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RESHeat

Renewable Energy System for Residential Building Heating and Electricity Production

project Presentation

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Funding and Acknowledgements

In the **RESHeat** project, the Cracow University of Technology **is the project coordinator,** while the partners are leading European research institutions, namely:

- **Sapienza University of Rome** (Italy),
- **Brno University of Technology** (Czech Republic),

as well as companies and firms in the SME sector, i.e.

- **OILON OY** (Finland),
- **F.H.U. CZAMARA SC** (Poland),
- **ELFRAN Franciszek Ścisłowicz** (Poland).

Demonstration installations carried out in multi-family residential buildings owned by:

- **Municipal Buildings Management Board in Krakow**,
- **ATER Provincia di Roma** (Italy) – Building Management Board in Lazio region,
- **TOP CEZAR** (Limanowa) - private company.

European Commission

THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION
HORIZON 2020

RESHeat

Project under the **Horizon 2020** Financial Perspective, programme H2020-LC-SC3-2018-2019-2020: "*Building a Low-Carbon, Climate Resilient Future: Secure, Clean and Efficient Energy*".

The total funding is more than 2.4 mln EUR.

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Project objectives

A. Development of a heating and hot water system **to cover at least 70% of the annual energy demand** for multi-family residential buildings **from RES**.

B. **Demonstrate the actual performance** (including economic performance) of **the system** and provide the end user with information on the overall performance of the system.

C. Demonstration of system scalability for different types of multi-family residential buildings. **Three demonstration plants are planned**, in Limanowa, Krakow and a suburb of Rome, for multi-family buildings with 9, 13 and 24 flats respectively. In addition, the system will be modified so that it also works efficiently **for cooling, as tests in Italy will demonstrate.**

D. **Economic efficiency assessment**, life cycle analysis and environmental impact assessment of RESHeat systems.

The main objective of the project is to prepare the RESHeat system for commercialization.

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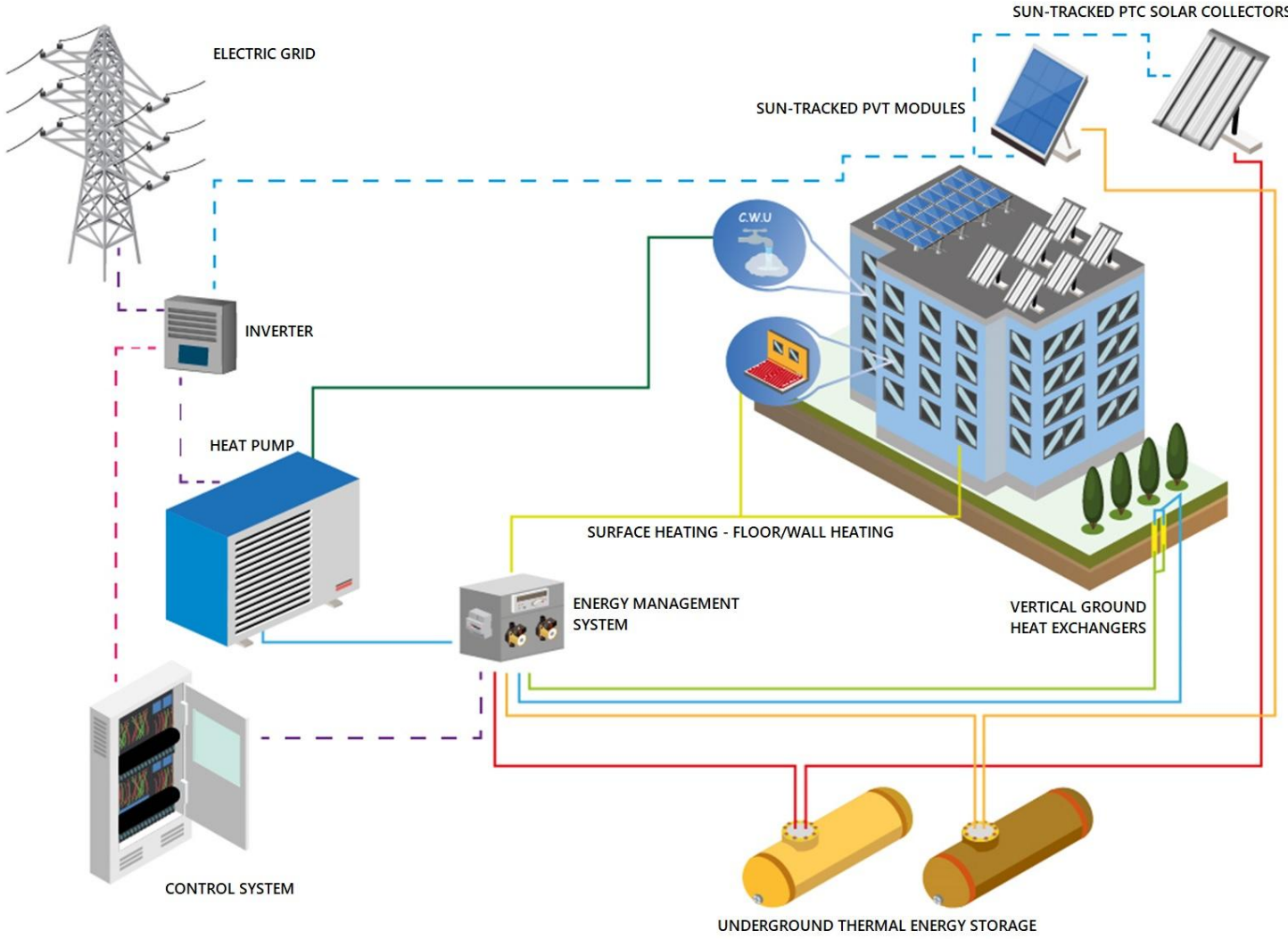
System concept

The idea behind the RESHeat project is to develop **a zero-carbon and autonomous energy system** based only on Renewable Energy Sources (RES).

RESHeat is an energy trigeneration system, thus uses RES to produce **electricity**, **heat** and **cooling** for residential (including passive), public and commercial buildings.



