ENERGY SUPPLY FOR THE DISTRICT FREILADEBAHNHOF IN LEIPZIG

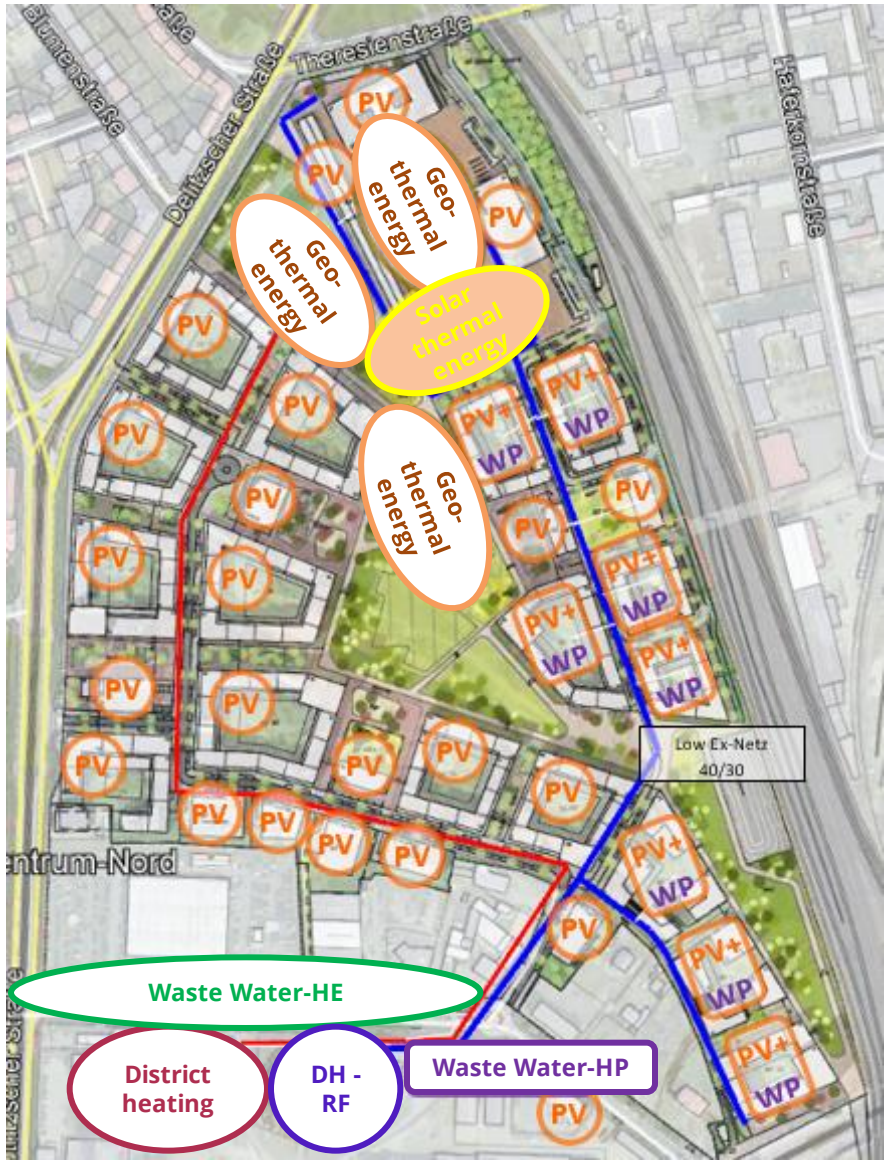
INNOVATIVE, COMFORTABLE, ECOLOGICAL, EFFICIENT, AFFORDABLE, SAFE

ENERGIEWENDE IM STADTVIERTEL: ENERGIEEFFIZIENZ IM NEUBAU

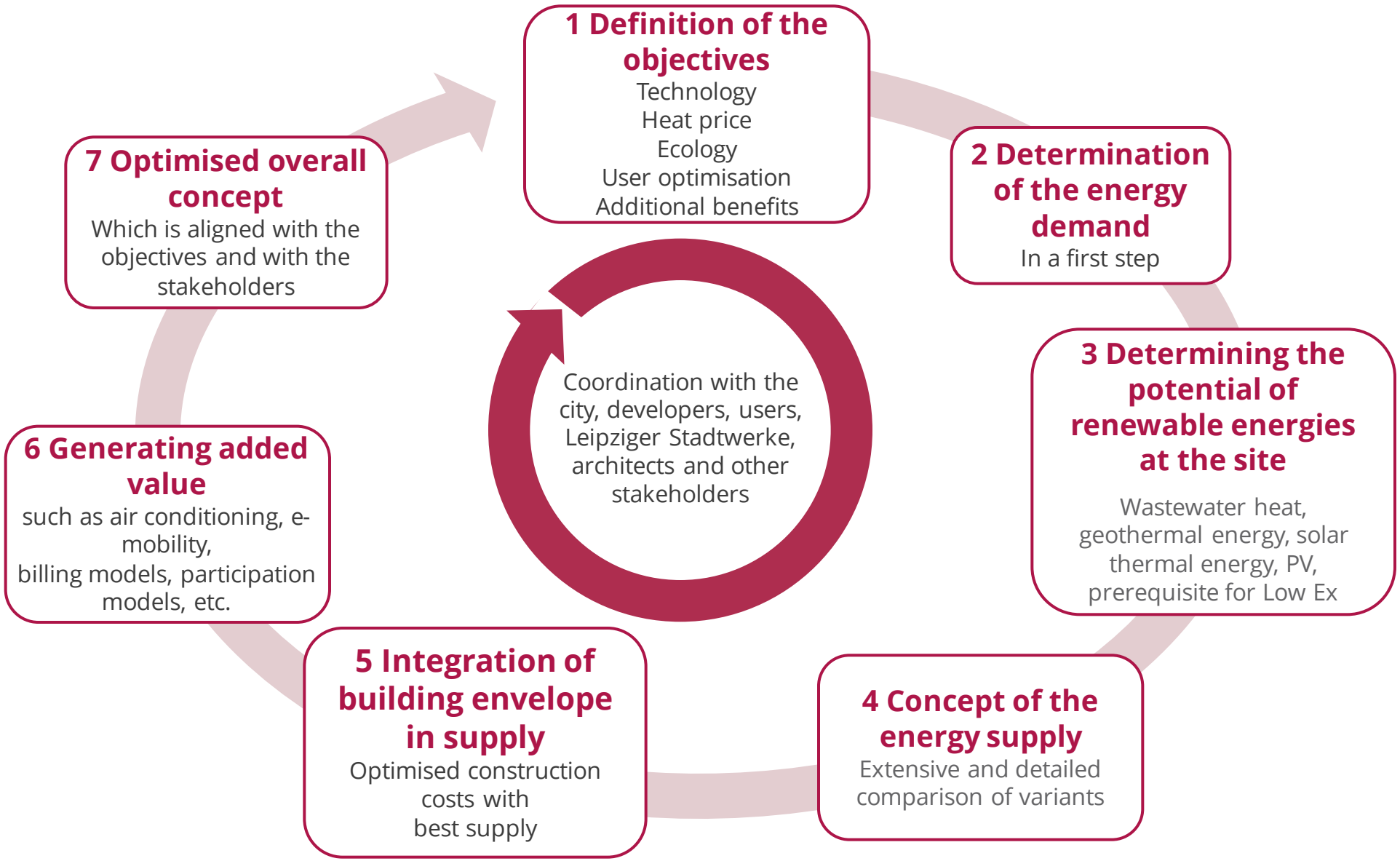
29. September 2021

REQUIREMENTS FOR AN INNOVATIVE ENERGY CONCEPT

- affordable, i.e. socially acceptable, energy costs
- from an ecological point of view, exemplary for Leipzig and beyond
- exploitation of the potential of renewable energy sources at the site
- highly efficient with the lowest possible losses
- avoidance of excessive construction costs for insulation
- low costs for the supplier and operator



