



**POLITECNICO**  
MILANO 1863



**WATT+VOLT**  
ELECTRICITY | NATURAL GAS



**HEAT4COOL**



**HOCHSCHULE  
LUZERN**

## Pilot 2. Chorzow – Final retrofit status

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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



# Demo site in Poland – Historical building



<b>Location</b>	Chorzow, Poland
<b>Surface – conditioned</b>	1000 [m <sup>2</sup> ]
<b>Year of construction</b>	1902
<b>Type</b>	Residential
<b>Users</b>	60
<b>Apartments</b>	11 (12)
<b>Commercial zones</b>	3
<b>Main heat and DHW sources</b>	Gas boilers



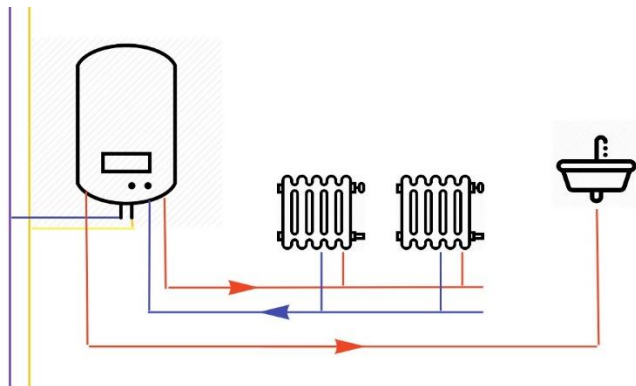


# HVAC systems in the building



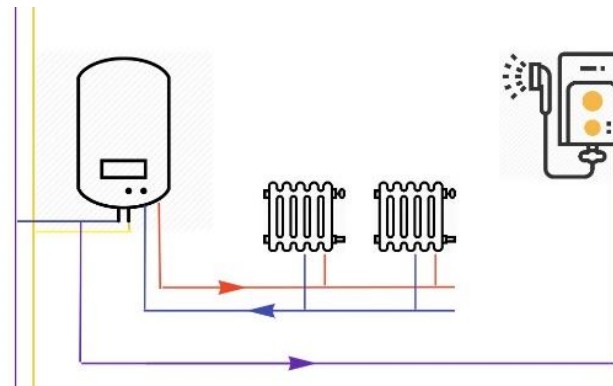
1

GAS SH + DHW



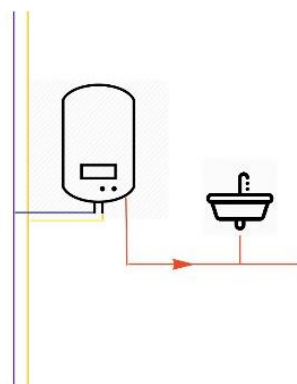
2

GAS SH + ELEC. DHW



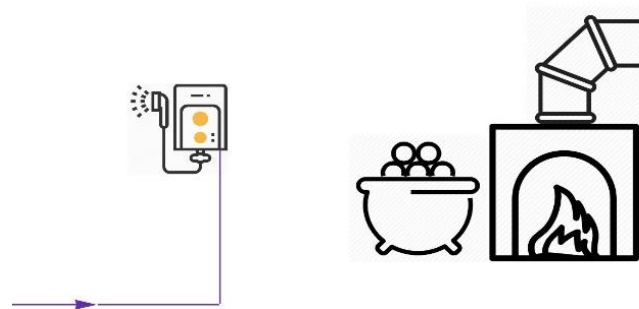
3

ELEC. SH + DHW



4

ELEC. DHW + COAL SH





# Heat4Cool project implementation



## Implemented technologies:

- 30 kW air to water heat pump;
- 8 PCM heat batteries for hot water preparation – each of 12 kWh capacity, 96 kWh in total;
- PV system on the roof of the building – 43 LG 340N1K-V5 PV modules and 15 kW SolarEdge inverter.