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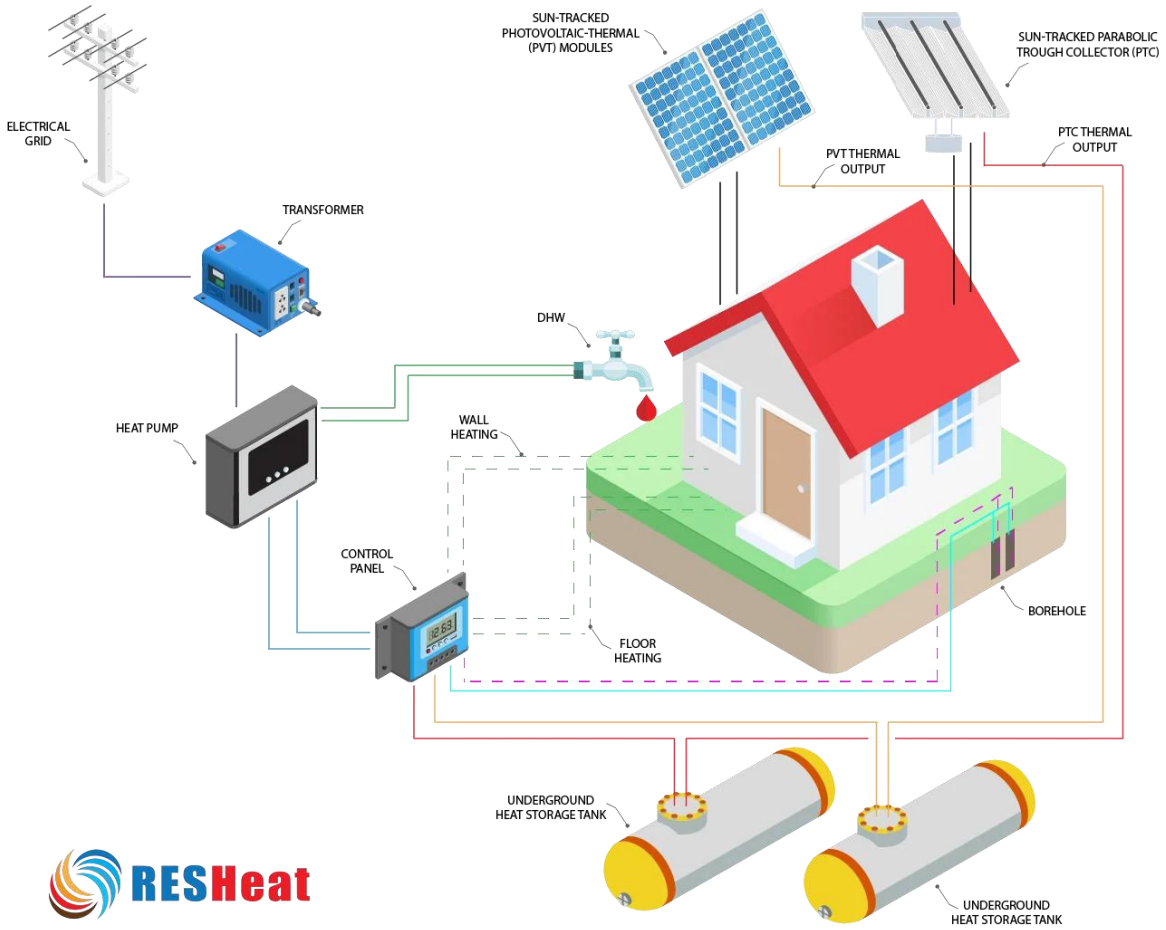
System concept



RESHeat

1) Using **solar energy** as a primary source of renewable energy:
   A. Electricity production from PV modules;
   B. Utilization of solar tracking systems;
   C. More **efficient use of solar energy** through the use of PV-T modules (combination of PV and solar collectors);
2) Heating and cooling the building using a **heat pump**;
3) **Seasonal thermal energy storage** in underground storage facilities;
4) **Using waste heat** from PV-T modules or solar thermal collectors for ground regeneration

by which

5) **Maintaining the high COP** of the heat pump during the heating season.

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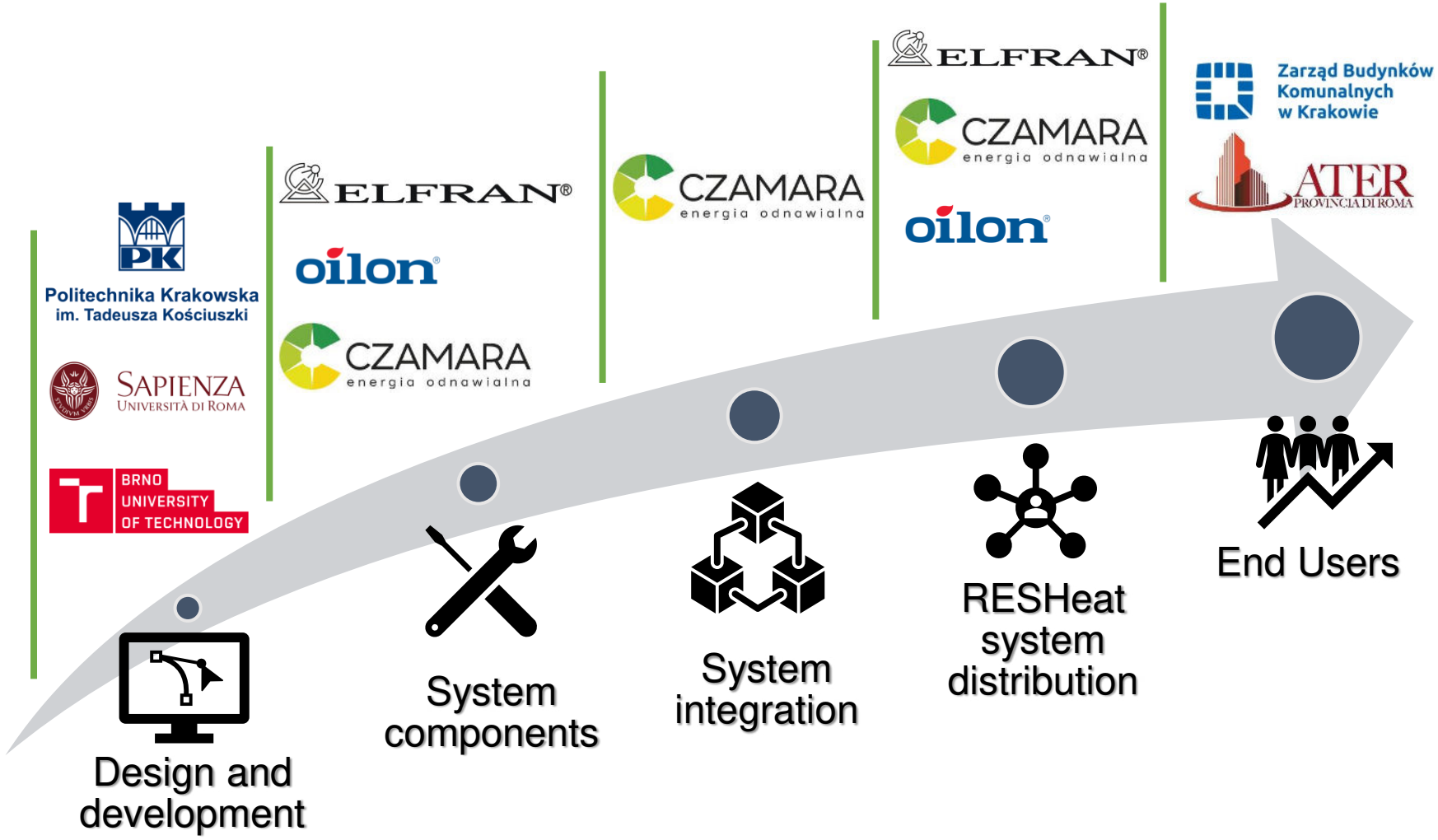
Project implementation



