

SolAhrtal energy concept for the village of Kreuzberg

Fundamentals

- Kreuzberg 53505 Altenahr
- 200 buildings severely damaged by flooding
- 210 buildings
- Heat concept required by 2028
- Approx. 650 inhabitants

Objectives

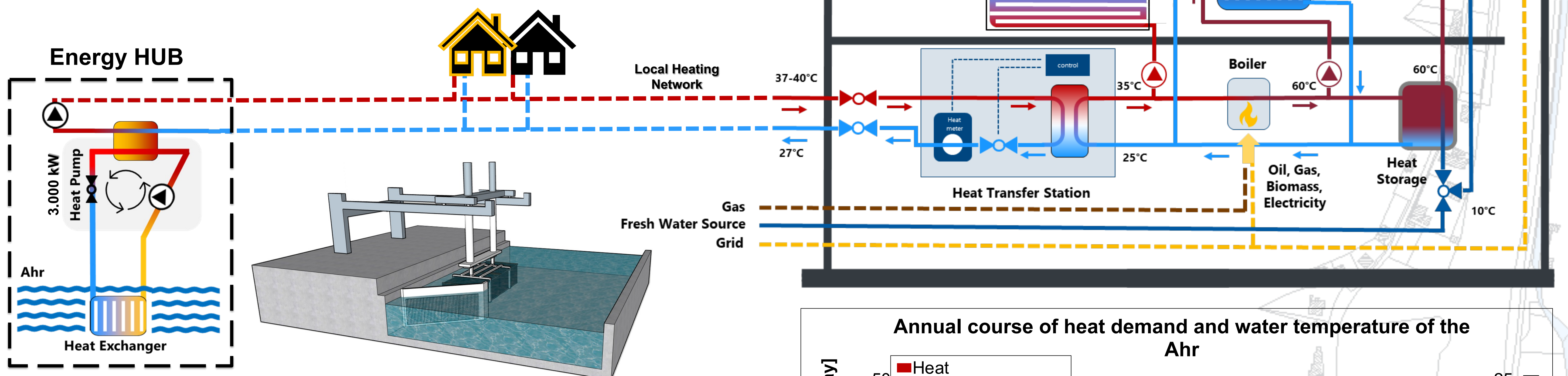
- Achieving a sustainable energy supply that is protected from significant price volatility
- Financial benefits for Kreuzberg residents through energy transition
- Enabling local heat planning through preliminary preparations