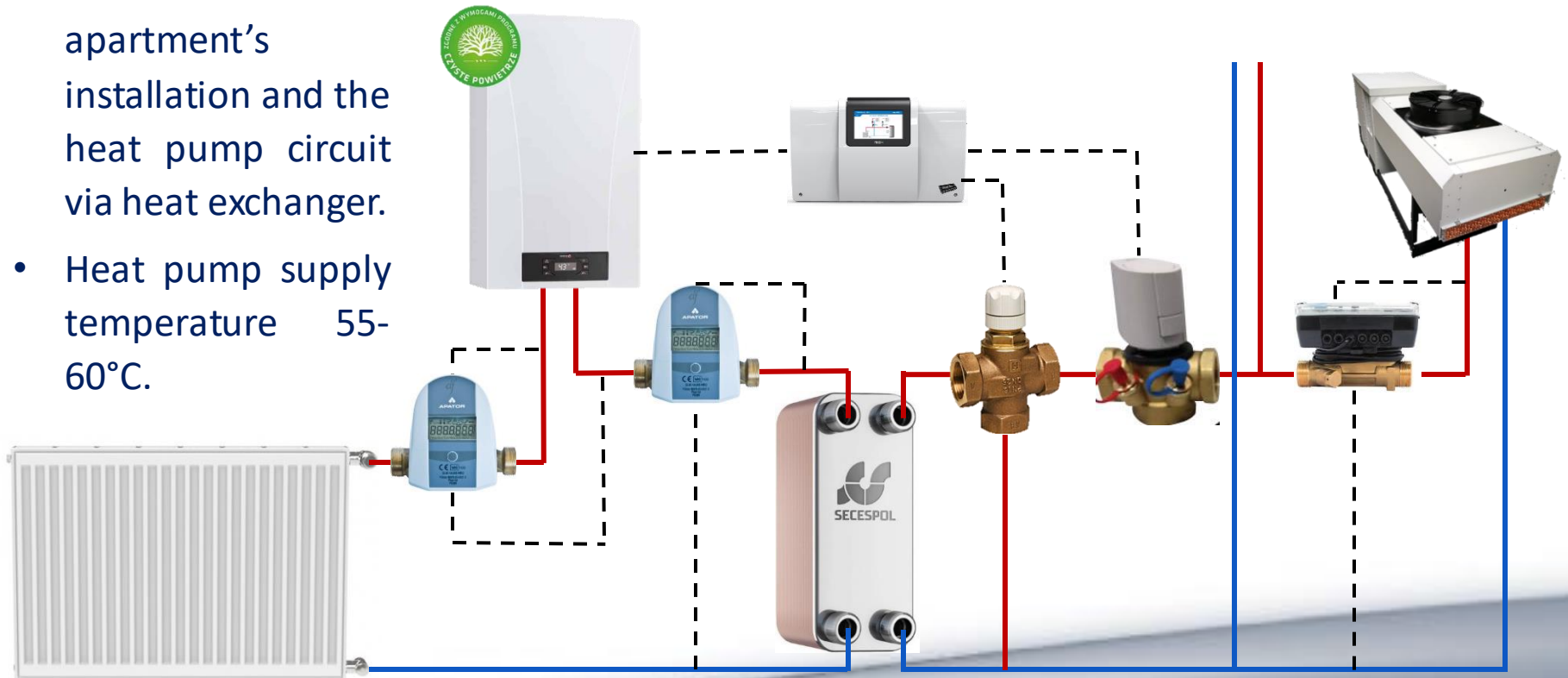




# Space heating system



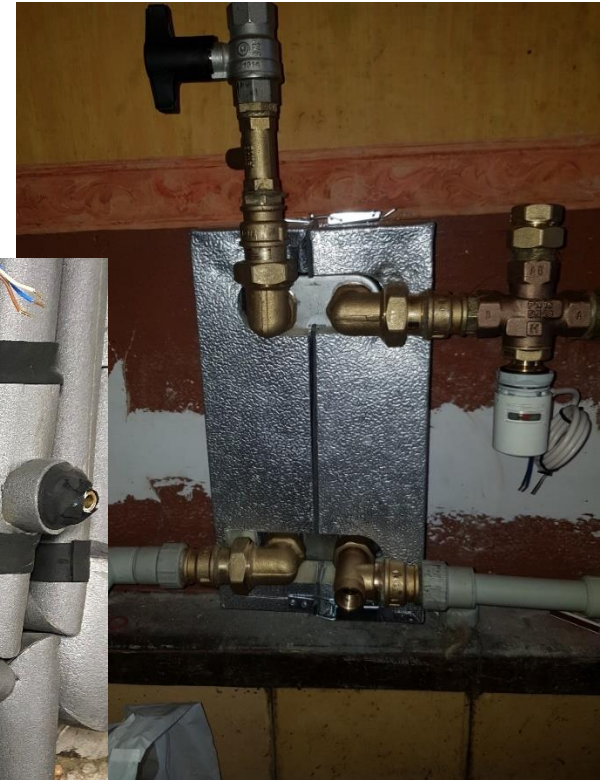
- The main source of the heating power – gas boilers.
- Independent work of the circulation pumps and the boilers in apartments.
- 3-way valves with actuators before the heat exchangers
- Connection of the apartment's installation and the heat pump circuit via heat exchanger.
- Heat pump supply temperature 55-60°C.