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RESHeat - demo installation in Krakow

Location: **26 Działkowa Street, Kraków**
year of construction: 2013
number of dwellings: 24
heating: natural gas.

Promo video→

Next door an identical building.

During the project it is possible to compare heating costs for before/after retrofitting

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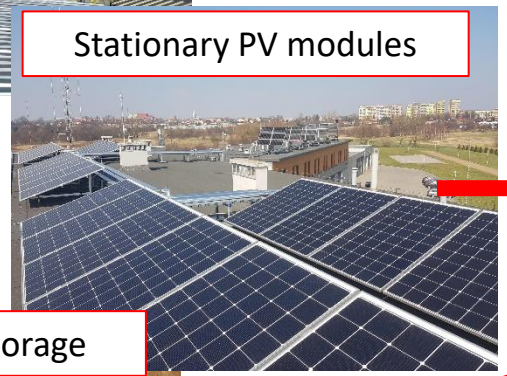
RESHeat - demo installation in Krakow

Solar collectors on trackers

Stationary PV modules



Seasonal heat storage

PV-T modules on trackers

Water-to-water heat pump

<u>Installation power:</u>

Solar collectors on trackers: 30.4 kWt
PVT modules on trackers: 10.4 kWe, 5.6 kWt
Stationary PV panels: 30 kWe (68 pcs.)
Heat pump: 95 kW
Underground heat storage: 50m^3

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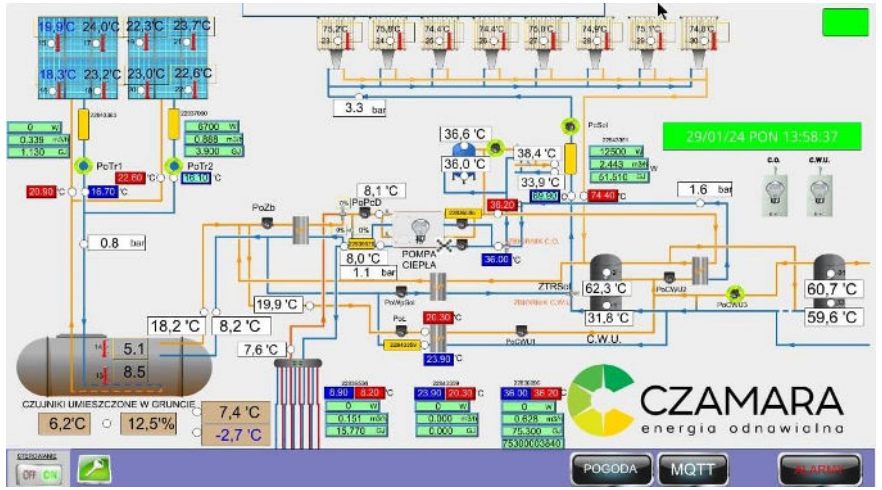
RESHeat - demo installation in Krakow