APPROACH TO THE CONCEPTION



SUMMARY

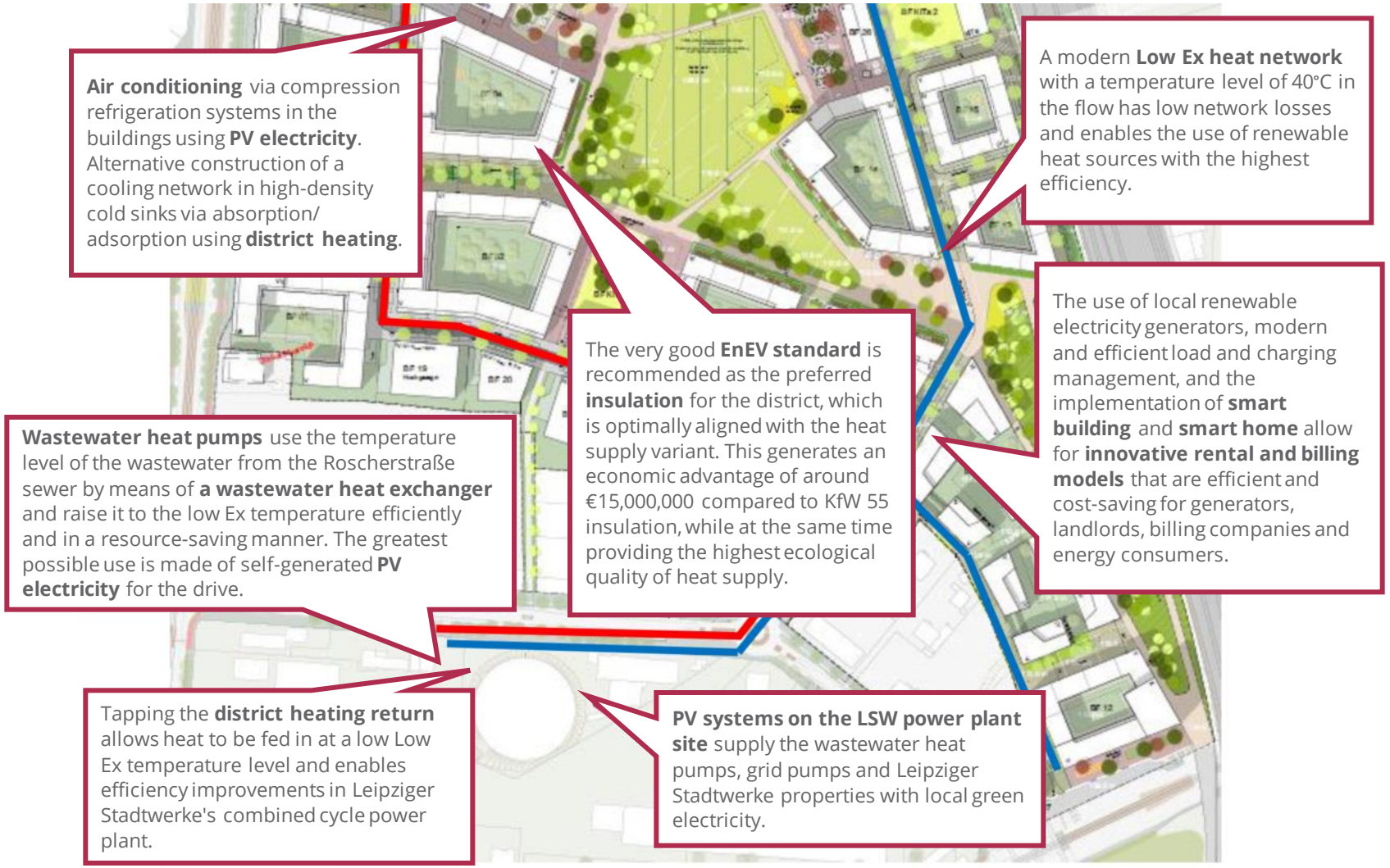
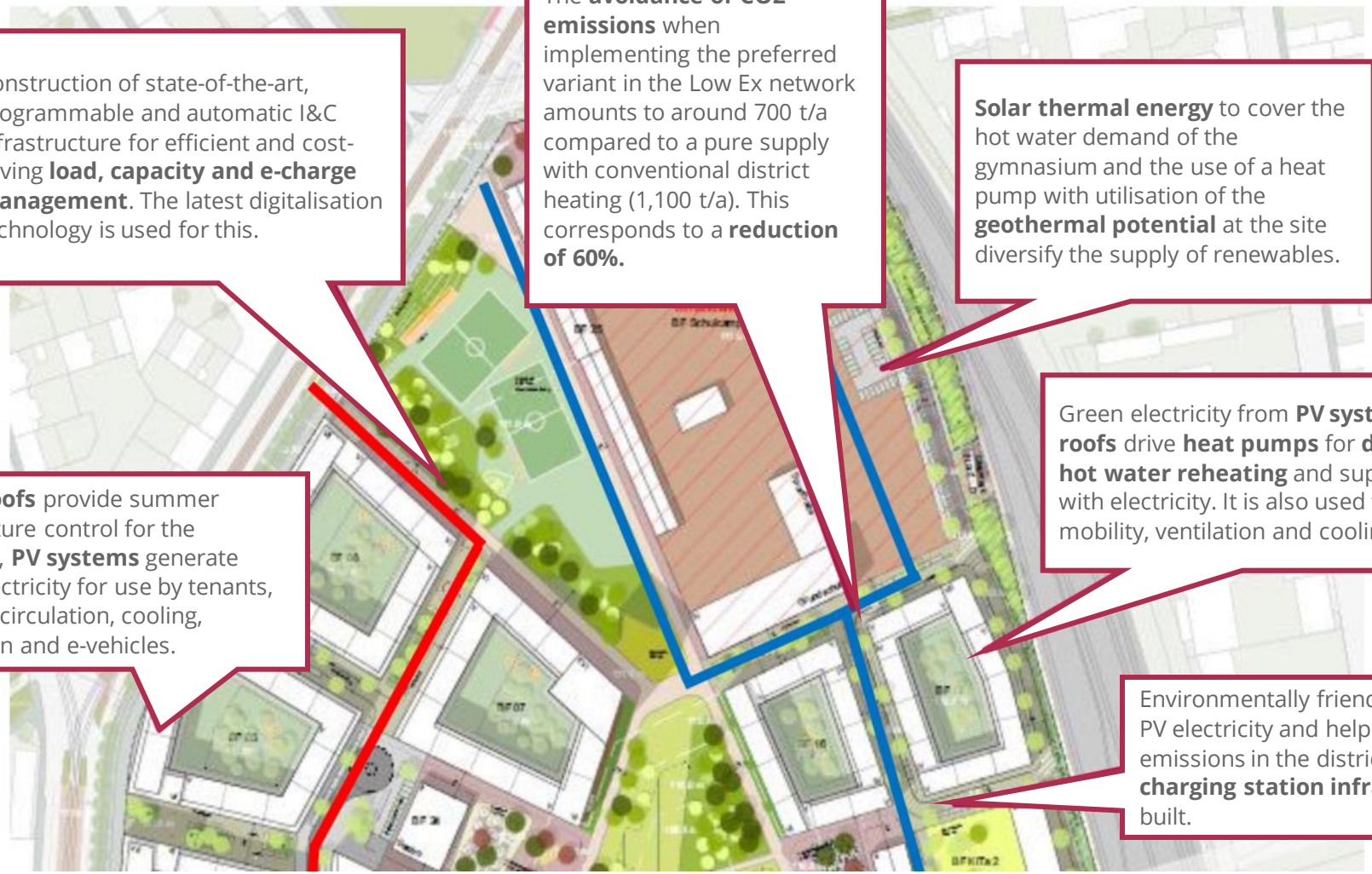


Figure 1: An innovative, modern and environmentally friendly energy supply for the new quarter on Freiladebahnhof

SUMMARY



Construction of state-of-the-art, programmable and automatic I&C infrastructure for efficient and cost-saving **load, capacity and e-charge management**. The latest digitalisation technology is used for this.