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# Space heating system

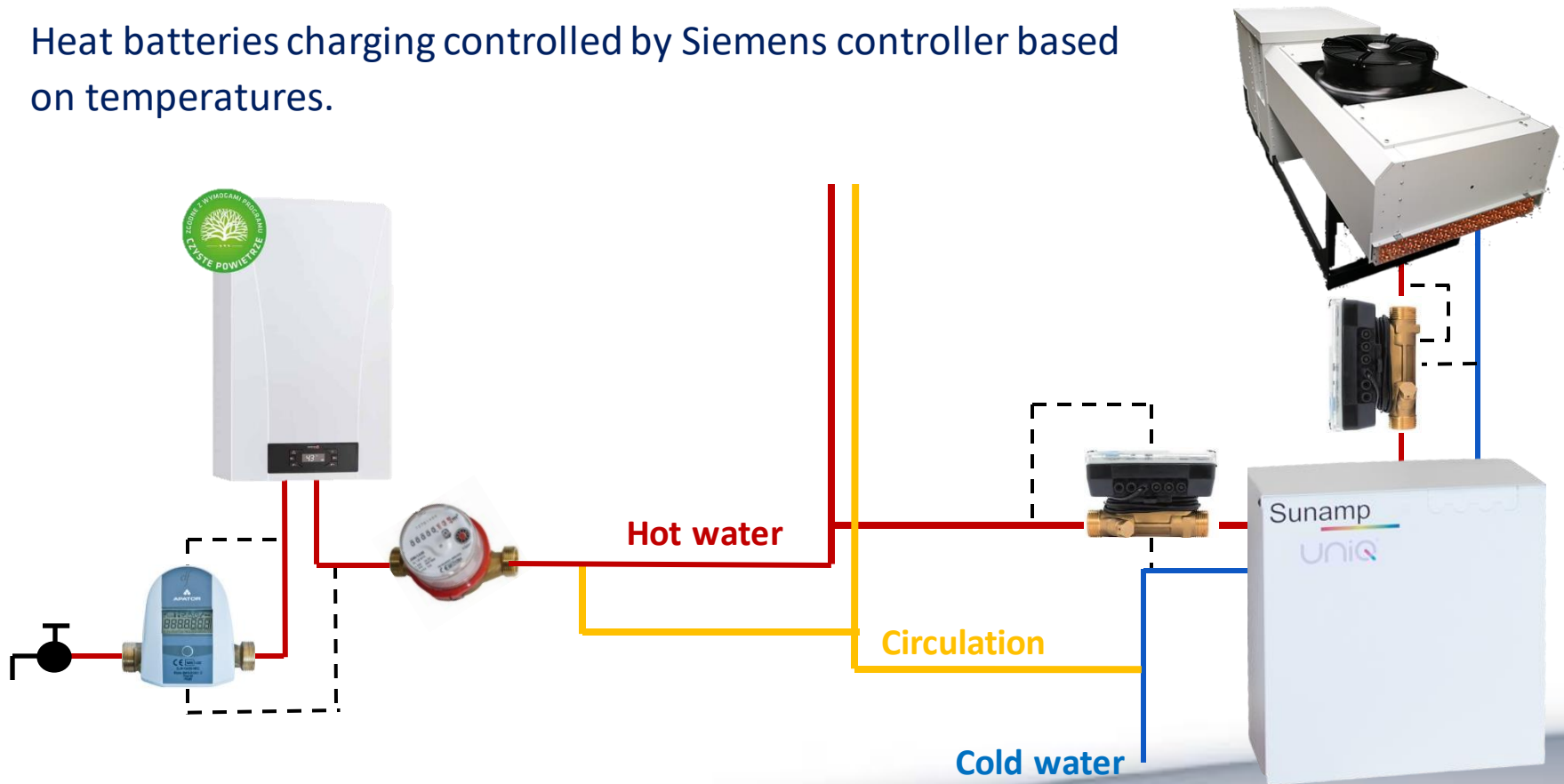




# Hot water preheating system



- 8 PCM heat batteries installed in the basement for hot water needs.
- Average DHW temperature around 41°C.
- Heat batteries charging controlled by Siemens controller based on temperatures.







