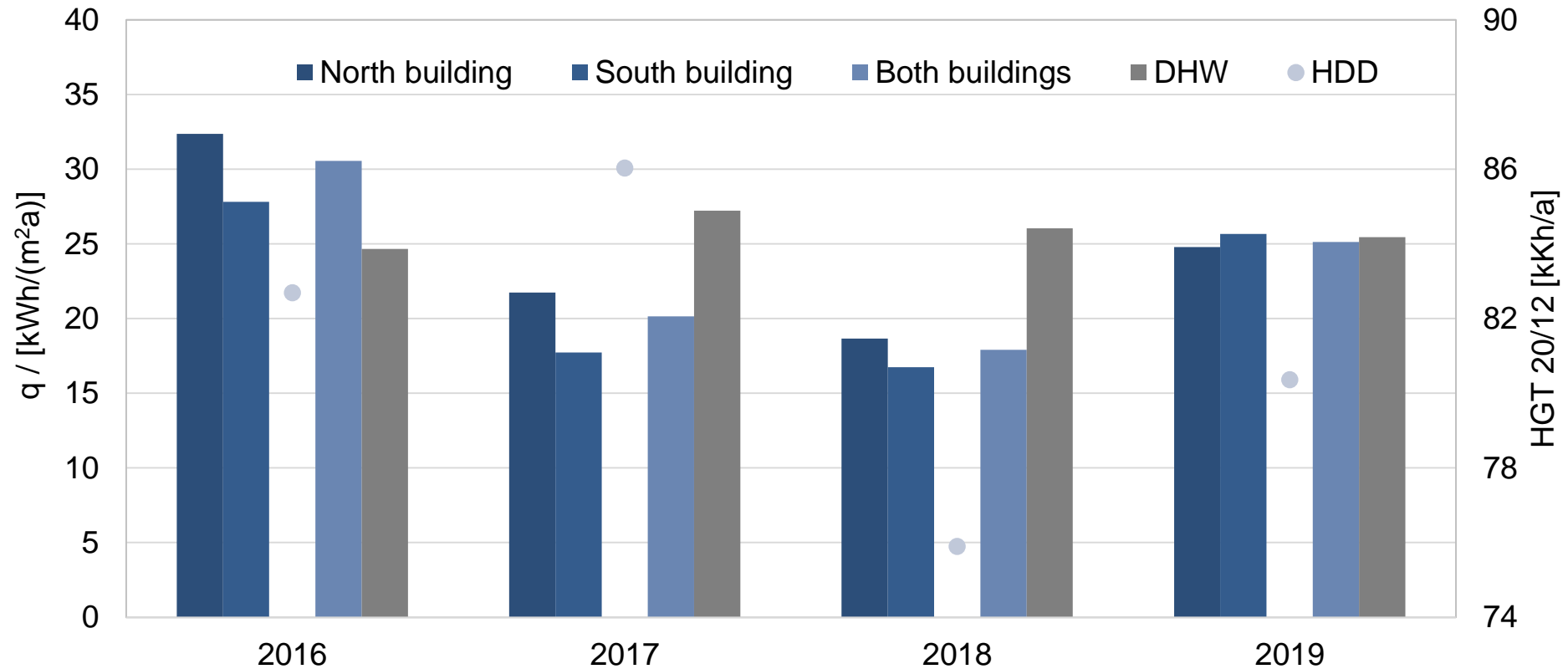
- » Multi Family Buildings (MFBs) in Passive House (PH) Standard
 - with Ground Water Heat Pump (GW-HP)
 - with Solar Thermal (ST) with large Buffer Tank (6 m³) and PV
 - Low temperature distribution: Floor heating (35/30 °C),
DHW with decentral fresh water stations (DHW HX, 52/15...30 °C)