Sun-tracked solar collectors

OILON RE 76 Heat pump

Sun-tracked PV/T modules

Underground heat storage tank
50 m^3 volume



Control panel

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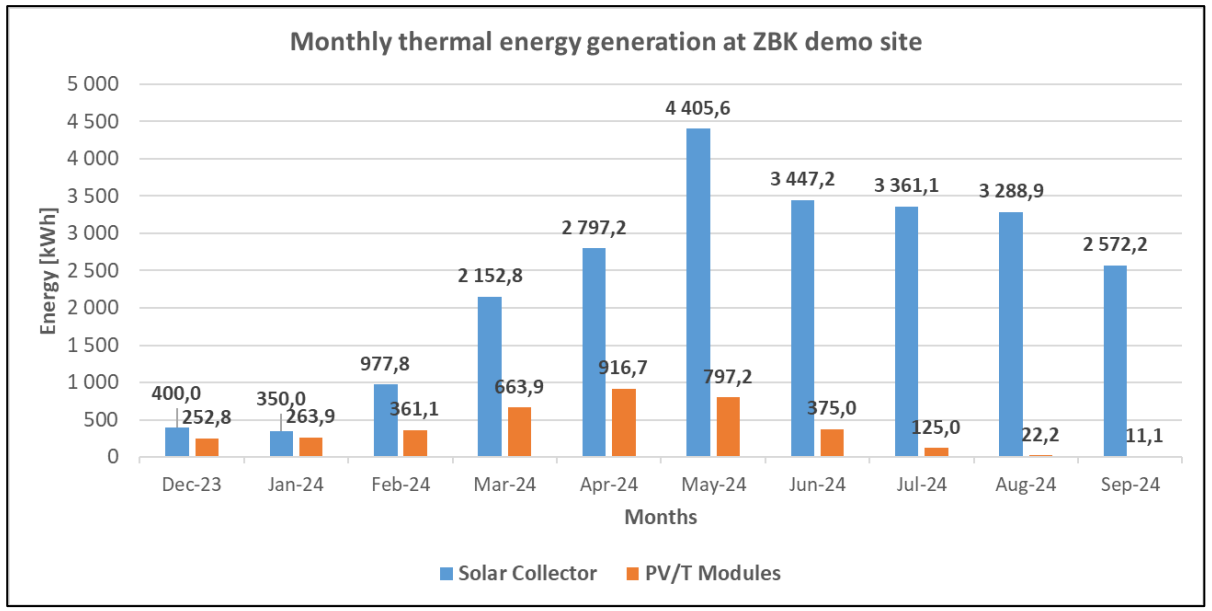
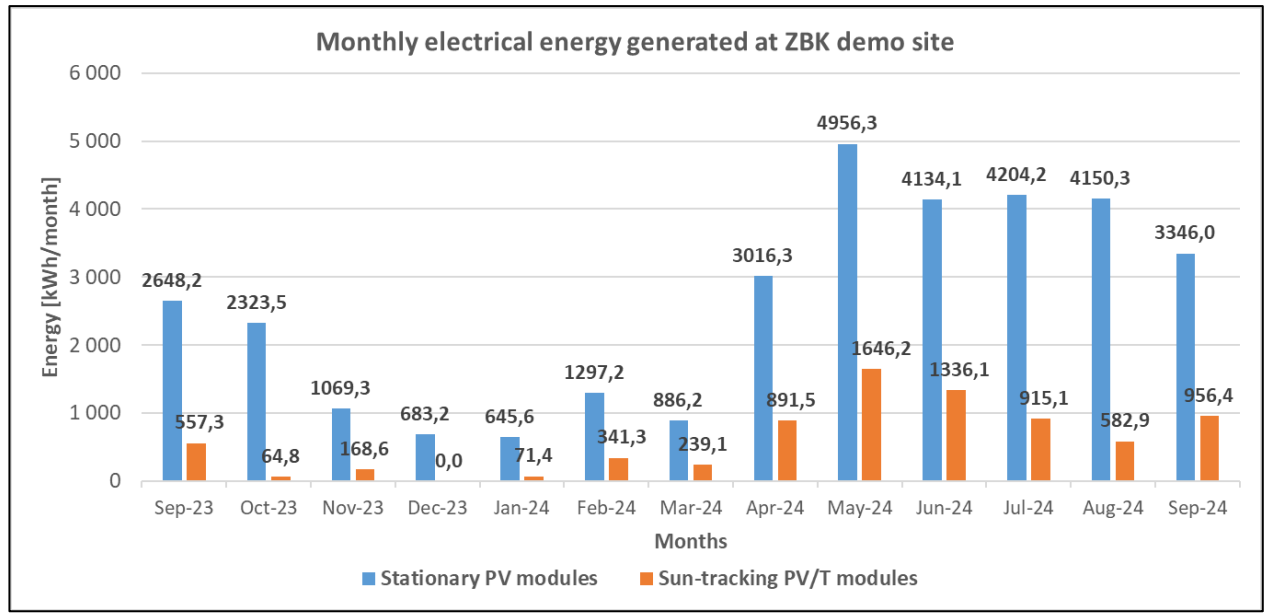
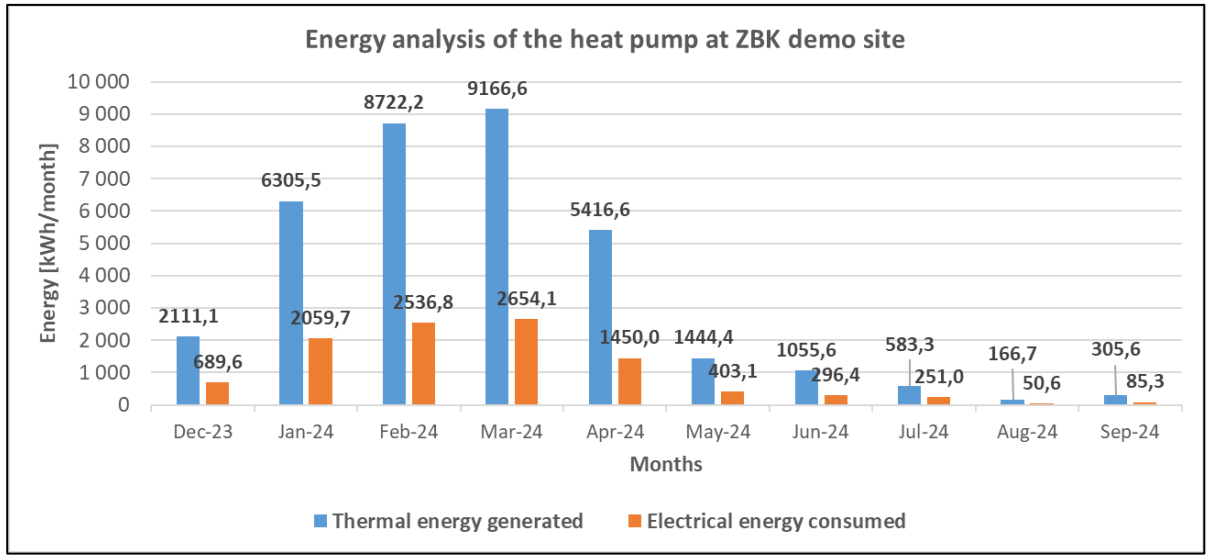
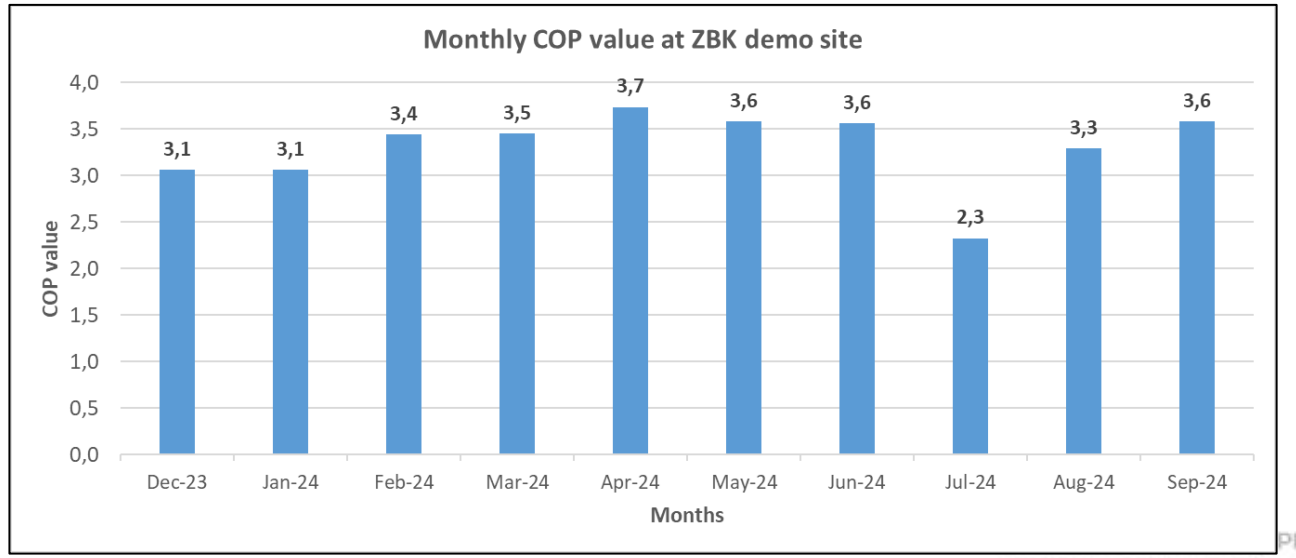
RESHeat - demo installation in Krakow









