WP6 Monitoring data assessment at pilot site level

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Heat4COOL project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 723925

Introduction

Packages	Where
1. Solar **H**eating **C**ooling system **SHC system**	*@ Valencia*
2. Waste **W**ater **H**eat **E**xchanger, **E**lectric **H**eat **P**ump for **D**istrict **H**eating and **C**ooling system **WW-HX + EHP for DHC system**	*@ Budapest*
3. Photo**V**oltaic system, **E**lectric **H**eat **P**ump and **P**hase **C**hange **M**aterial **H**eat **B**atteries **PV, EHP and PCM HB system**	*@ Chorzow and Sofia*

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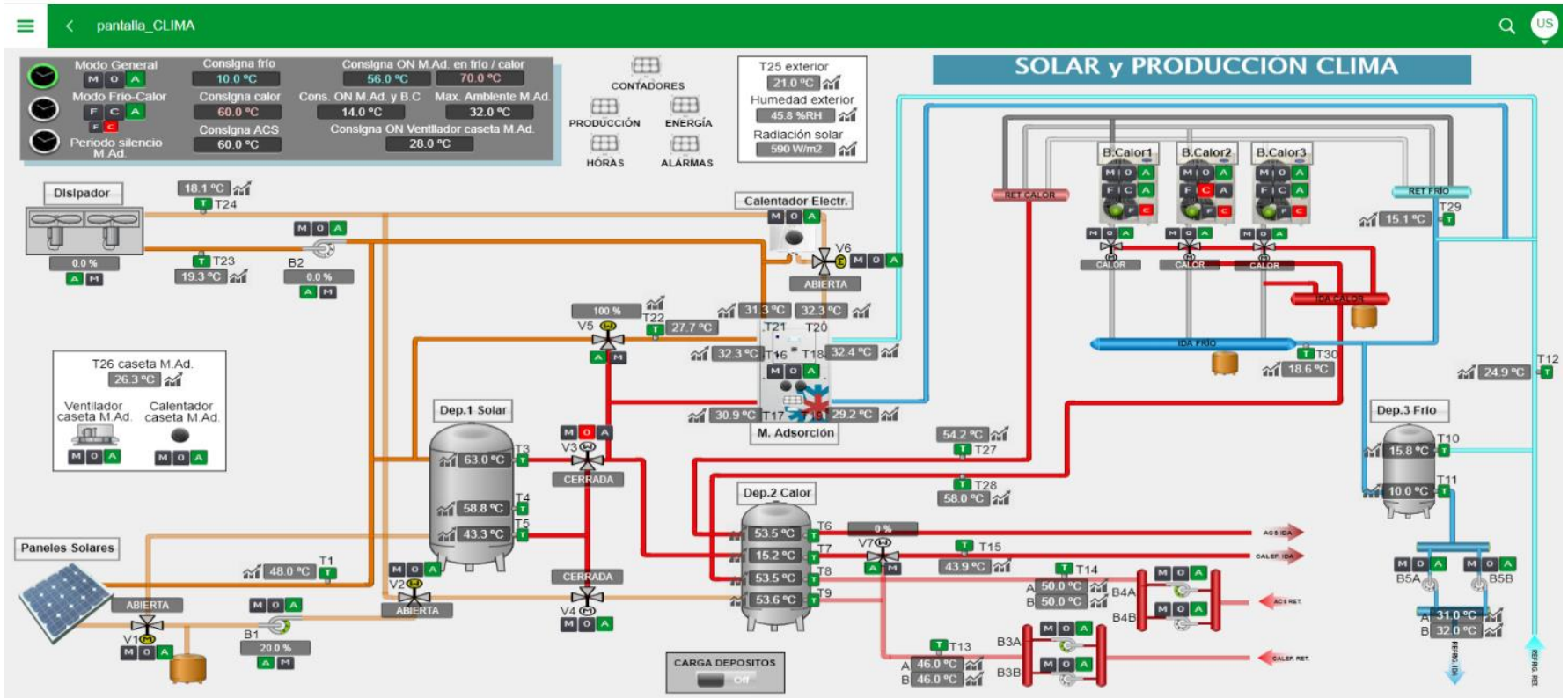
SHC system @Valencia

Screen control



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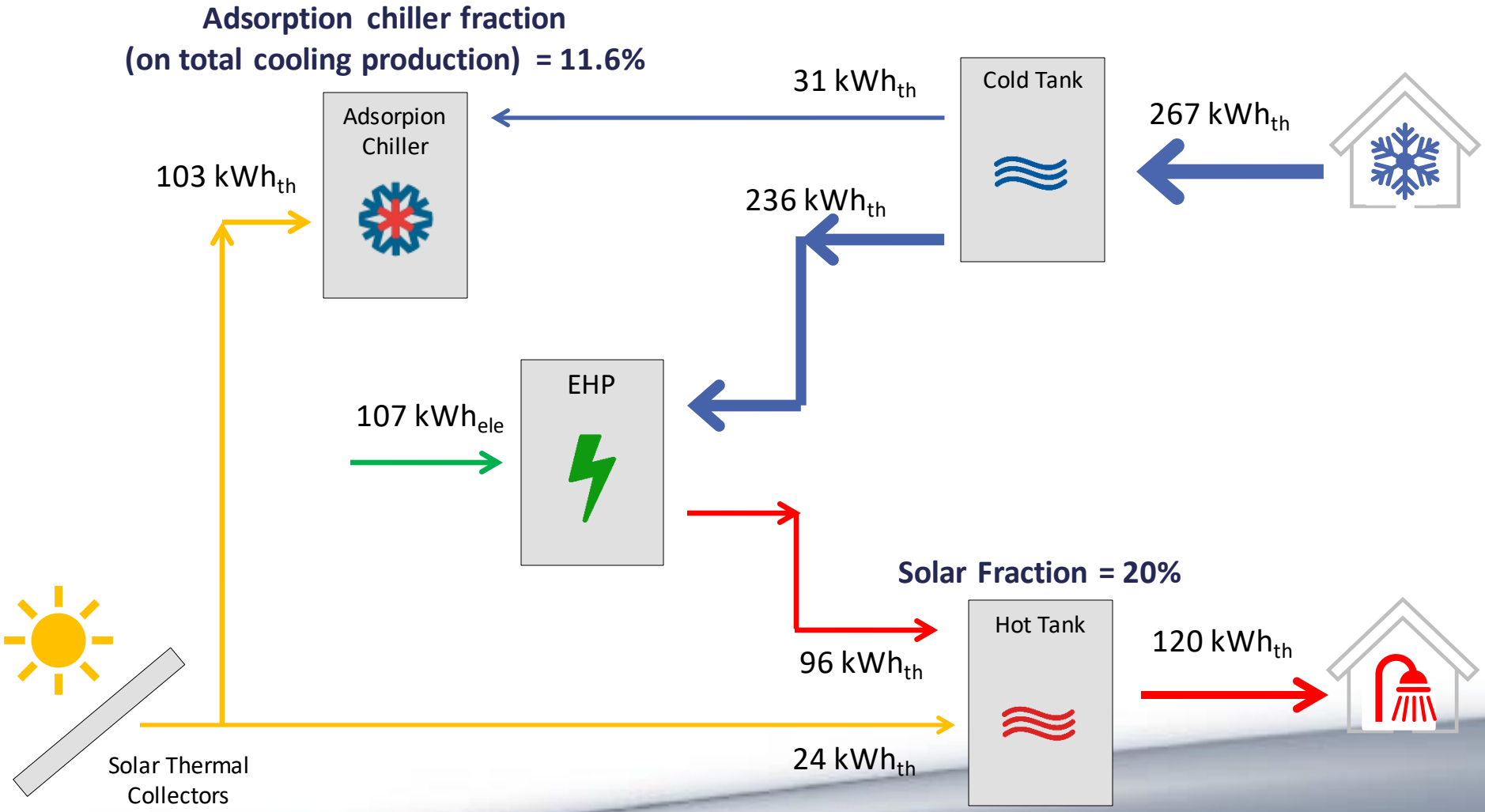
SHC system @Valencia