Measures

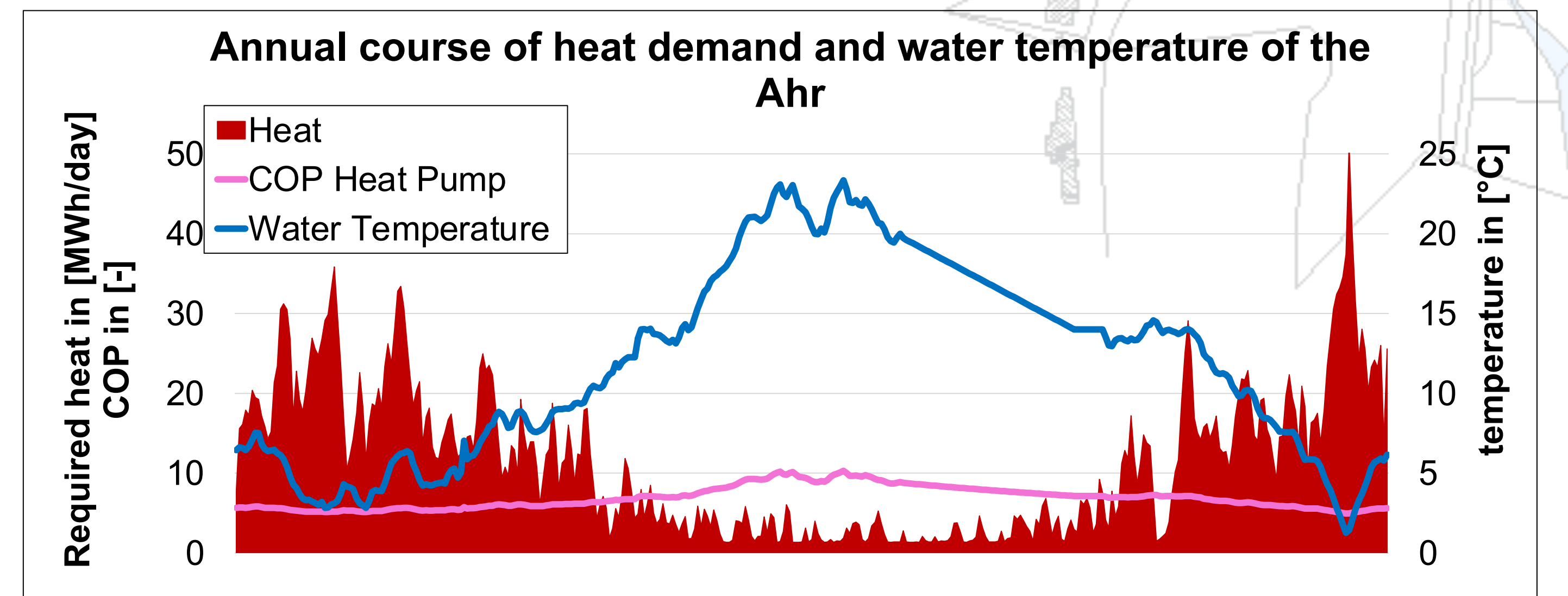
- Conducting a residential survey to evaluate building performance- and usage pattern
- Analyze possible energy potentials & grid limitations
- Implementation of a local heating network & adaptation of existing systems to reduce energy costs
- Installation of roof PV-systems by an established citizens' energy cooperative

Concept

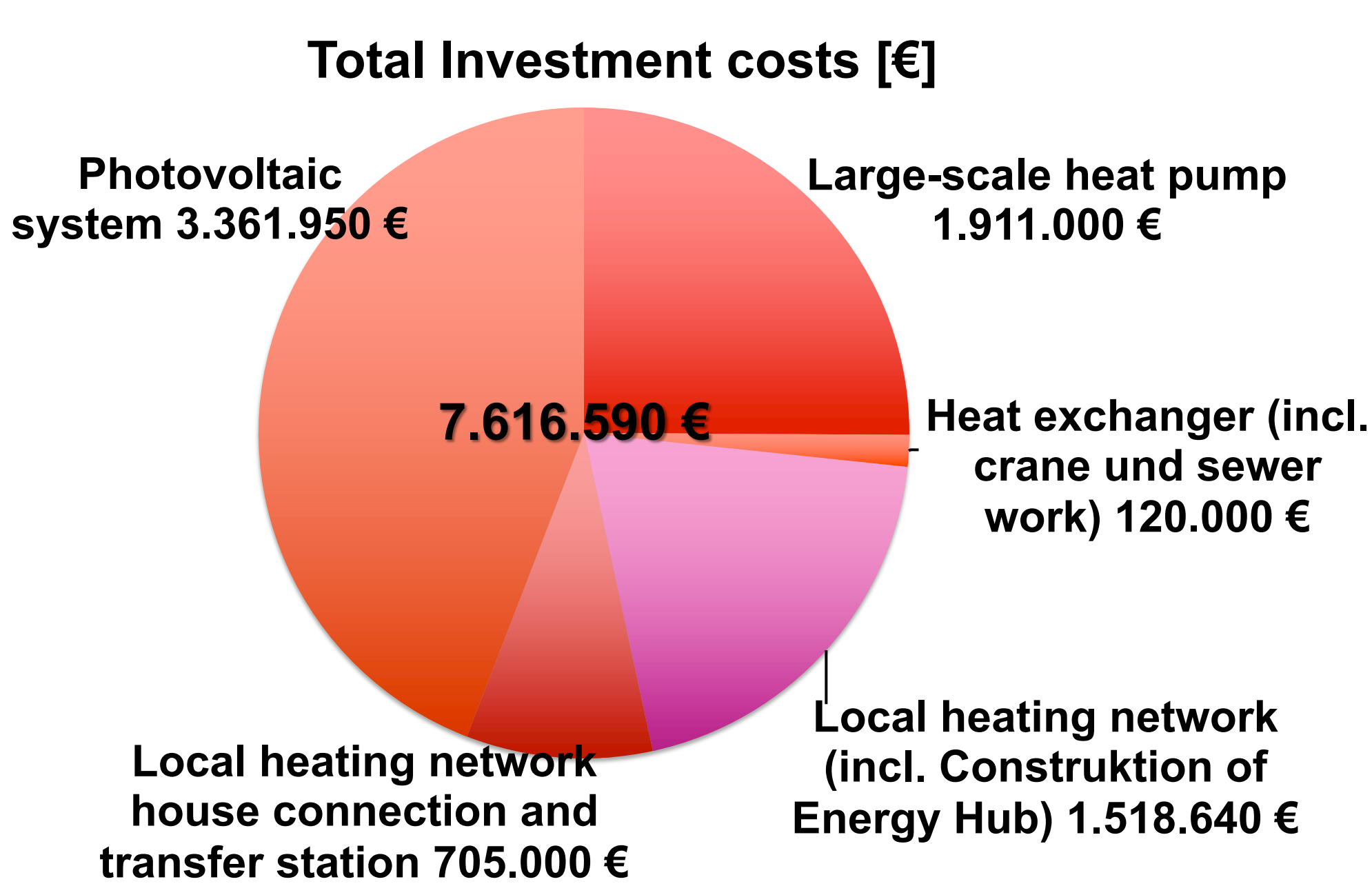
- Connecting 141 buildings to a local heating network
- Installation of 2.241 kWp decentralized Photovoltaics
- Decentralized temperature increase for low thermal performing buildings and fresh water via existing systems up to 60 °C