Hydraulic scheme – double stage heat pump with desuperheater



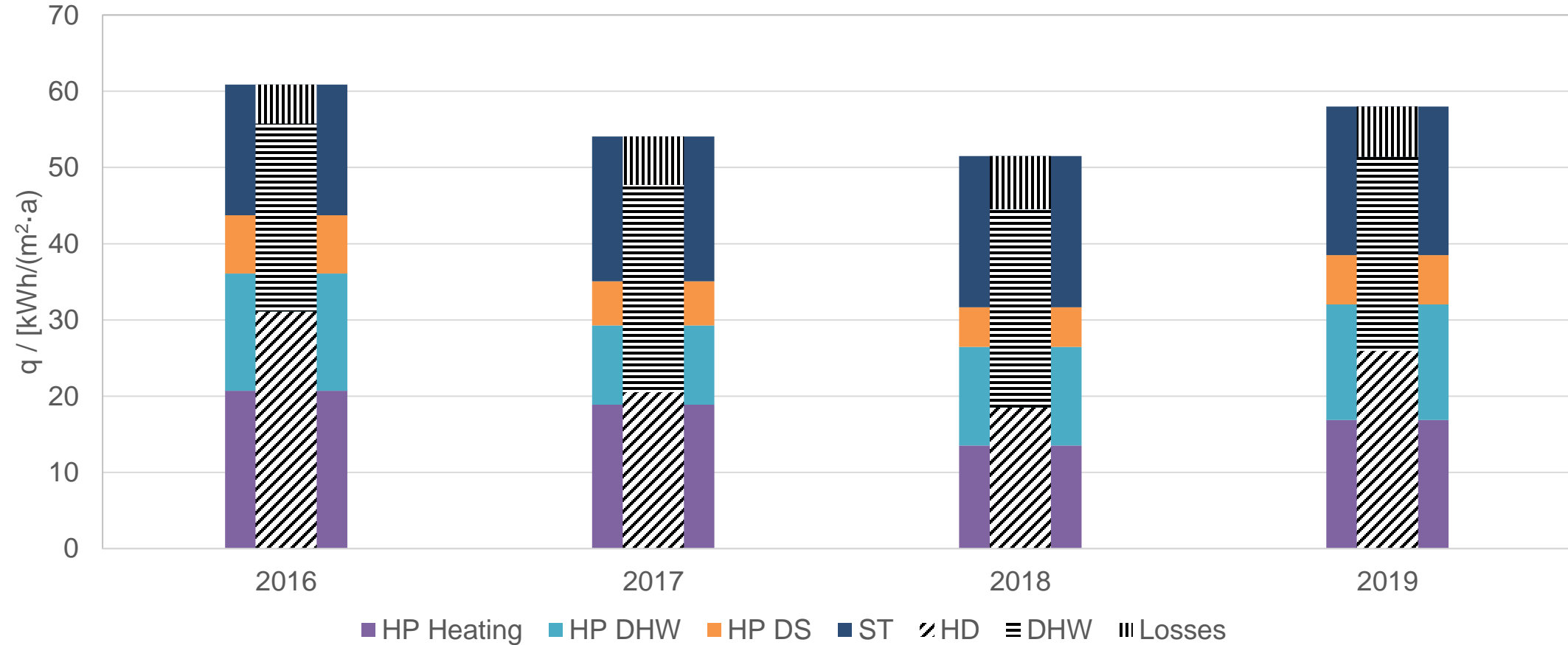
Heating Demand and HDD, Domestic Hot Water Demand



Treated area: 1295.6 m² (North) + 853.2 m² (South)