Energy Performance - Summer typical Day 1



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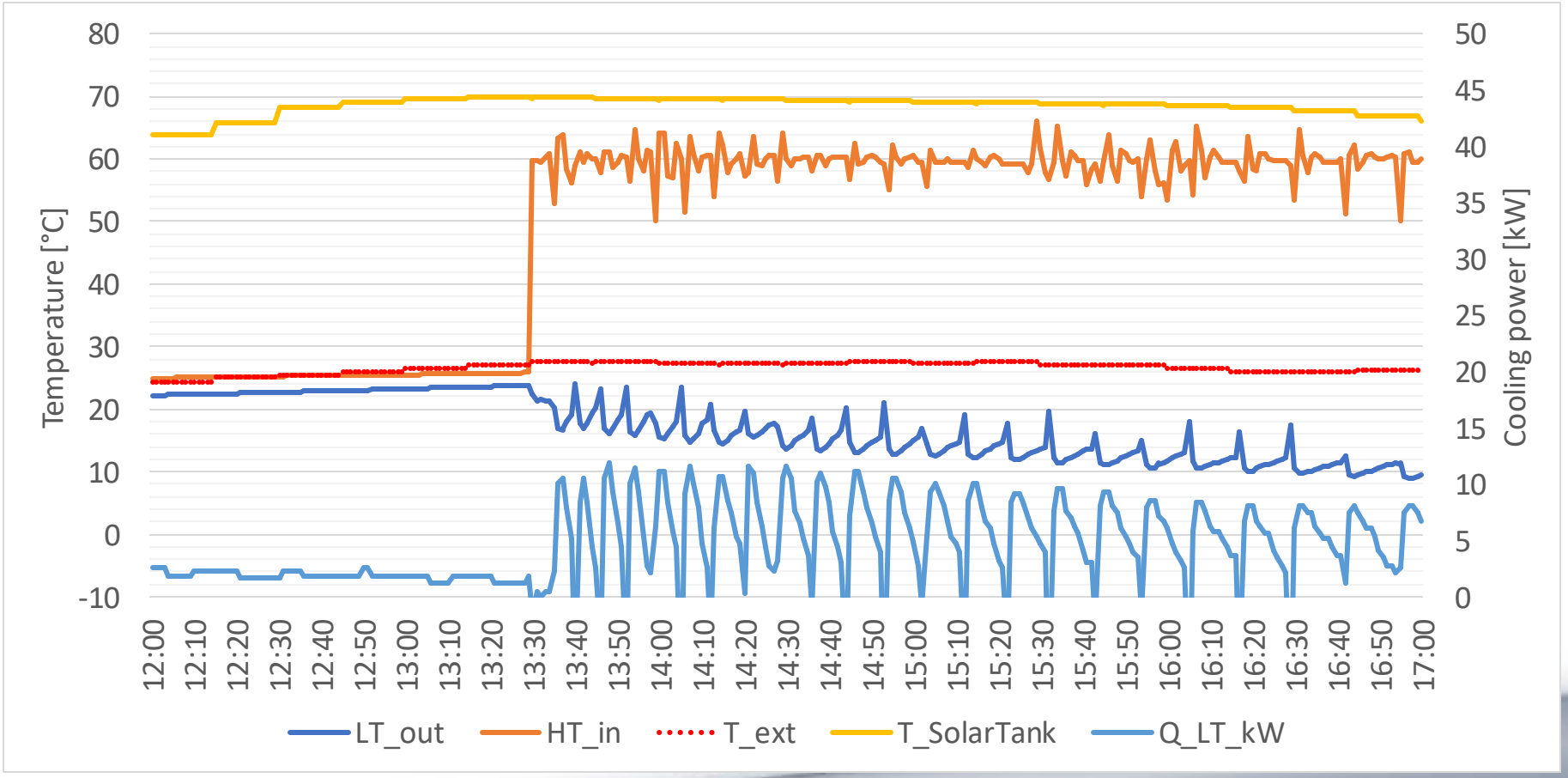
SHC system @Valencia