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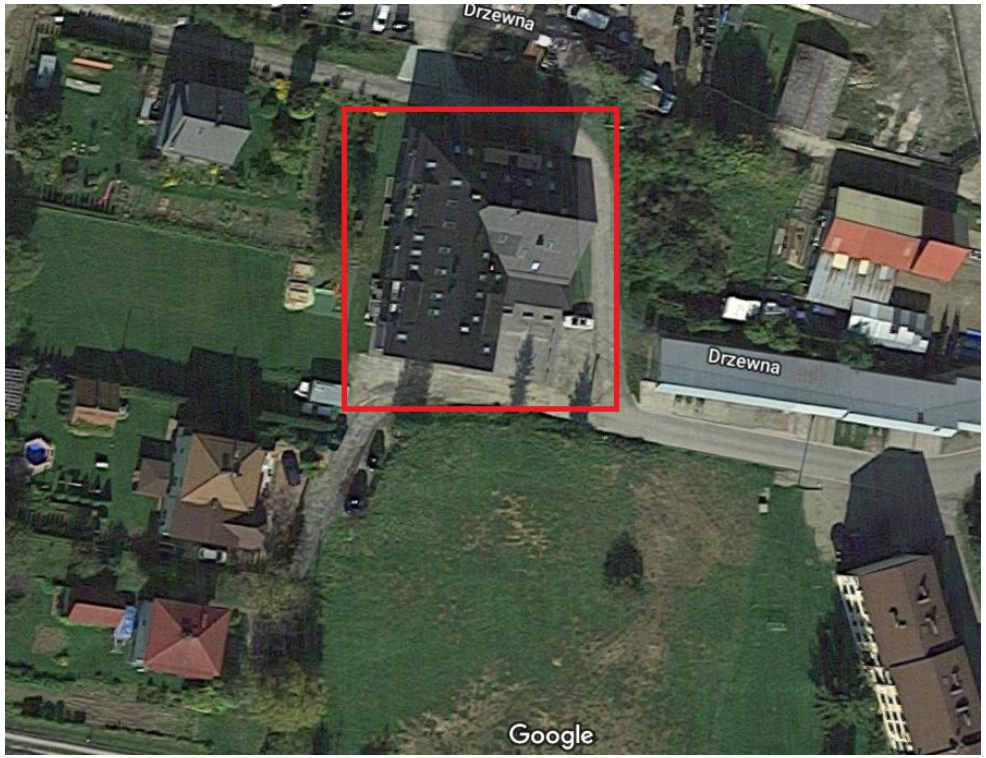
RESHeat - demo installation in Limanowa



Location: **5 Drzewna Street, Limanowa**
year of construction: 2017
number of flats: 9 (ground floor only)
heating: natural gas.

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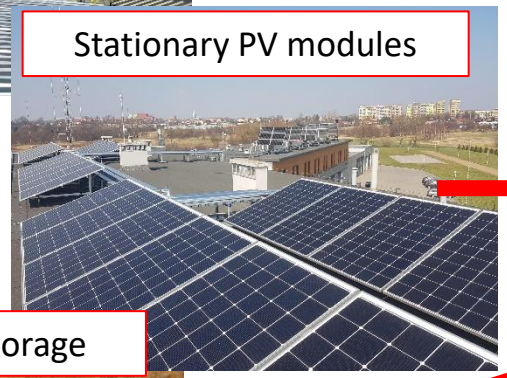
RESHeat - demo installation in Limanowa

Solar collectors on trackers

Stationary PV modules



Seasonal heat storage

PV-T modules on trackers

Water-to-water heat pump

Installation power:

Solar collectors on trackers: 19 kWt
PVT modules on trackers: 10.4 kWe, 5.6 kWt
Stationary PV panels: 19.4 kWe (44 units).
Heat pump: 42 kW
Underground heat storage: 50m^3