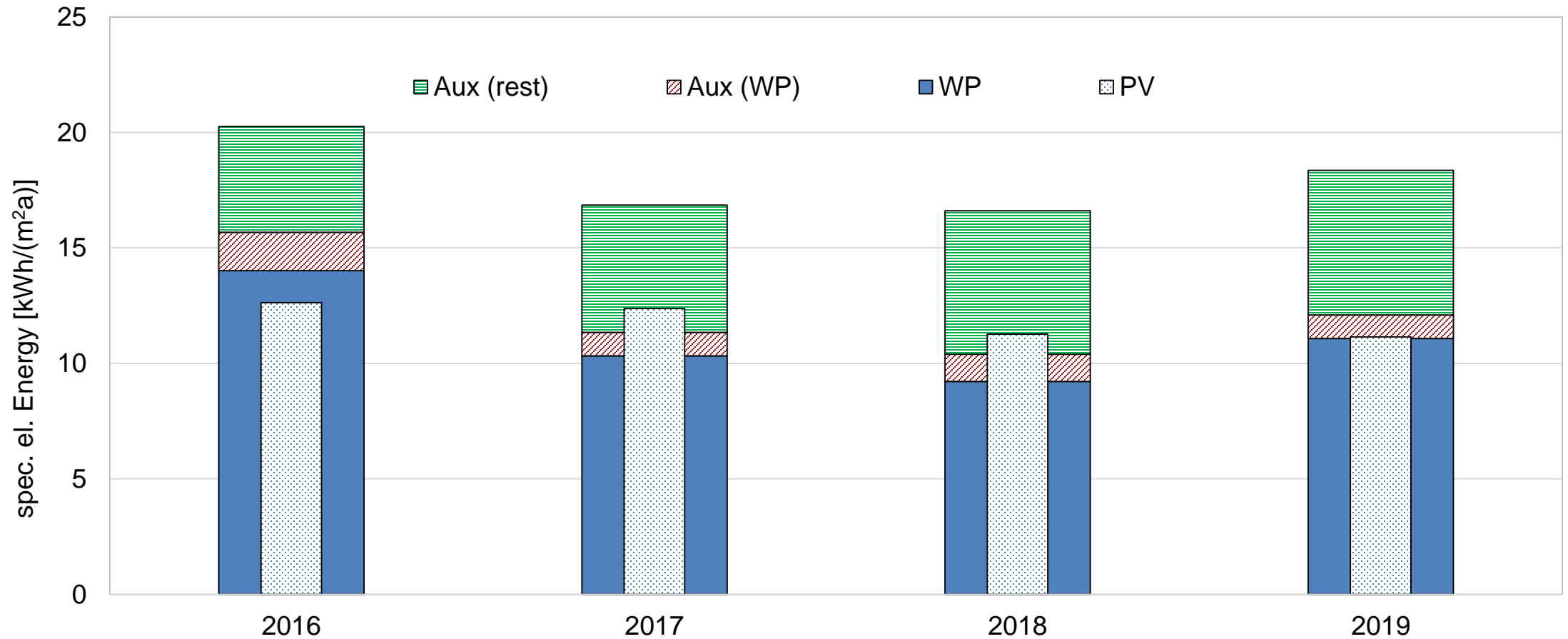
Energy Balance 2016 to 2019

HP Heating: low temperature (space heat)
 HP DHW: high temperature operation (DHW)
 DS: Desuperheater