Adsorption chiller – Summer typical Day 2

- Cooling energy production = 31.5 kWh
- Thermal COP = 0.49



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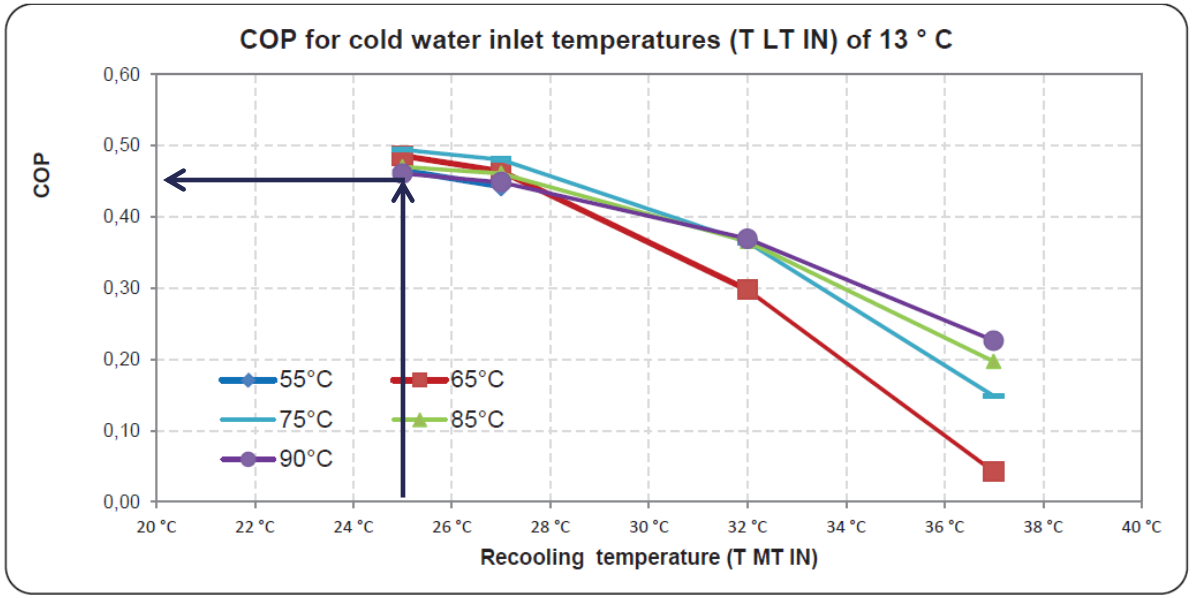
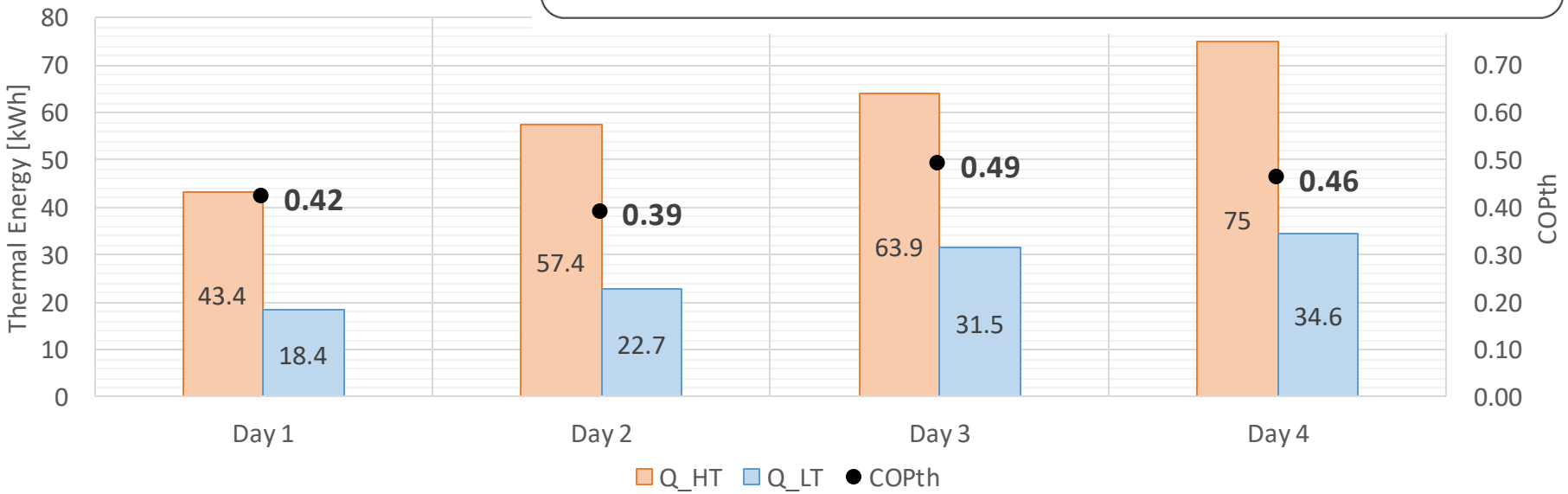
SHC system @Valencia

Adsorption chiller Performance

Data	UoM	Average
LT_in	°C	12.8
HT_in	°C	55.0
MT_in	°C	25.0
COPth	-	0.44





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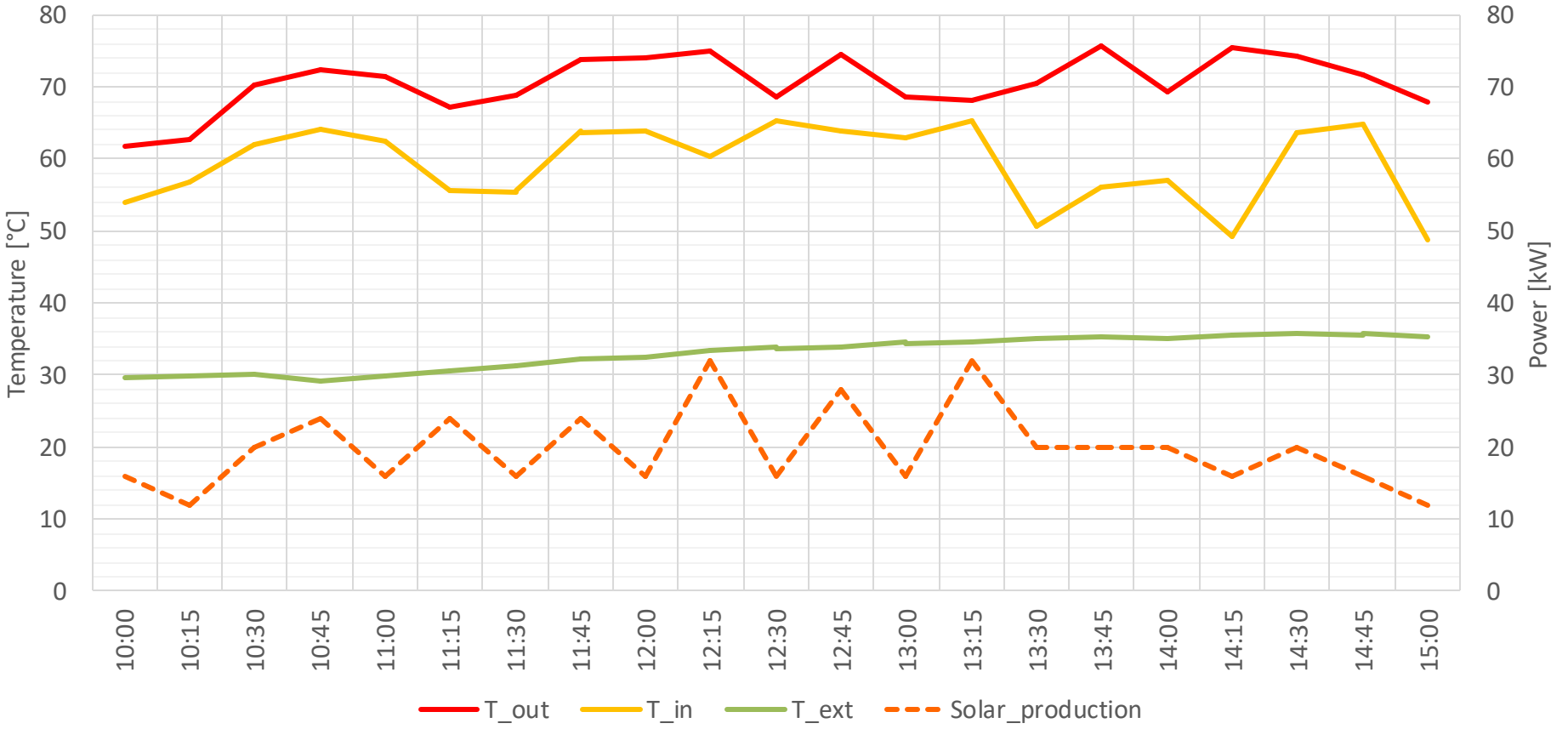
SHC system @Valencia