The **avoidance of CO2 emissions** when implementing the preferred variant in the Low Ex network amounts to around 700 t/a compared to a pure supply with conventional district heating (1,100 t/a). This corresponds to a **reduction of 60%.**

Solar thermal energy to cover the hot water demand of the gymnasium and the use of a heat pump with utilisation of the **geothermal potential** at the site diversify the supply of renewables.

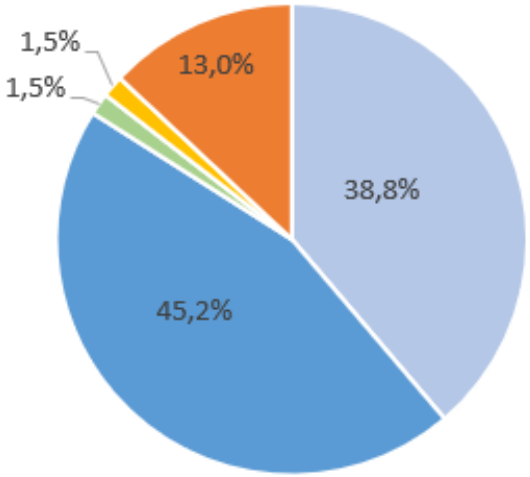
Green electricity from **PV systems on roofs** drive **heat pumps** for **domestic hot water reheating** and supply tenants with electricity. It is also used for e-mobility, ventilation and cooling.

Green roofs provide summer temperature control for the buildings, **PV systems** generate green electricity for use by tenants, for DHW circulation, cooling, ventilation and e-vehicles.

Environmentally friendly **e-mobiles** use PV electricity and help to avoid charging emissions in the district. In addition, an **e-charging station infrastructure** is being built.

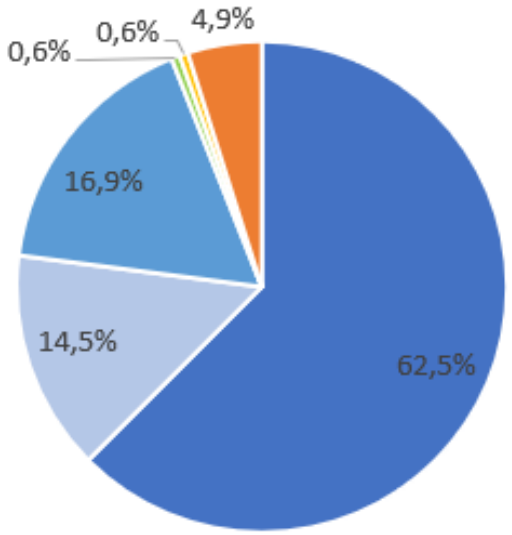
USE OF RENEWABLE ENERGIES IN THE DISTRICT

Heat supply area WNS 4.0



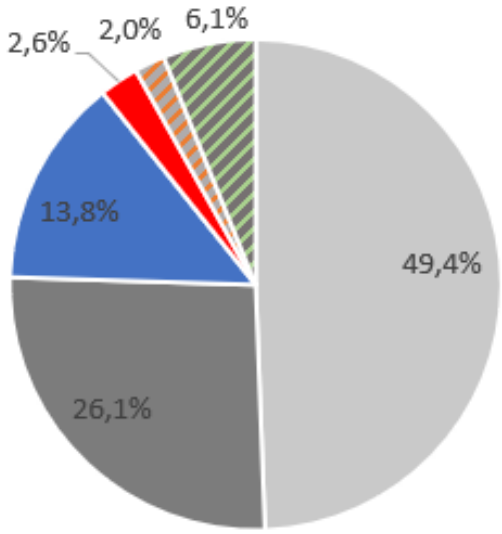
Heat demand WNS 4.0:
6,900 MWh/a

Total heat supply area



Total heat demand:
18,300 MWh/a

Heat supply BRD 2017



Source:
Statistisches Bundesamt

- DH-RF
- Heat pumps with PV electricity
- Electricity (conventional)
- Wastewater heat incl. PV electricity
- Natural gas
- Heat pumps with conv. electricity
- Geothermal heat
- Heating oil
- Wood, coal
- Solar thermal energy
- District heating conventional