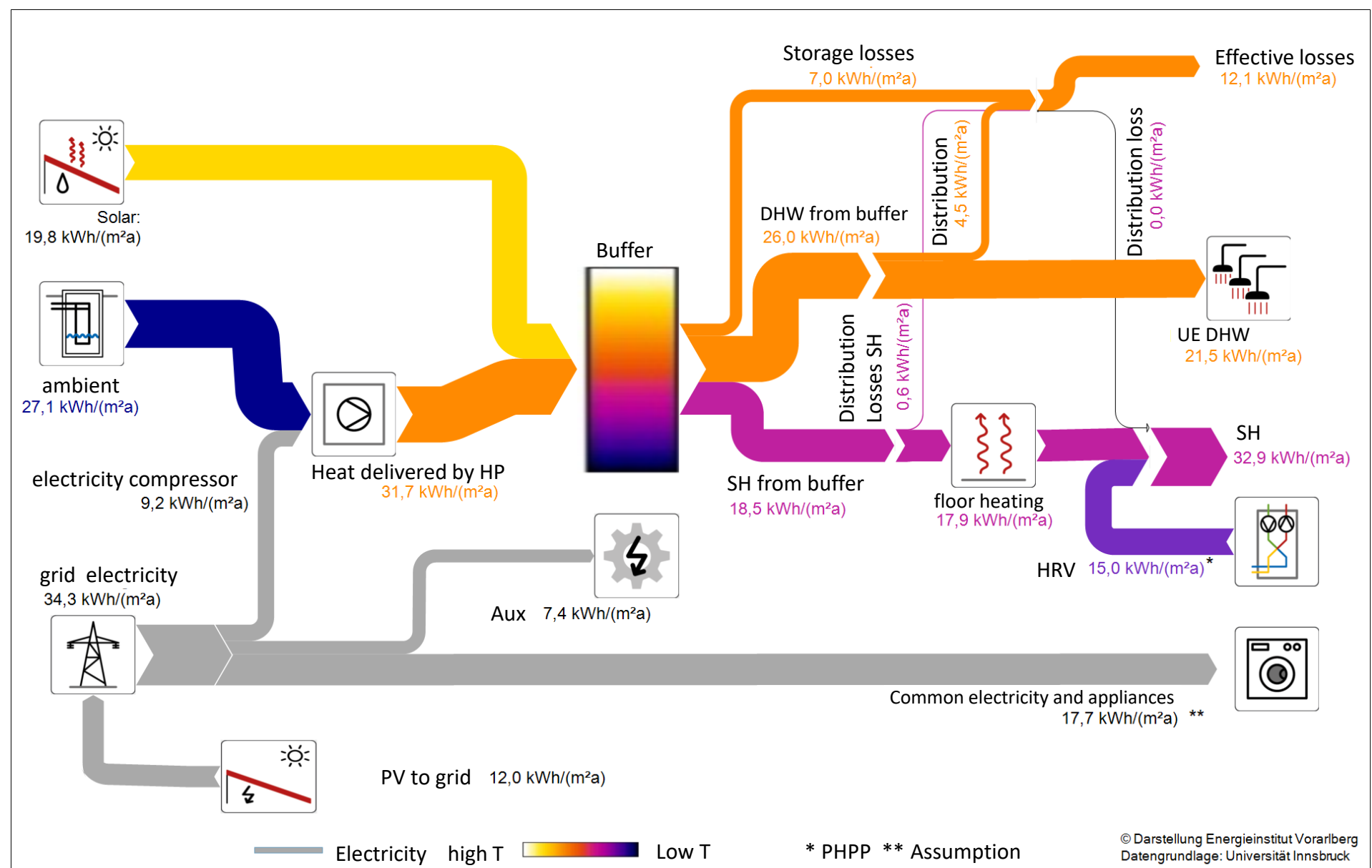
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Electric Energy Balance 2016 to 2019