# Heat pump installation



- The 30 kW heat pump as one unit device for outdoor use.
- Connection to the building with pre-insulated PEX pipes in the ground.
- Concrete foundation with gravel filling and perforated pipe.



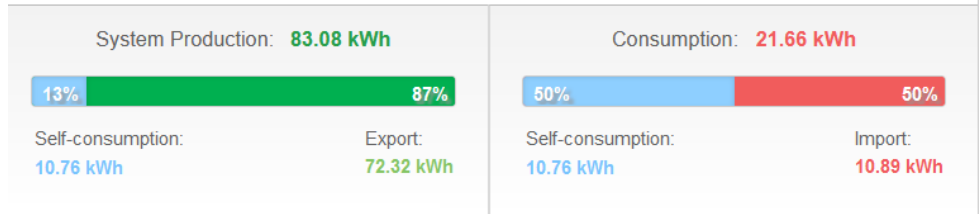




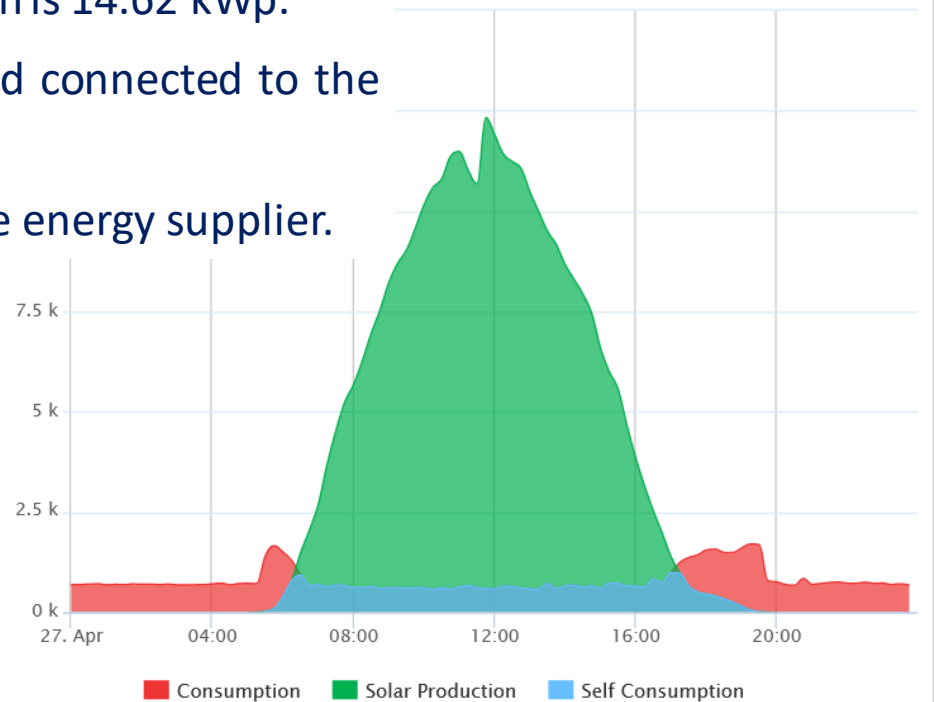
# PV system



27/04/2021



- 43 LG 340N1K-V5 modules are installed with angle of 36.6°.
- Total generation power of the installation is 14.62 kWp.
- 15 kW SolarEdge inverter is installed and connected to the Internet and the monitoring platform.
- 2-way electricity meter is installed by the energy supplier.



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# SCI-BEMS



The system is monitored and controlled by BMS created for the building. It collects data from meters and send it to the data base.