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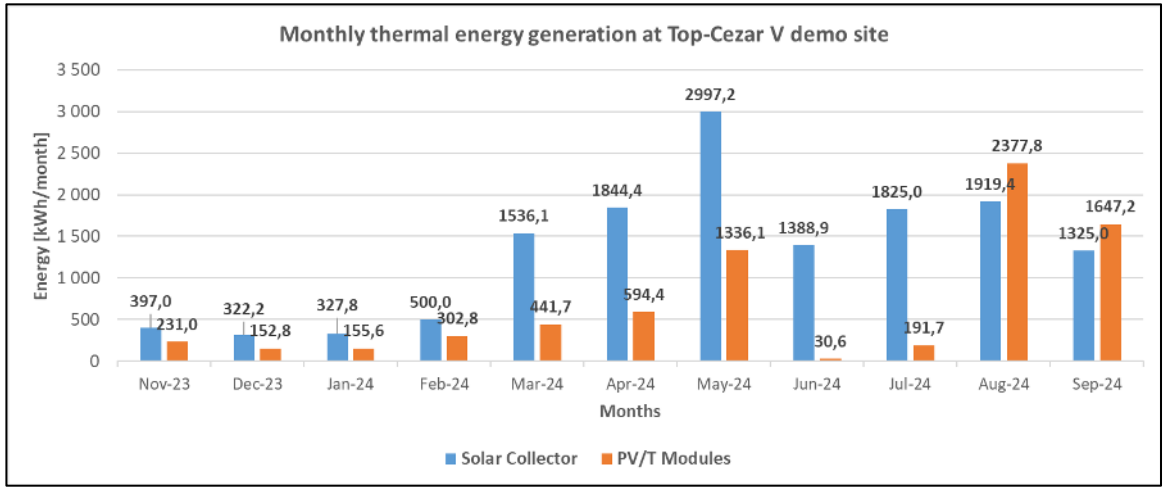
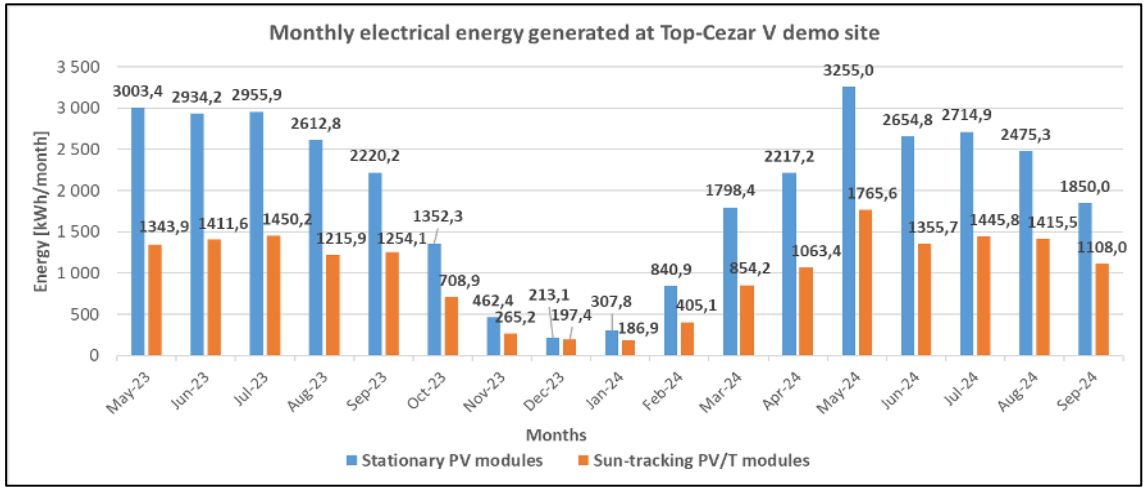
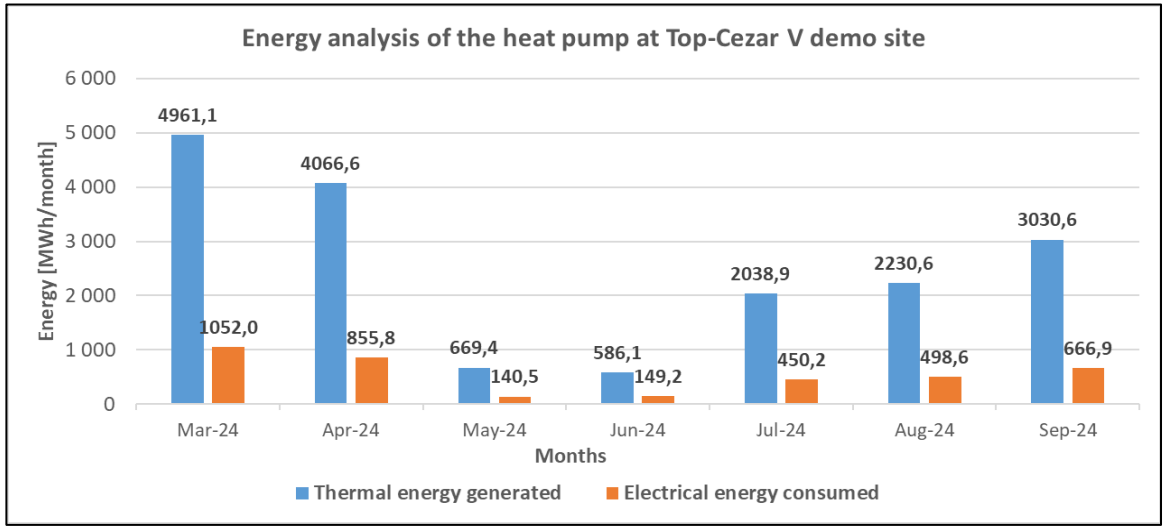
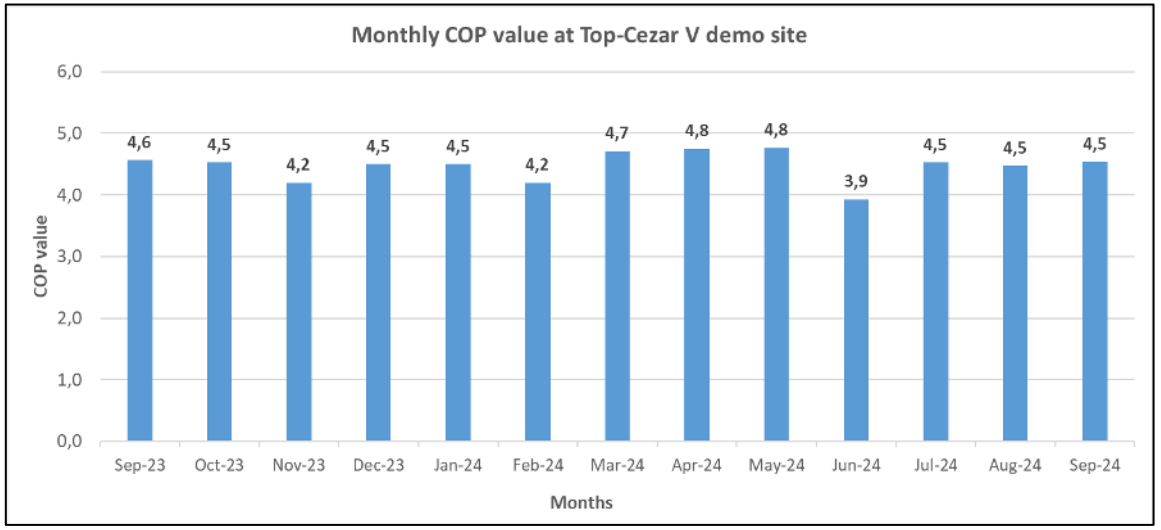
RESHeat - demo installation in Limanowa