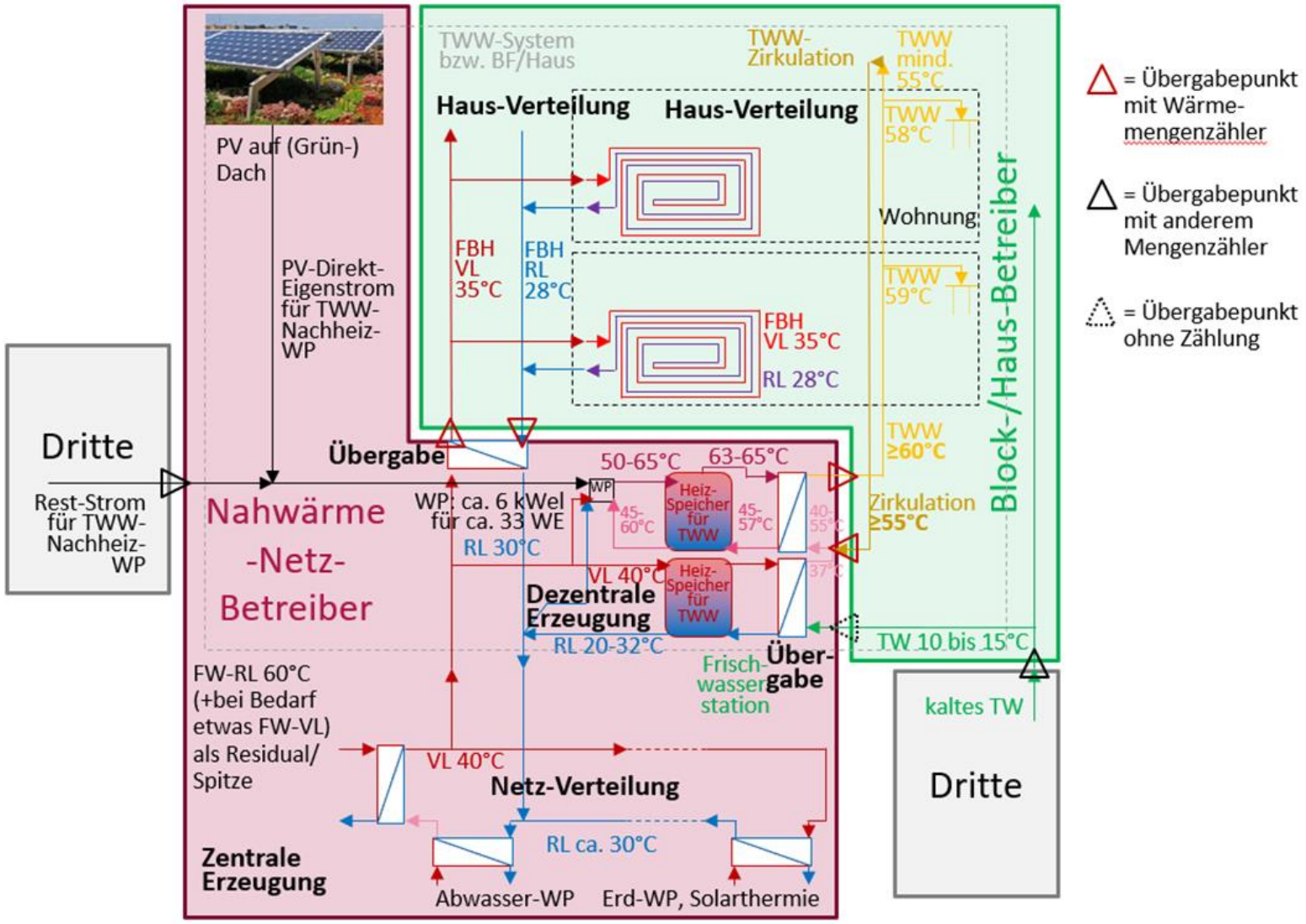
Primary energy factor as an indicator of ecological heat supply		
0,24	0,29	1,3 (Natural gas and oil boilers)
CO_2-emissions from heat generation		
61 g/kWh	119 g/kWh	220 bis 300 g/kWh (Gas, oil)

Source: https://de.statista.com/statistik/daten/studie/162218/umfrage/beheizungsstruktur-des-wohnbestandes-in-deutschland-seit-1975/

USE OF RENEWABLE ENERGIES IN THE DISTRICT - PHOTOVOLTAICS

- The energy concept provides for the maximum possible expansion of photovoltaic systems on roofs in the district.
- The concept allows for a wide range of uses within the district for:
  - ecological heat generation,
  - air-conditioning of the residential and office buildings, the school and the retail trade,
  - covering the electricity needs of the tenants in the flats,
  - for the charging of e-mobiles, and
  - for street lighting