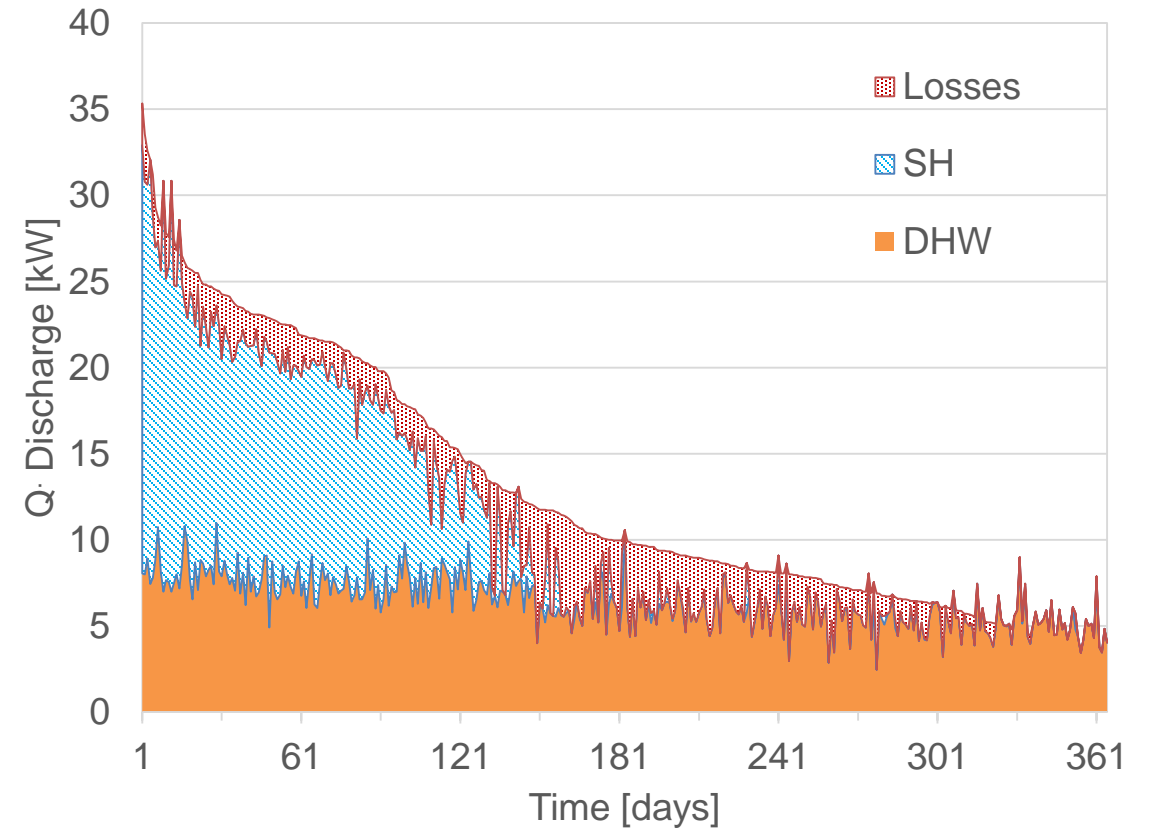
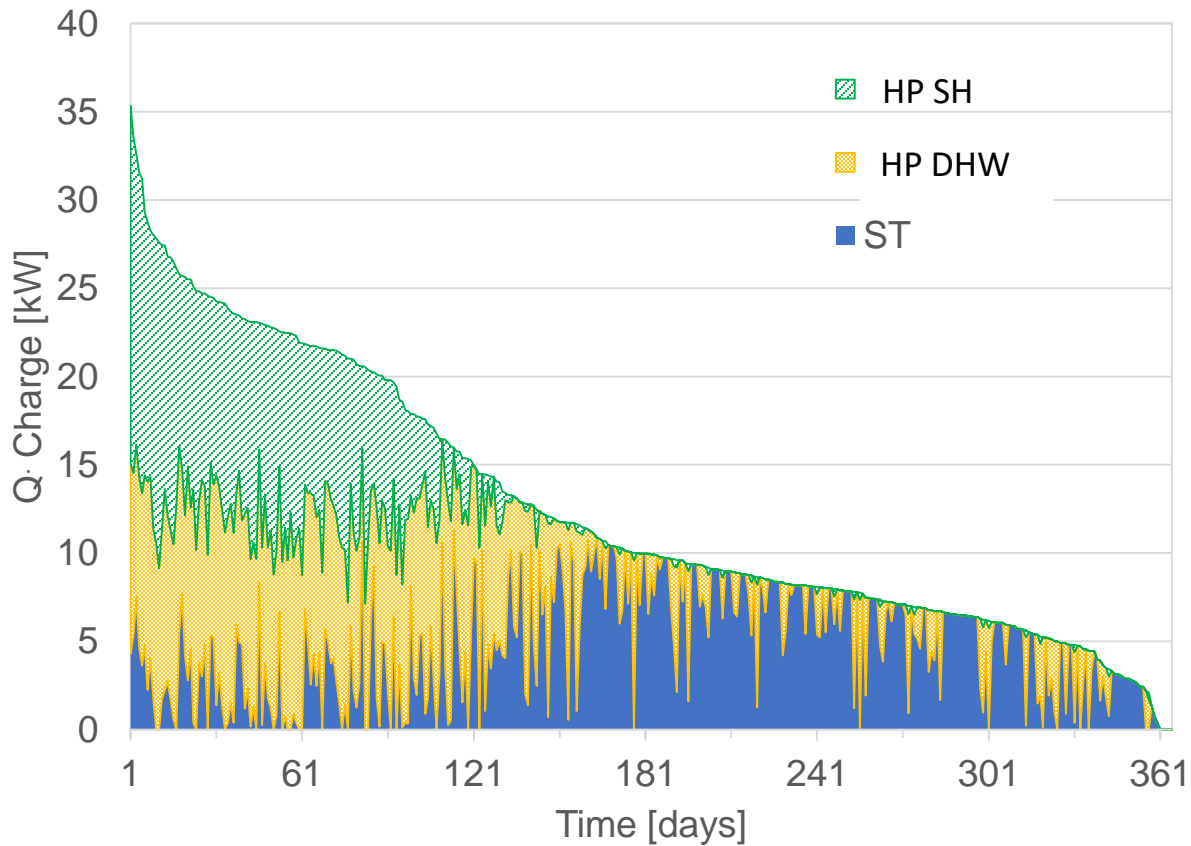