Solar thermal collectors system – Summer typical Day 3

- Solar heating energy production = 104 kWh
- Collectors efficiency = 0.47



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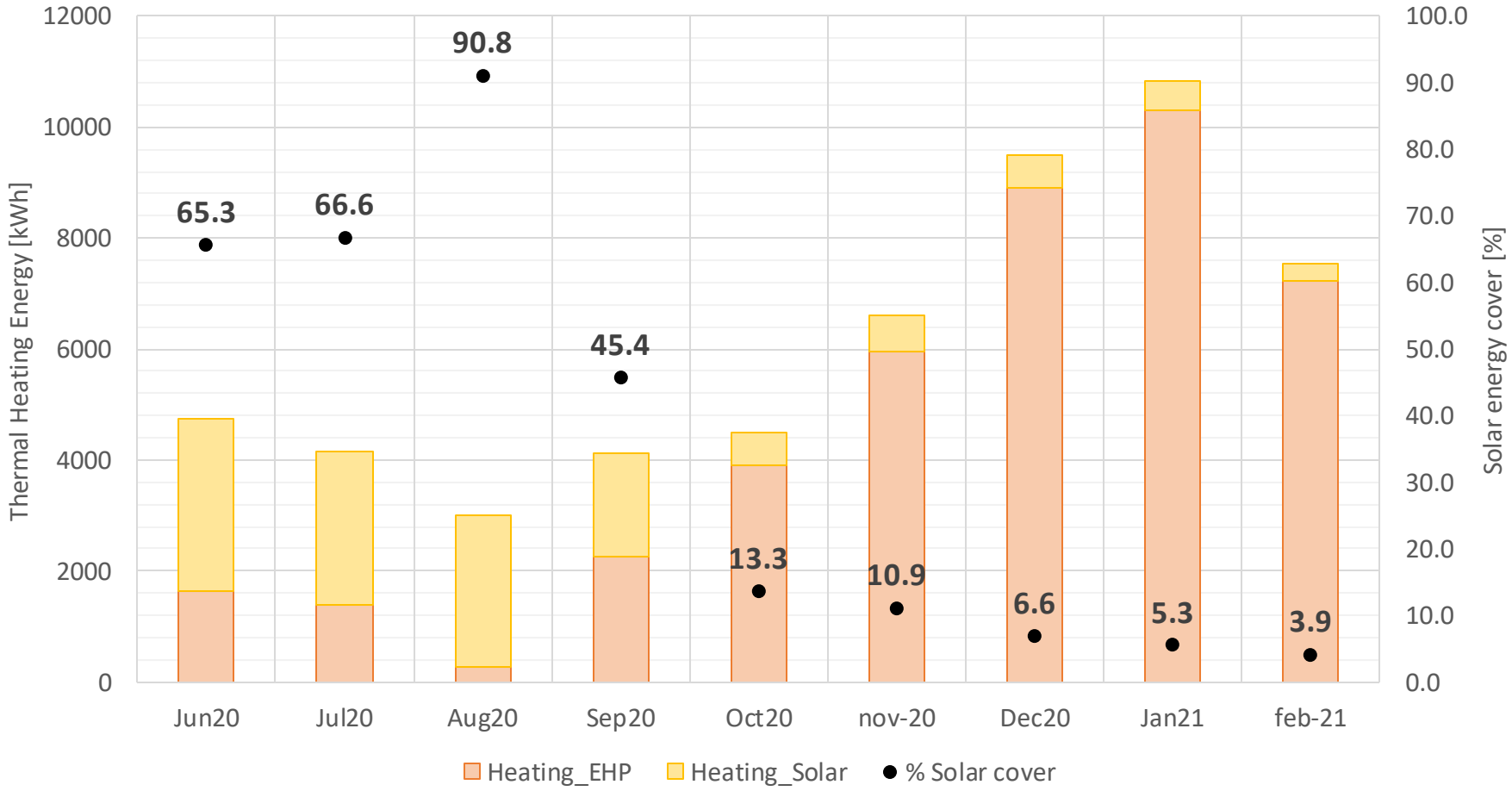
SHC system @Valencia

Solar thermal collectors system – SH and DHW energy need cover



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Packages	Where
2. Waste **W**ater **H**eat **E**xchanger, **E**lectric **H**eat **P**ump for **D**istrict **H**eating and **C**ooling system **WW-HX + EHP for DHC system**	*@ Budapest*

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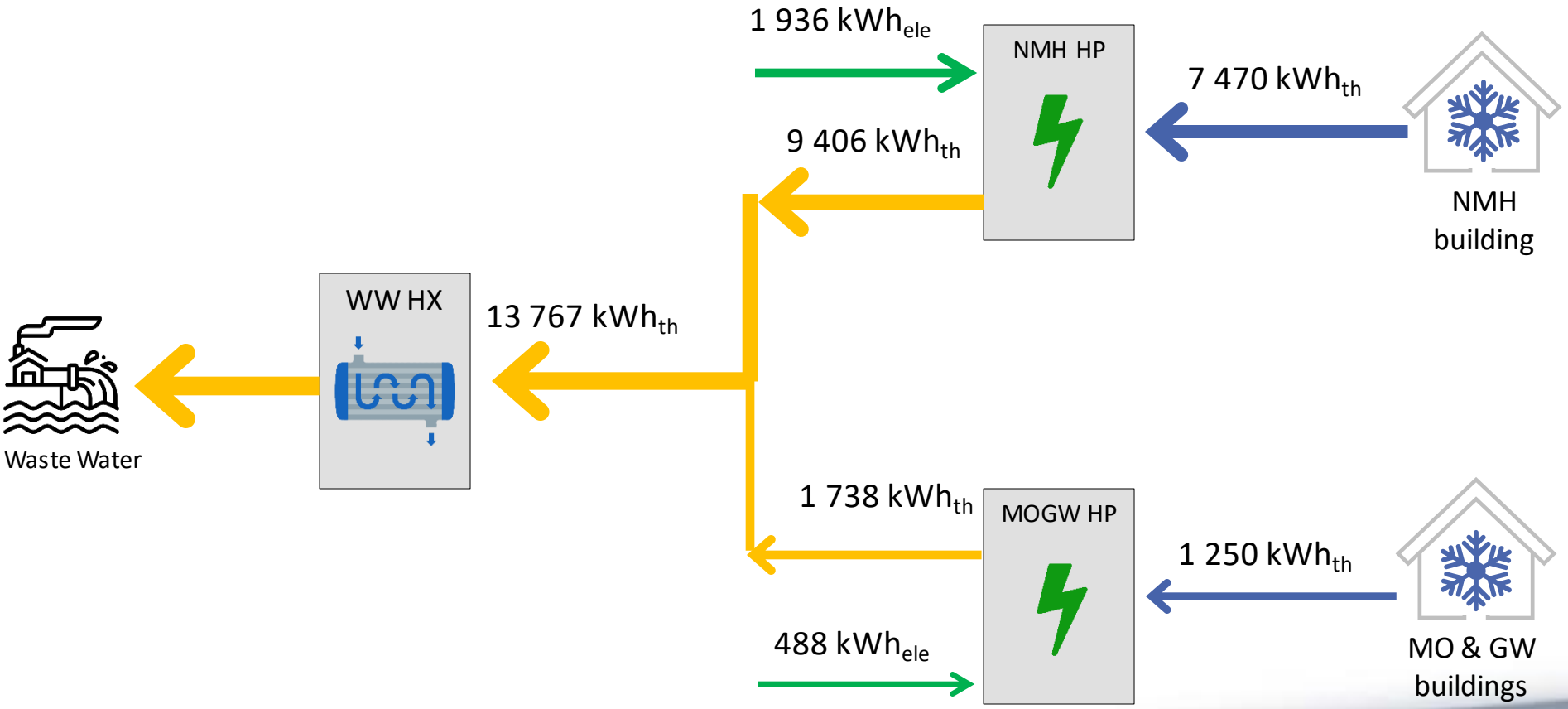
WW-HX, EHP for DHC system @Budapest