CONCEIVED SUPPLY SCHEME IN THE DISTRICT



OPTIMISED APPROACH: CONSUMPTION TO SUPPLY VICE VERSA

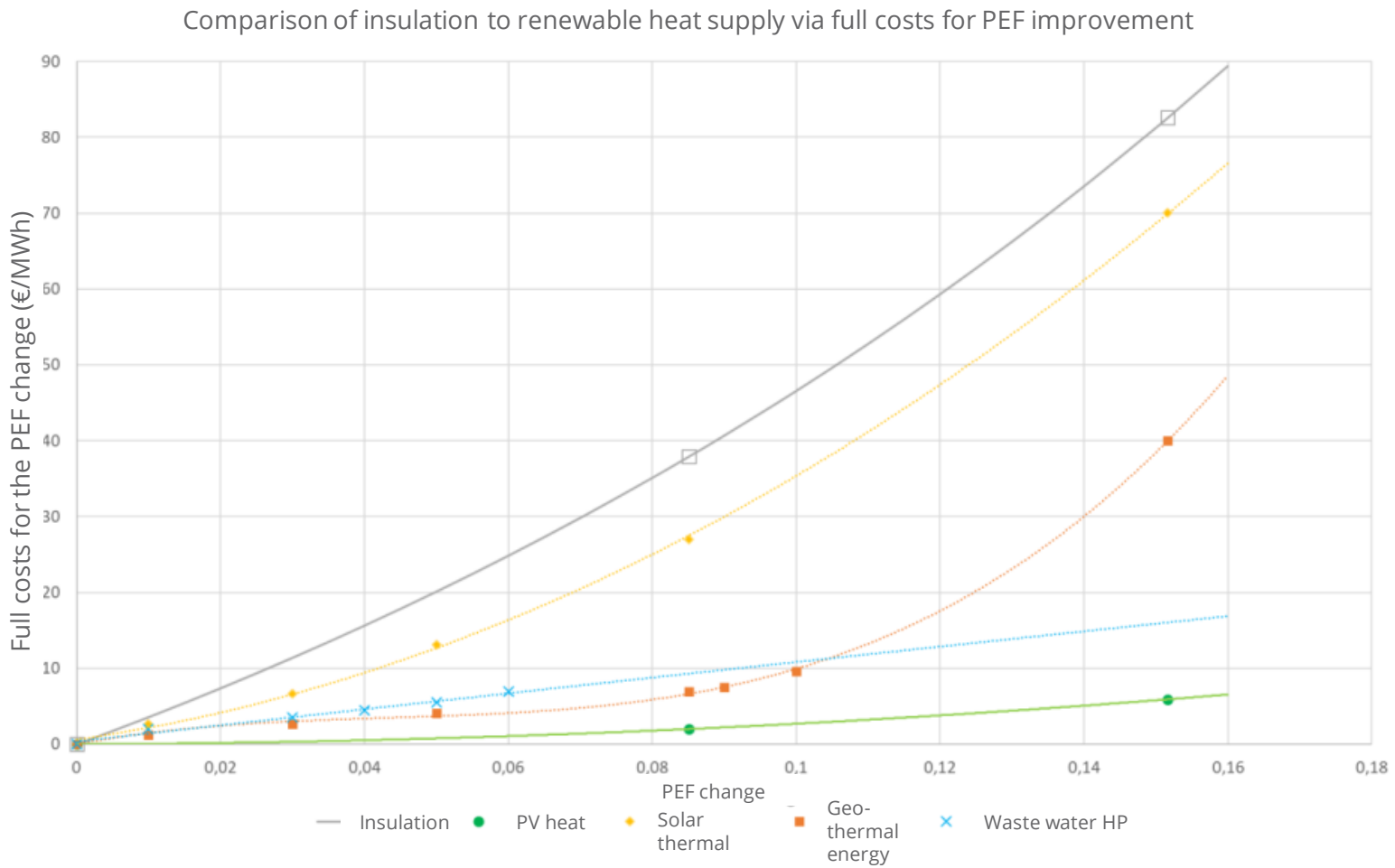


Figure 7: Comparison of insulation to renewable heat supply over the full costs to PEF change (own calculation and representation)

RESULTS

- ✓ Socially acceptable heating prices at the level of the Leipzig district heating prices with less than 9.50 ct/kWh and 60 ct/m² living space and month (cf. Germany: 1.0 €/m²*M) (all values gross)
- ✓ (Over-)fulfilment of the ecological requirements of a district supply system
- ✓ Maximum utilisation of the potential for renewable energies at the location under technical aspects and economic justifiability
- ✓ Highest efficiency of heat distribution via a 40˚C grid in the western area
- ✓ Reduction of construction costs by 2-digit million € through optimised insulation (GEG - lowest energy standard) for this ecological standard of heat
- ✓ Use of state-of-the-art, intelligent and automated control of all producers, distribution, storage and users ("smart home") to increase efficiency, comfort and reduce energy costs.

GEMEINSAM DEN WANDEL GESTALTEN

WIR FREUEN UNS AUF DIE
GEMEINSAME ZUSAMMENARBEIT!