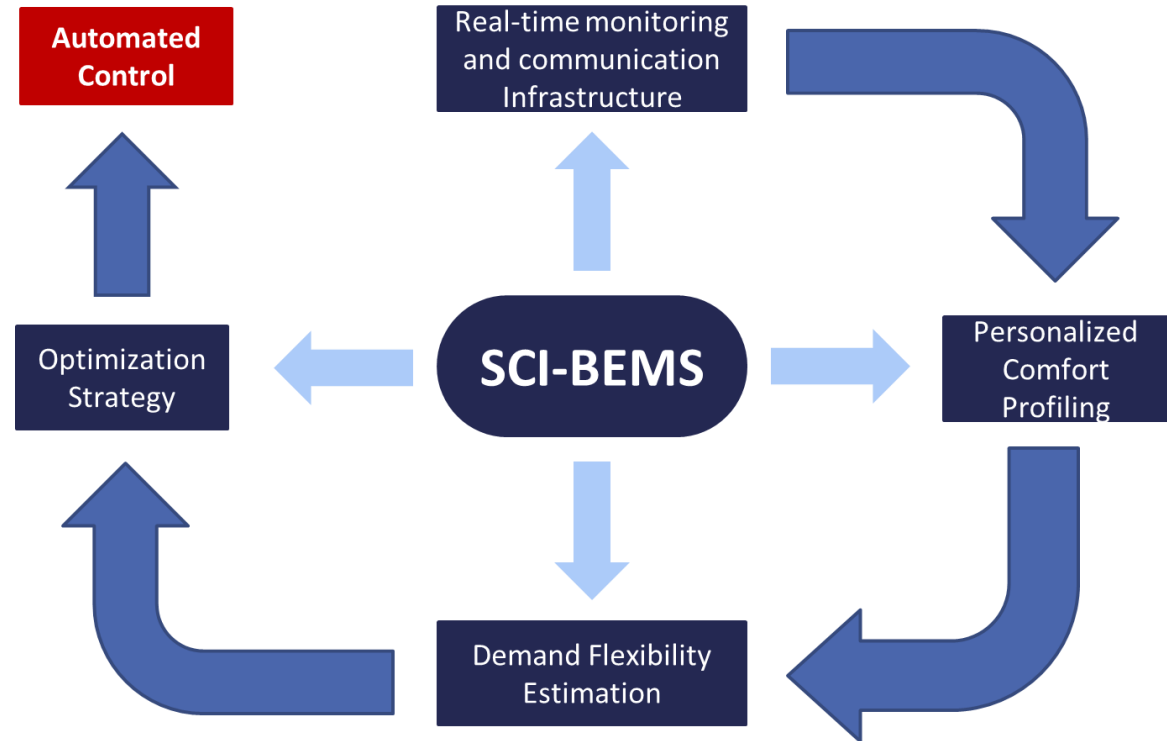
ZWave sensors in apartments (radiators' FIBARO thermostats and humidity-temperature-motion AEOTEC MULTISENSOR) are a part of **SCI-BEMS**.

## **Tenants' availability of control:**

- Thermostats in apartments,
- Boilers.