Energy Performance - Summer typical Day 1



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WW-HX, EHP for DHC system @Budapest

New heat exchangers - Summer typical Day 2

- Waste Water Cooled

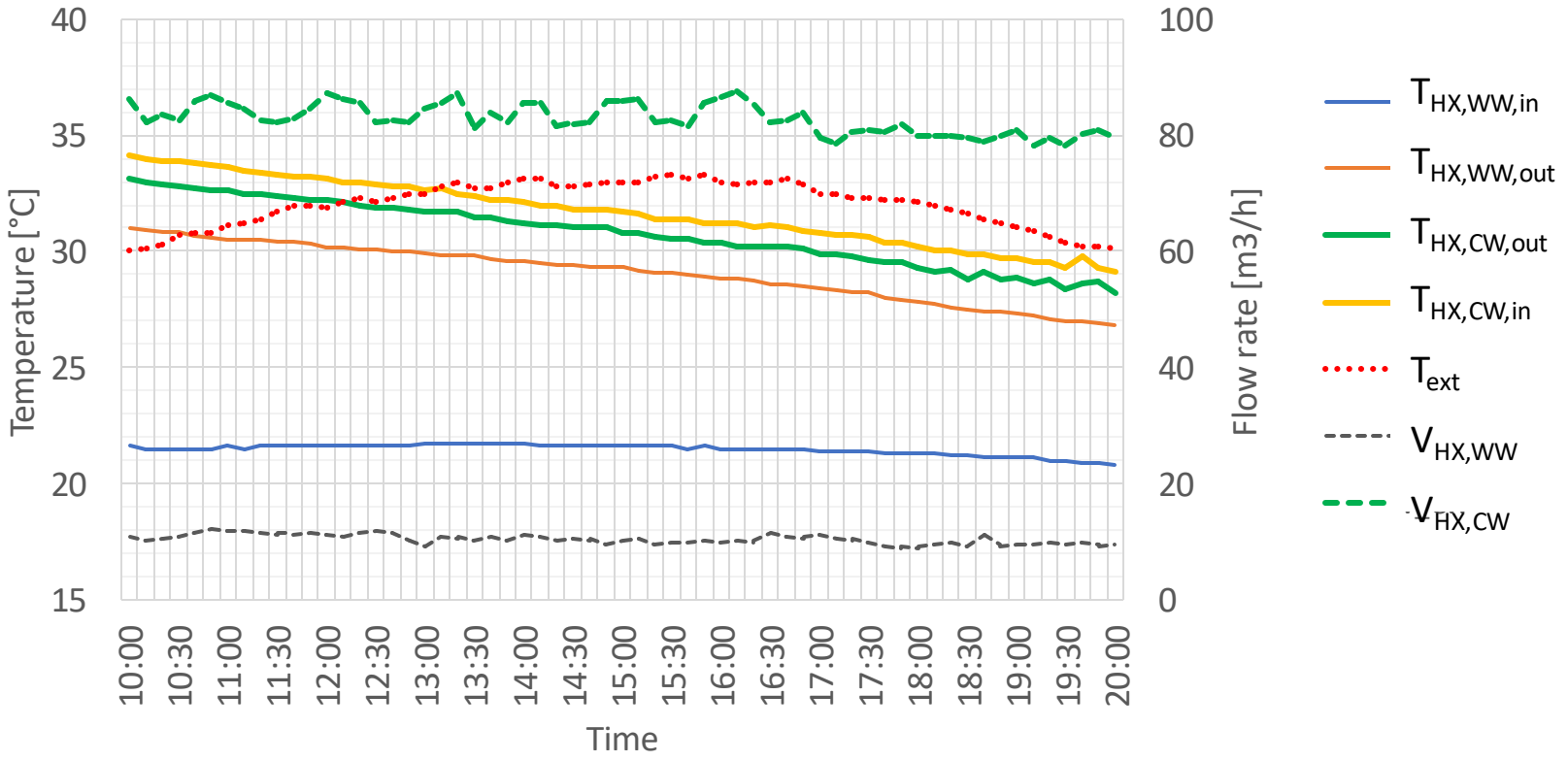
  EER = 5.71

  (refrigerant temperature = 31°C)

- Air Cooled (reference case)

  EER = 4.87

  (refrigerant temperature = 38°C)



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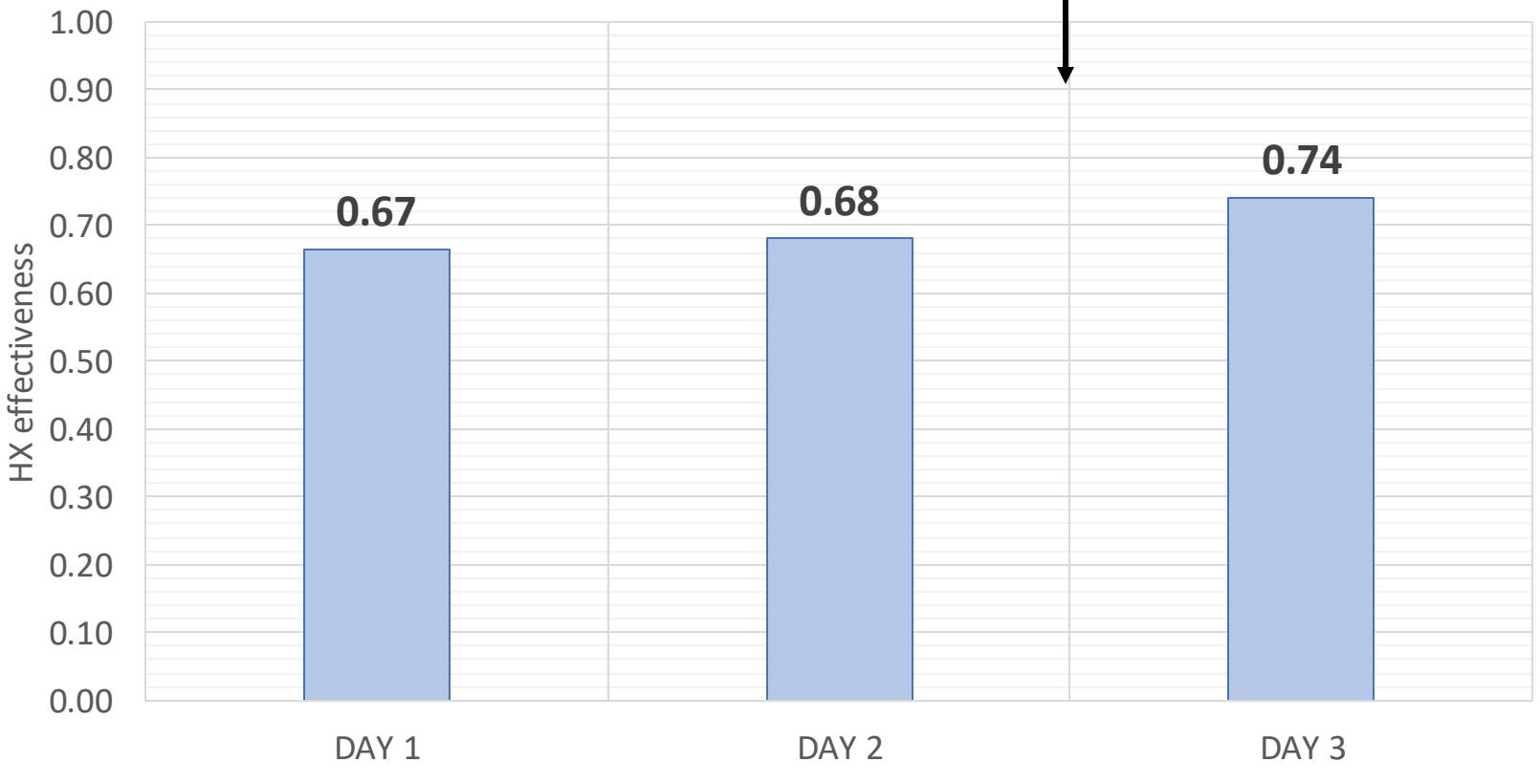
WW-HX, EHP for DHC system @Budapest