SEBASTIAN KROEMER

Senior Manager Tilia GmbH

Inselstr. 31 04103 Leipzig

0341 2008 98 50 / +49 174 933 14 00

sebastian.kroemer@tilia.info

Back-Up

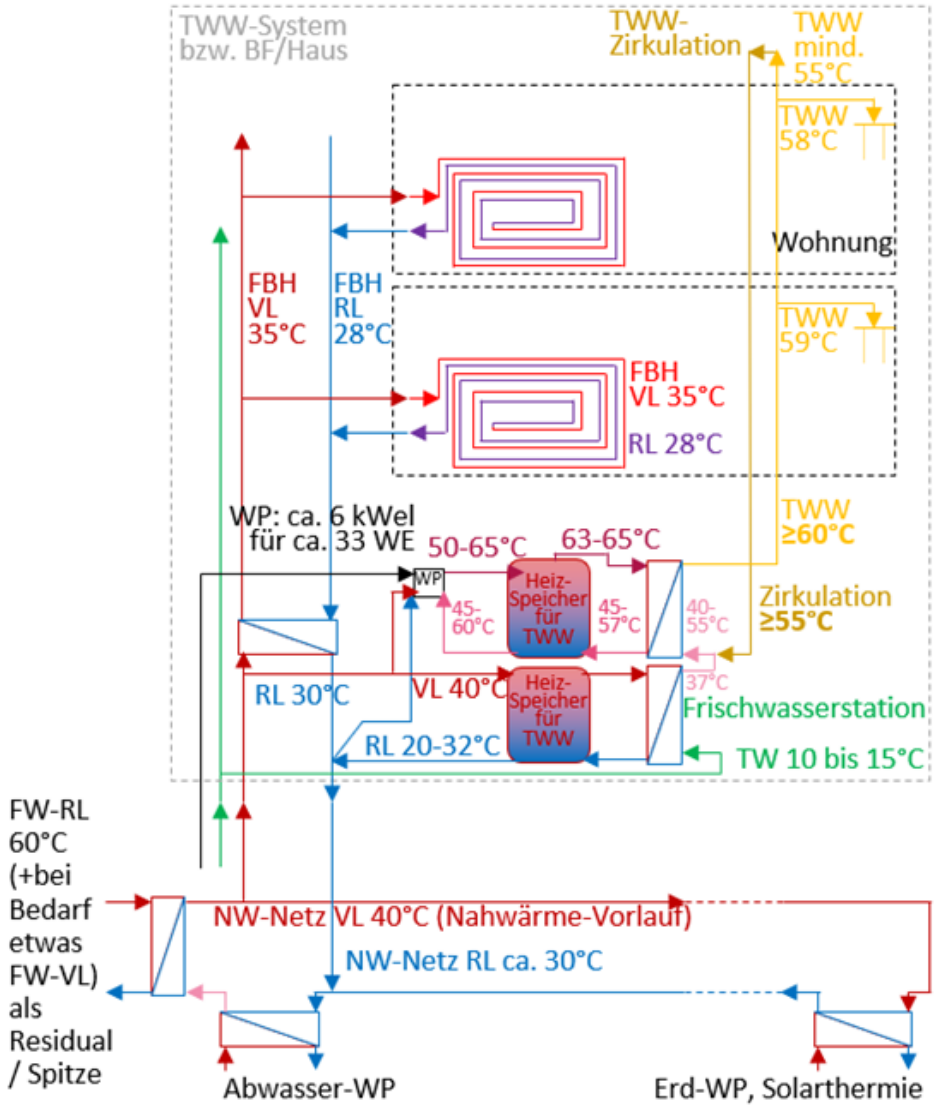
ÜBERSICHT UND ZUSAMMENFASSUNG

Abbildung 1: Lage des Quartiers im Stadtgebiet mit „WNS 4.0-Gebiet" (blau), Zustand vor Neubau

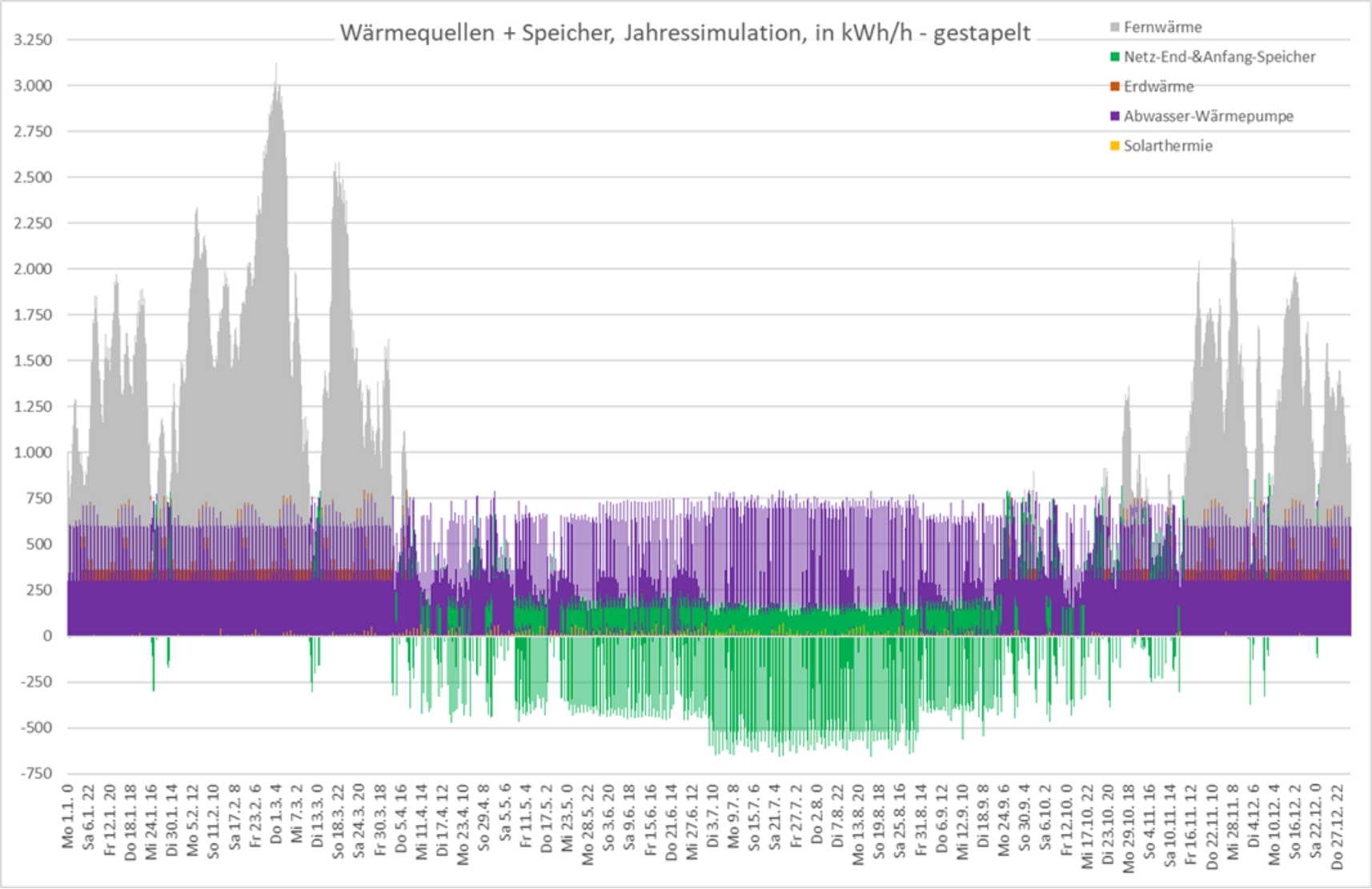
Abbildung 1: Eine innovative, moderne und umweltfreundliche Energieversorgung für das neue Quartier auf dem Freiladebahnhof