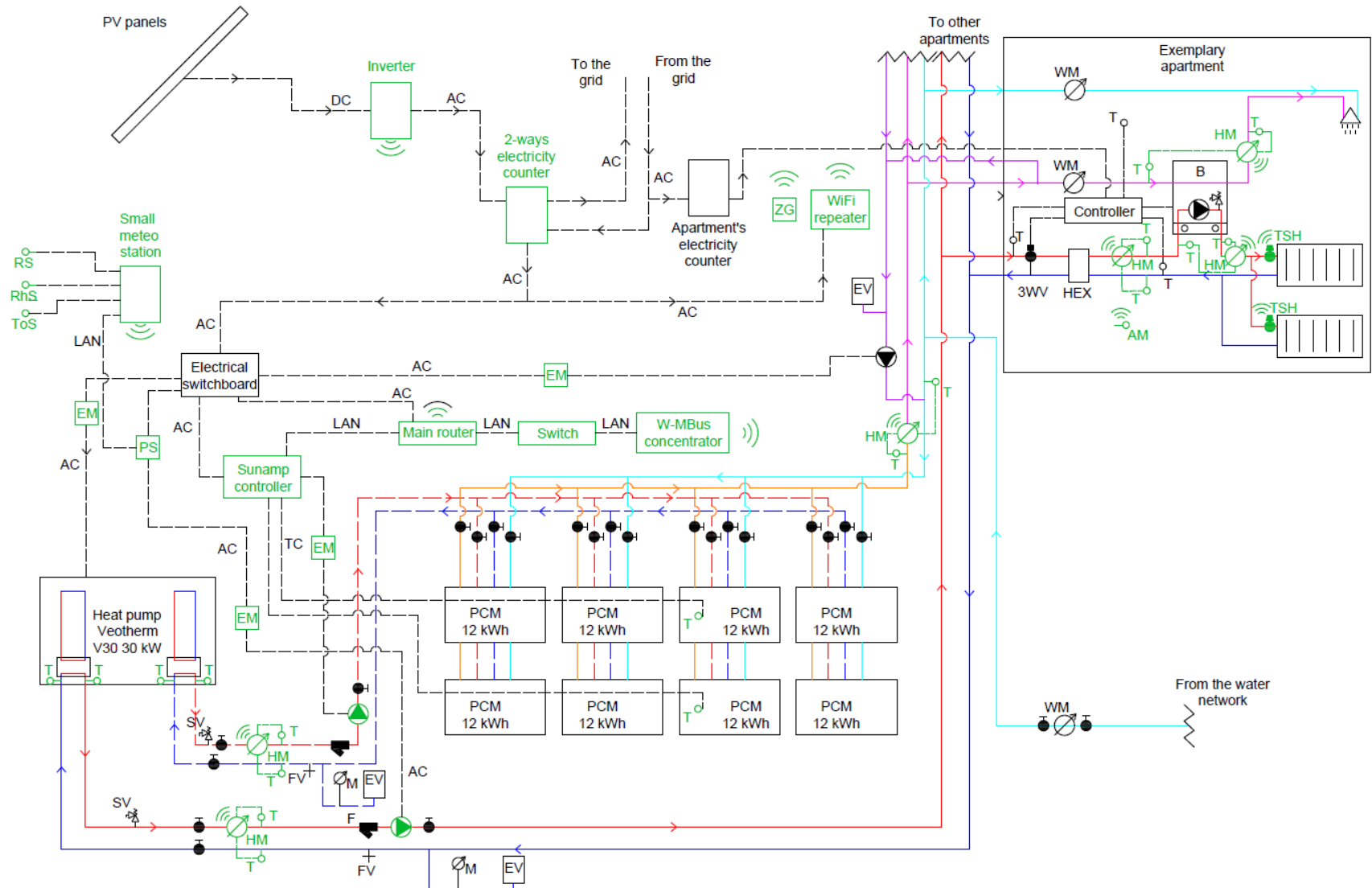
## **IZNAB controls:**

- SH and HB circulation pump,
- Siemens PLC managing the heat batteries,
- Thermostats in apartments,
- Heat pump,
- PV inverter.





# Complete system in Chorzów



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# Data monitoring



Heat metres' data are collected since January 2020 (heat, flow). Data is sent to the monitoring platform since June 2020 (heat, flow, temperatures).

Raw data of electricity production from the PV system are available since March 2020.

Raw data for heat pump electricity consumption are available and they allowed to calculate the overall consumption.

Heating circuit circulation pump and heat batteries charging circulation pump are working all the time. Raw data about electricity consumption are available and can be calculated for specific period. Circulators data cover period from September 2020.

SCI-BEMS data (Fibaro thermostats' and Aeotec Multisensors' records) available from June 2020.





# Lessons learnt



- During the deep retrofitting of historical buildings or old buildings, **one cannot have a real estimation of the expected budget** needed to cover all the retrofitting costs due to the lack of detailed documentation and drawings.
- Heat4Cool system is **dependent on the tenants' habits**.
- **External software discharged the batteries** of Z-Wave equipment (SCI-BEMS) **in a much quicker way**, compared to what initially declared by the manufacturer.





# Issues during monitoring



The heat pump has broken after a half the year of working. It was repaired on March 2021.

An electrical surge in the building happened and some electrical parts of the system have been blown out.

Electricians have checked carefully the internal electrical installation trying to find a cause of the surge. At this moment the electrical installation works properly and a protection is applied to prevent similar situation in the future.

Broken equipment:

- Heat batteries charging circulation pump (repaired),
- Heat batteries and heat pump controllers (in service),
- Heat pump transformer (exchanged).

IZNAB wants to repair the devices and restore the proper work of the H4C system. It is planned to still monitor the system after the project, at least till the end of 2021.







Thank you.

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