New heat exchangers - heat exchange effectiveness

→ Heat Exchanger cleaning



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Packages	Where
3. Photo**V**oltaic system, **E**lectric **H**eat **P**ump and **P**hase **C**hange **M**aterial **H**eat **B**atteries **PV, EHP and PCM HB system**	*@ Chorzow*

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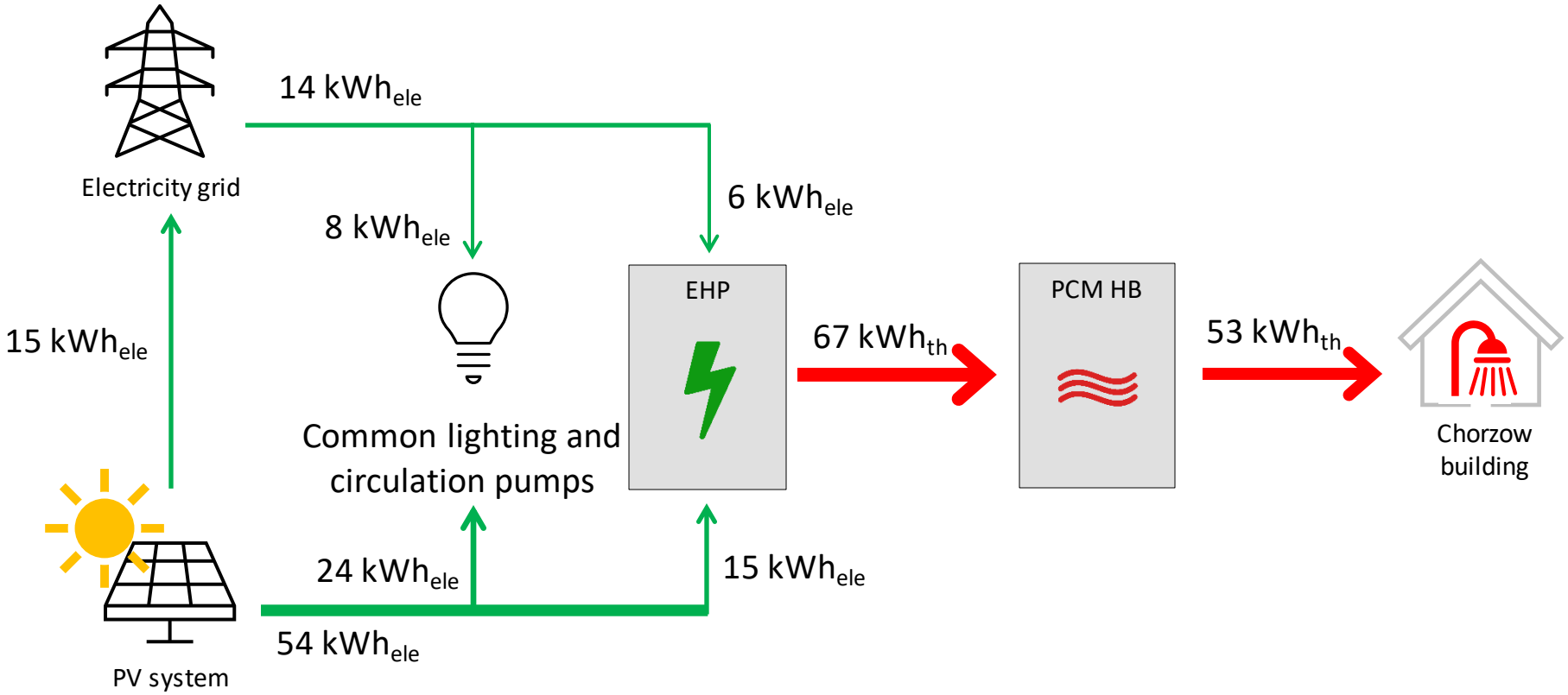
PV, EHP and PCM HB system @Chorzow

Energy Performance - Summer typical Day 1



- Self-consumption (on PV system production) = 73%
- Import (on total consumption) = 26%

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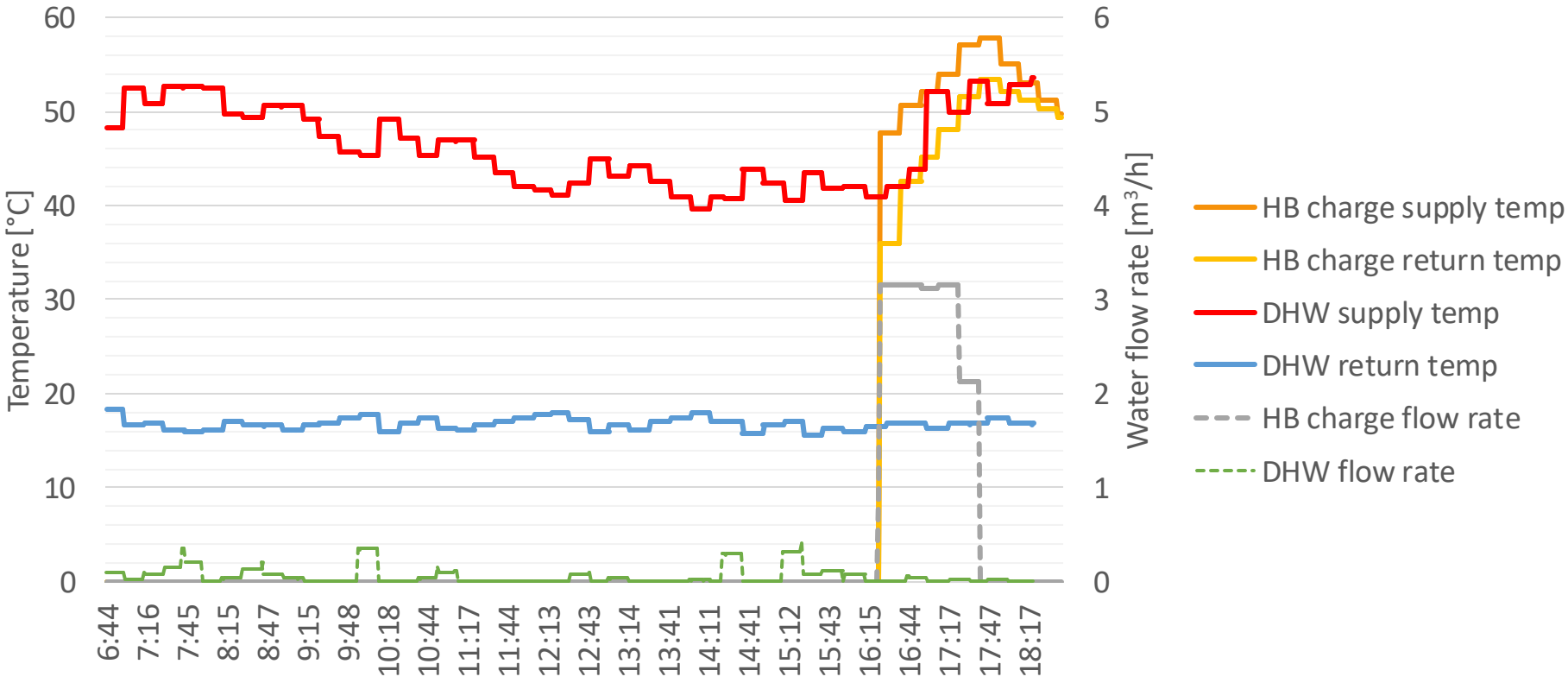
PV, EHP and PCM HB system @Chorzow