Treated area: 1295.6 m² (North) + 853.2 m² (South)

Innsbruck Vögelebichl (NHT) Measurement 2018

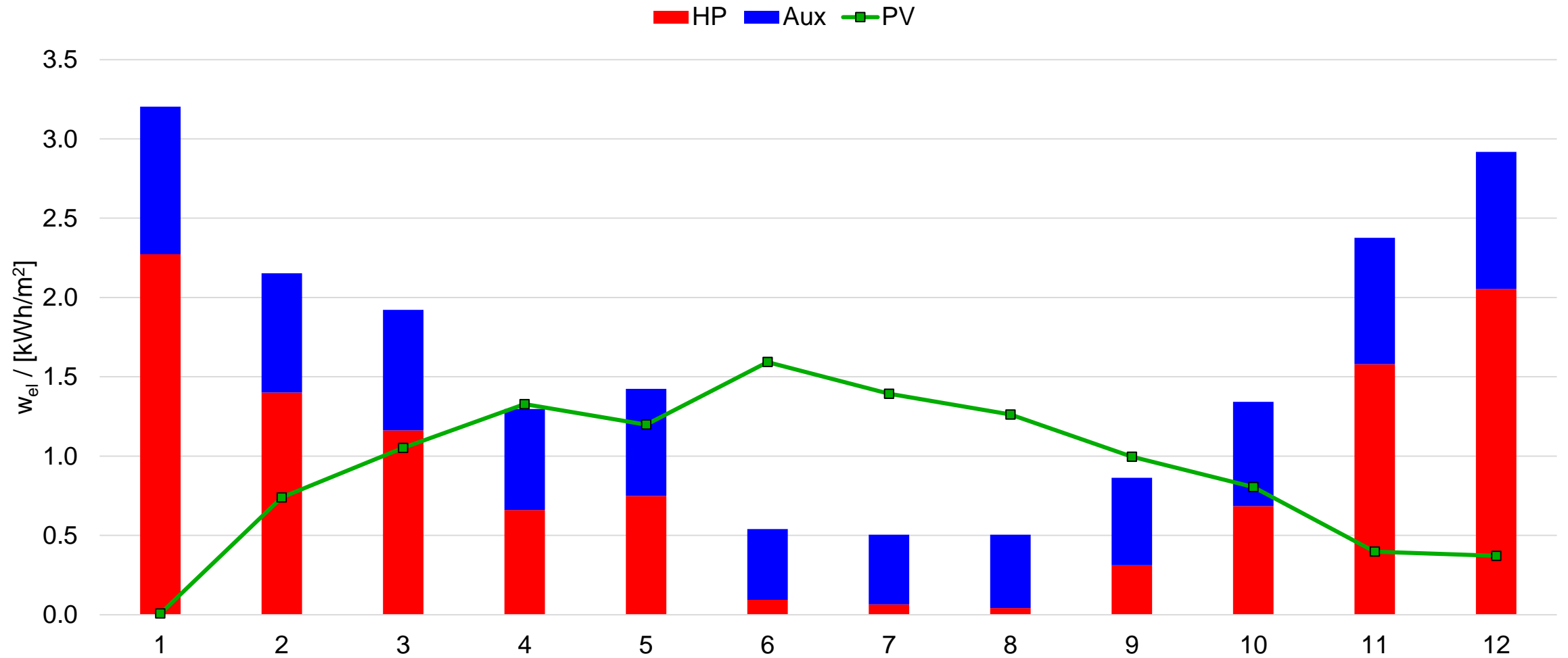


Daily load duration curve (balance of buffer storage, 2018)