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RESHeat - demo installation in Palombara

Location: **Palombara Sabina – Italy**
End user: ATER Della
Provincia di Roma
year of construction: 1980 – 1985
number of flats: 13
heating: natural gas.

Heat Pump: Oilon RE56 - 85kW-74kW(c)

PVT installation: 23,25kW(e); 17,5kW(t)

Heat storage tanks: 3 x 1000m^3

Dry Cooler: up to 147kW

Heating and cooling area: 1.135m^2

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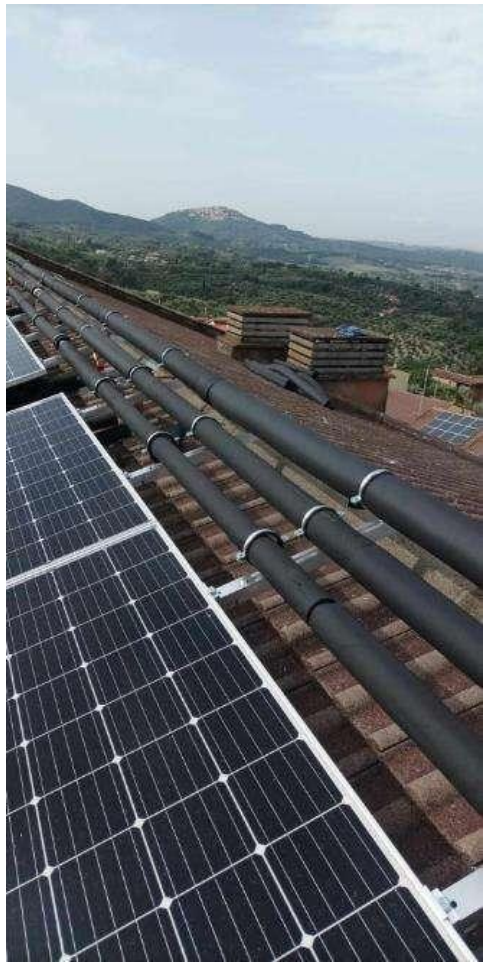
RESHeat - demo installation in Palombara

75 stationary PV/T panels installation at the ATER demo site



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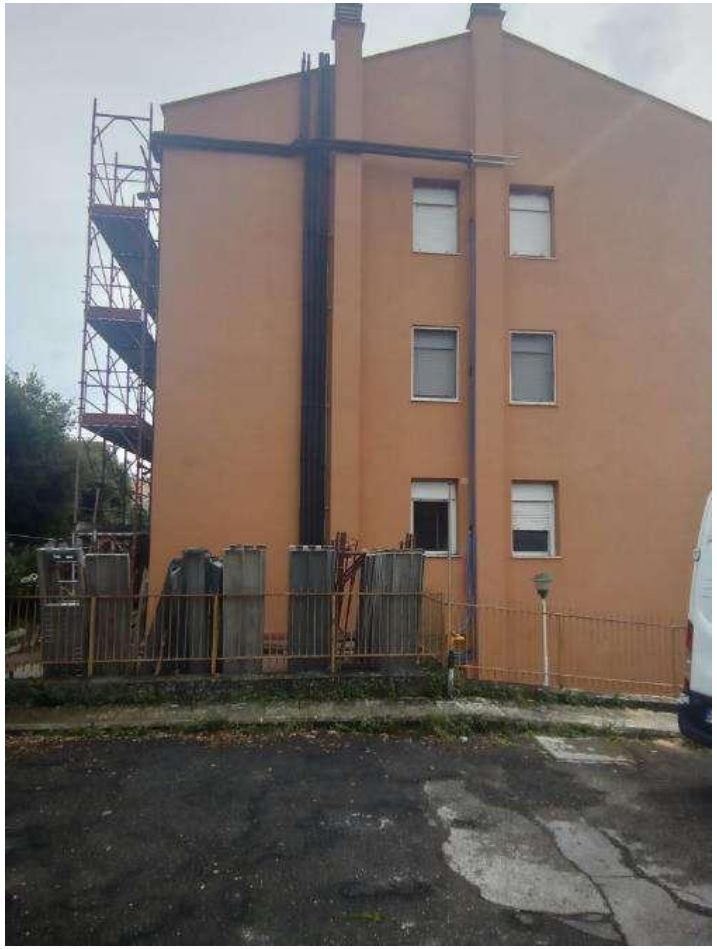
RESHeat - demo installation in Palombara