PCM heat batteries - Summer typical Day 2

- Charging energy provided = 67 kWh
- DHW energy provided = 55 kWh



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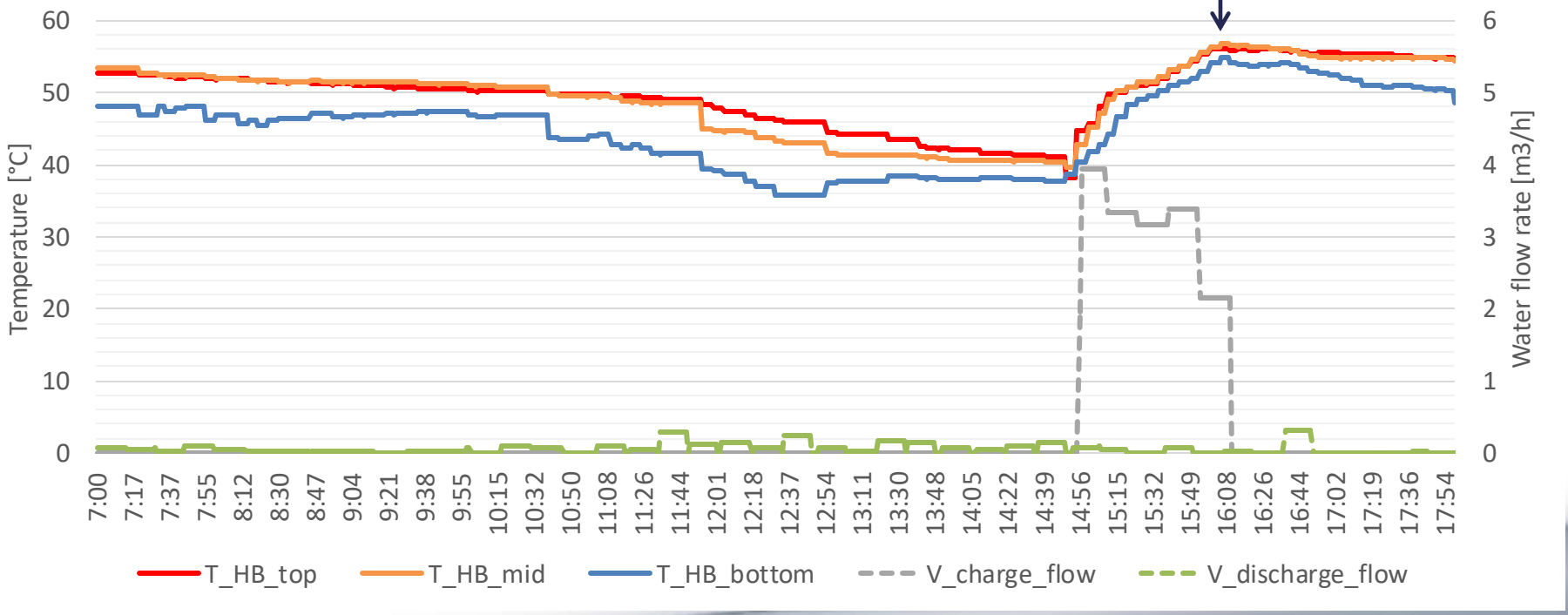
PV, EHP and PCM HB system @Chorzow

PCM heat batteries - Summer typical Day 2

Water pump stops running if:

- **T_HB_top reaches a temperature of 55°C**
- T_HB_mid reaches a temperature of 54°C
- T_HB_bottom reaches a temperature of 50°C



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3. Photo**V**oltaic system, **E**lectric **H**eat **P**ump and **P**hase **C**hange **M**aterial **H**eat **B**atteries **PV, EHP and PCM HB system**	*@ Sofia*

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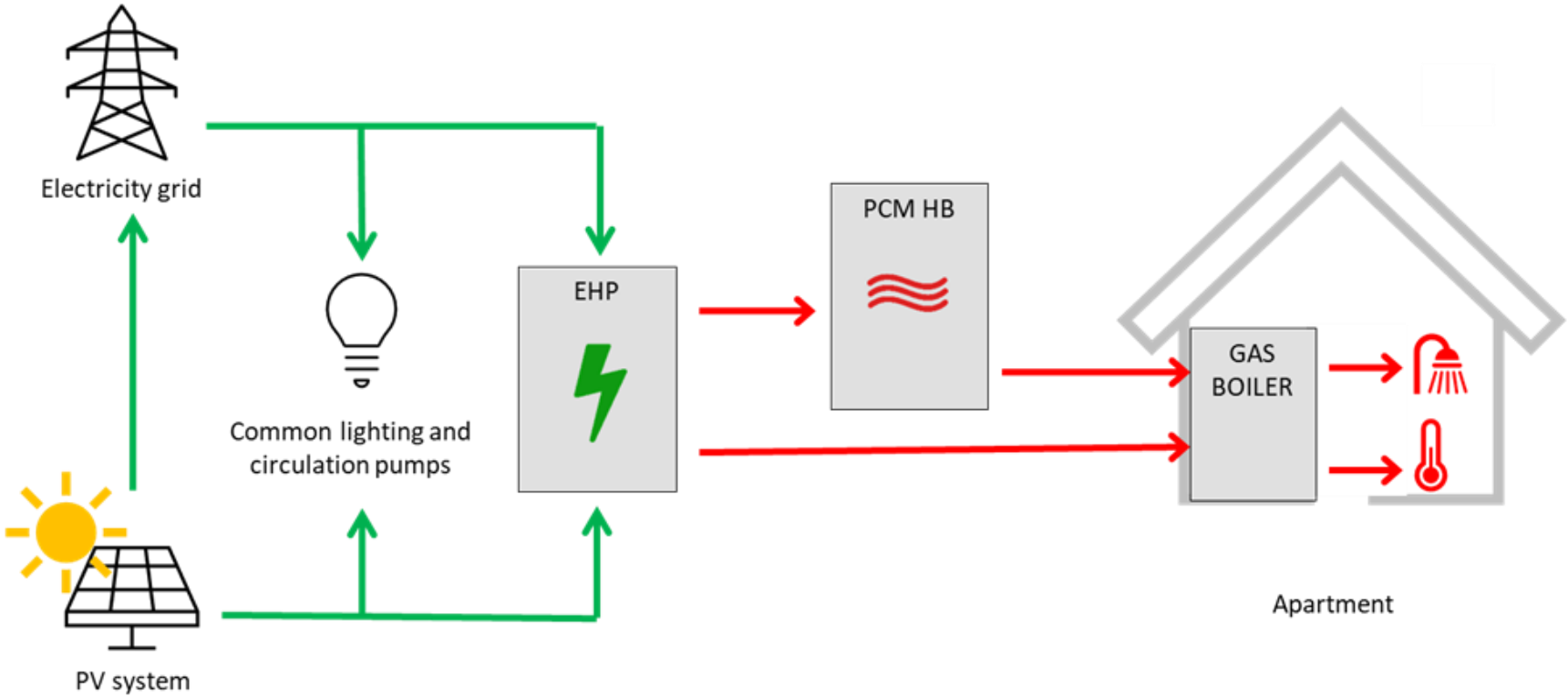
PV, EHP and PCM HB system @Sofia