- Heat pump with natural refrigerant R600a extracts heat from the Ahr via river water heat exchanger, raising the temperature from 3 - 23°C to 40°C into LHN
- HP-Power supply via photovoltaics & grid, min COP 5.18 (SCOP 6)
- Parallel connection of smaller 1 MW heat pumps to take advantage of economies of scale and increasing security if supply
- Concrete gutter to ensure the water depth of at least 2 m as well as a crane system for maintenance



Costs



Finance

- Total Cost LHN 4.254.640 € (Invest after Subsidies 2.200.284 €)
 - Public Sector 1.706.784 €
 - Cost of Capital per Year 151.335 €
 - Private Sector 493.000 € (3.5 k€/household)
- Total Cost PV-Systems 3.361.950 €
 - Amortisation after 8,2 Years
- Cost of Heating Supply
 - 5.000 € (3.500 €) for network-connection
 - Basic price per month around 100 €
 - Energy Price per kWh 6,2 Cents

Side Effects of Measures

- Enables the cost-effective installation of PV systems by the energy cooperative and thus a lucrative source of income
- Creating incentives for e-mobility through PV Systems and thus a reduction in CO₂ in the mobility sector
- Enables cost-effective heat supply for years and therefore provides security
- The System adapts to existing buildings and will become more efficient in the renovation process, resulting in lower system temperatures

Conclusion

Despite limited potential for renewable energies and financial resources at the project location, an energy concept was developed that uses a 3 MW heat pump system that harnesses energy from the Ahr river and a local heating network to significantly reduce greenhouse gas emissions at a cost of € 0.062/kWh + € 100/month Base price. 141 households will be connected and the concept allows those requiring higher temperatures to integrate existing boilers to preserve post-flood investment. It is financed and operated by an energy co-operative, which creates economic and democratic participation for the local population. Harnessing the PV potential on rooftops exceeds the net-zero emissions target for connected households.

Research Project: "SolAhrtal"

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