Heat pump Oilon RE56

Fan-coil

Domestic hot water tanks



Piping system

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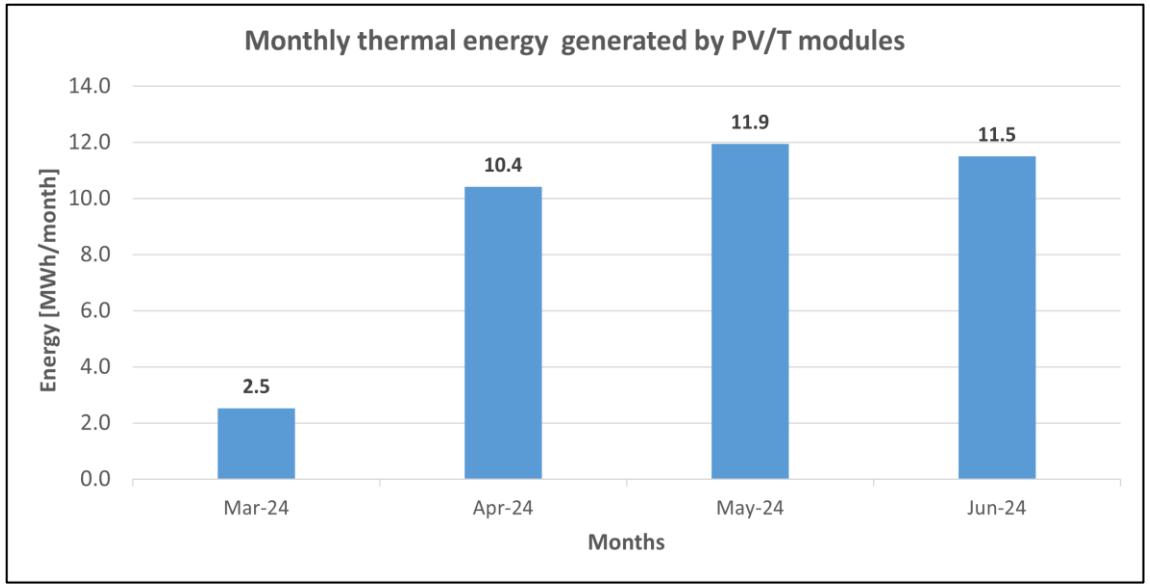
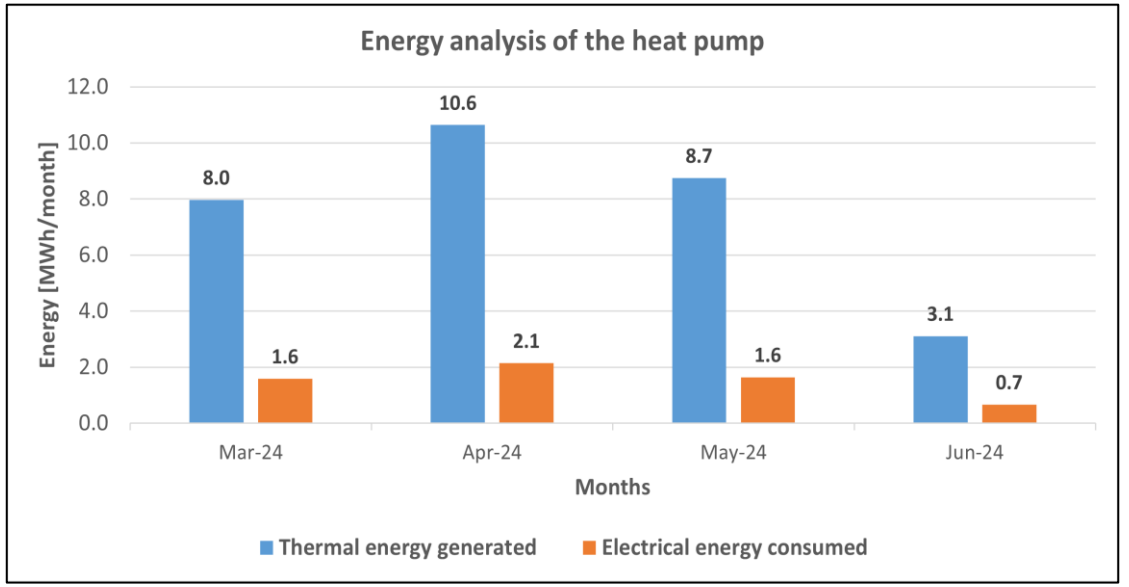
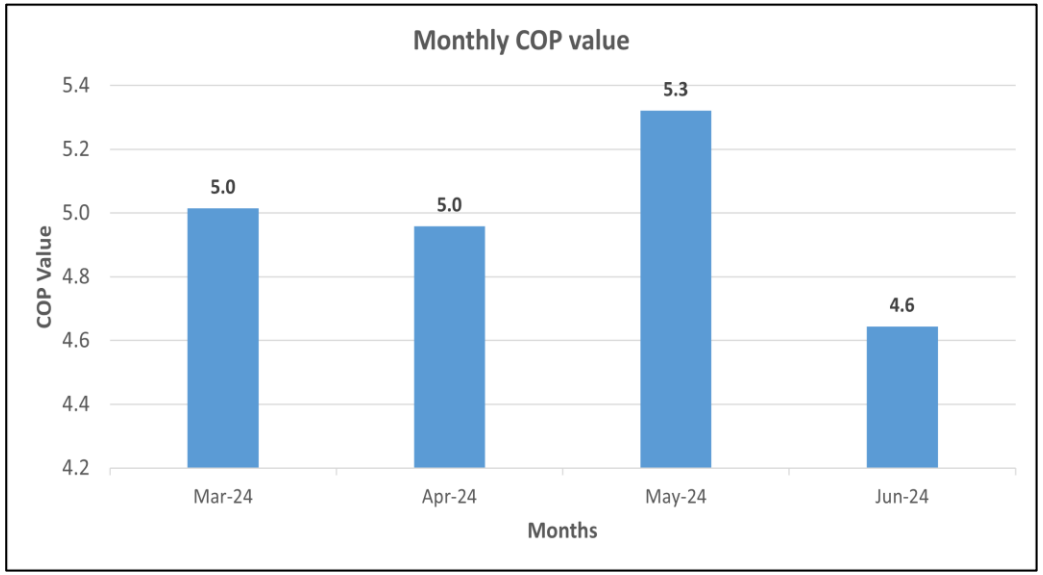
RESHeat - demo installation in Palombara







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Conclusions

RESHeat replication is an opportunity for ...

- Implementing a system for the production of electricity, and heat for heating and domestic hot water to cover **up to 70% of a** building's **total annual** energy **needs** from RES.
- ensuring **the scalability of the system** for different types and sizes of residential, public and commercial buildings.
- providing **an alternative to conventional heating systems for buildings using fossil fuels** - where gas piping or district heating networks are not possible/viable
- support for industry and SME companies facing the energy transition.

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Thank you for your attention

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