- Sofia pilot site monitoring system is a work in progress system thus data are available only from the PV system which started to operate in January 2021

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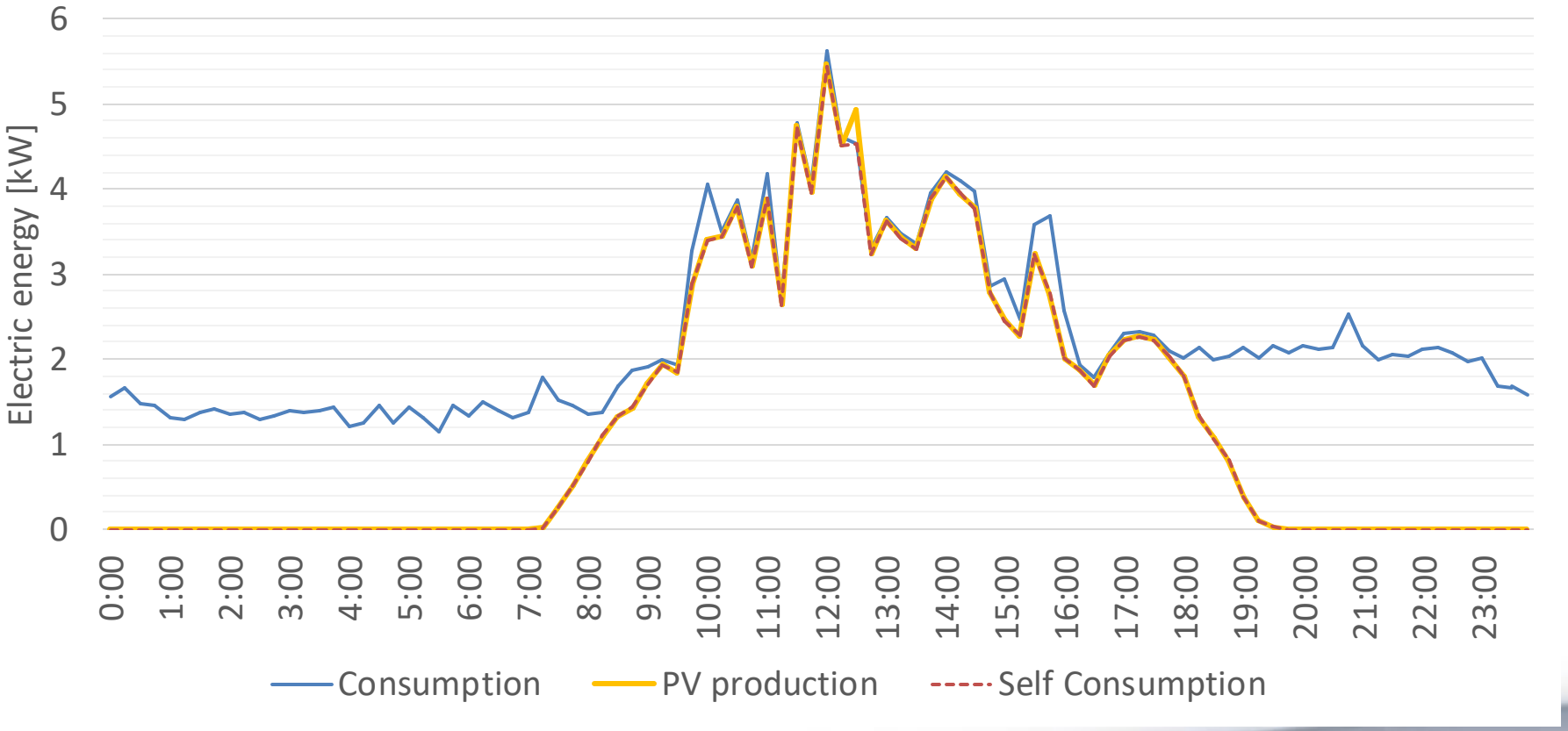
PV, EHP and PCM HB system @Sofia

PV system:

→ Export still not active in March 2021



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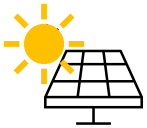
Conclusions

- The monitoring data analysis has been useful work to check the Heat4Cool technologies performance in each pilot site and, consequently, understand which strategies should be updated and improved in order to get better results.

SHC system - Valencia



- the adsorption heat pump can reach a cooling energy cover on the total demand equal to the 43%.
- This result has been reached thanks to the solar thermal collectors system which provides heating energy at high temperature to the adsorption machine.
- Moreover, it supports the electric heat pump for the DHW production, reaching a heating energy cover on the total demand equal to 90% in the hottest summer months.

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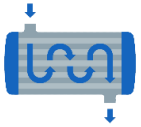
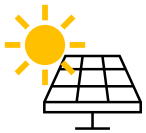
Conclusions

WW-HX, EHP for DHC system - Budapest



- this system can be taken as example in the Eastern Europe as district heating and cooling system electrically driven by heat pumps. In fact, convert the energy system market into electrically driven systems is one of the possible challenges of Europe's future.

PV, EHP and PCM HB system – Chorzow and Sofia



- Chorzow:
  - the PV system installed is able to cover at least the 50% of the electric energy needs.
  - Moreover, thanks to the heat pump fed by the renewable solar energy, the PCM heat batteries provides the necessary heating energy for the DHW demand, occupying less space than typical water storages.
- Sofia pilot site is a work in progress system thus it is not possible to conclude with final evaluation on its operation. Anyway, the example of Chorzow shows that this kind of system leads to good results in terms of efficiency and energy saving.

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Thank you

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