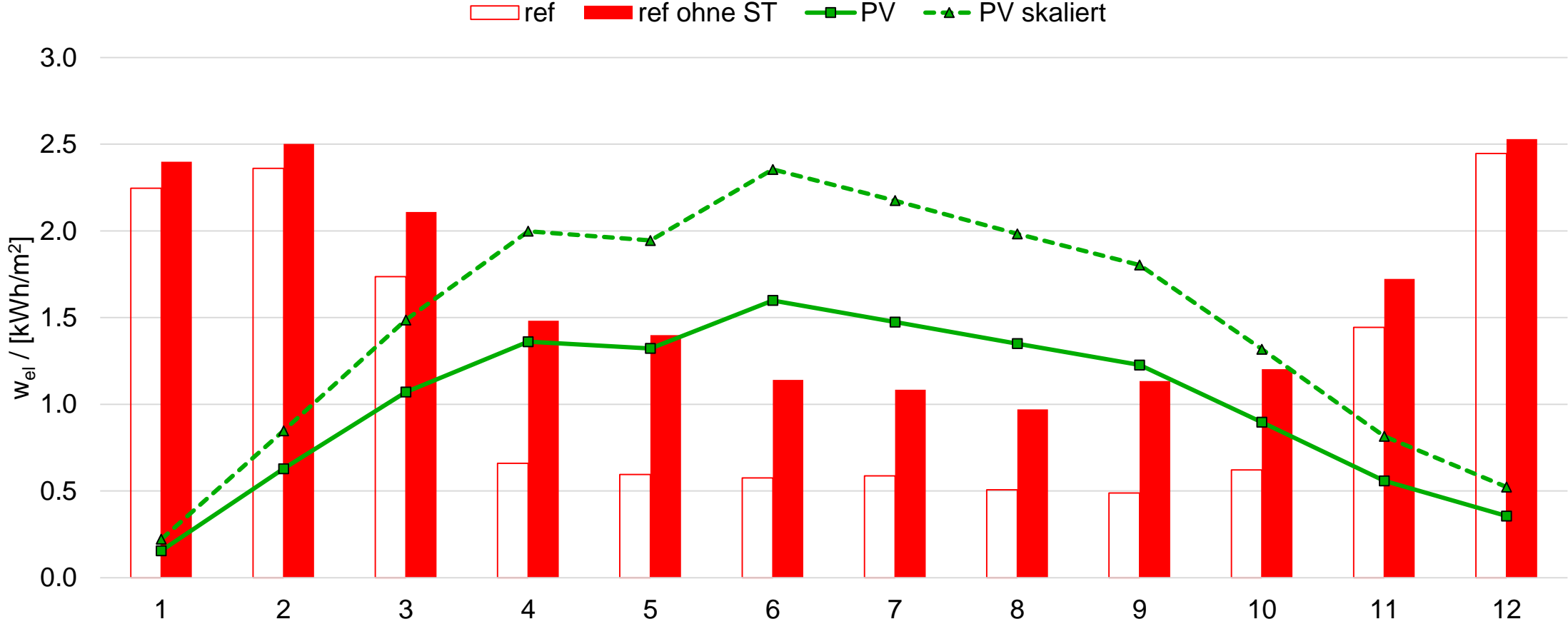


Dermentzis et al. 2021 (submitted)

Monthly Electric Energy balance (2019)



Optimisation – without Solar Thermal, larger PV



Conclusions and Outlook

- Passive House MFH with HP, ST, PV to achieve NZEB
 - Identification of (too high) thermal losses and (too high) auxiliary energies
 - Identification of unfavorable operation conditions and improvement of control of heat pump (and tank stratification)
 - Investigation of benefit of desuperheating
 - Simulation based optimization (hydraulics configuration, control, larger PV instead of ST)
 - Design recommendations for future NZEB with HP
- » Detailed monitoring of refrigerant cycle (planned)

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