KONZIPIERTE VERSORGUNGSVARIANTE IM GEBÄUDE

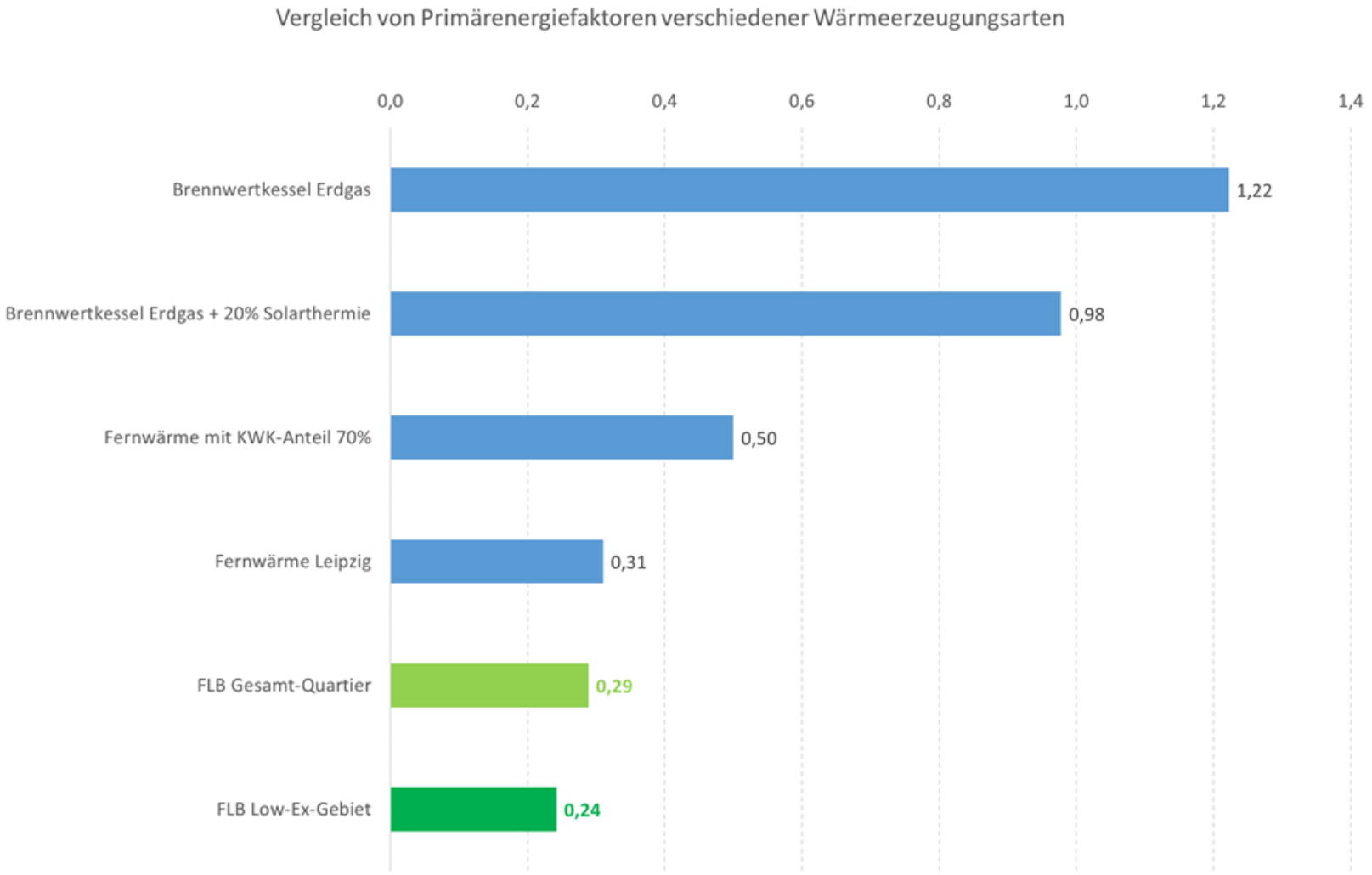
Spezifika	5.) 2-Leiter+Hygien. per WP
Vorlauf-Temperatur	40°C (oder 55°C)
Ausgelegt für	FBH; TWW-Ltg. & Zirk.&FWS & Heiz-Speicher-f.-TWW-**Vorwärm.+ WP (als PV-PtH)**
Invest Netz	durchschnittlich
Invest Hausübergabe	durchschnittlich
Invest Gebäude-Installation	FWS & HeizSpeicher + TW-Leitung + Zirkul. relativ günstig
Platz-Bedarf	Standard + integr-ierte Heizst./ WP
Invest + Betrieb Strom-Anbindung	Großer Stromanschluss
Invest FW-Übergabe	mittel
Hausverlust	Standard (Zirkulation)
Netzverlust	-40%; -60%
Netz abschaltbar?	Falls El./WP 100% des TWW schafft
Kühlung möglich?	Falls El. 100% kann
Betriebskosten Netz	Mittel
Betriebskosten Gebäude-Installation	Standard
PEF	sehr gut 0,26
Gestehungskosten	minimal



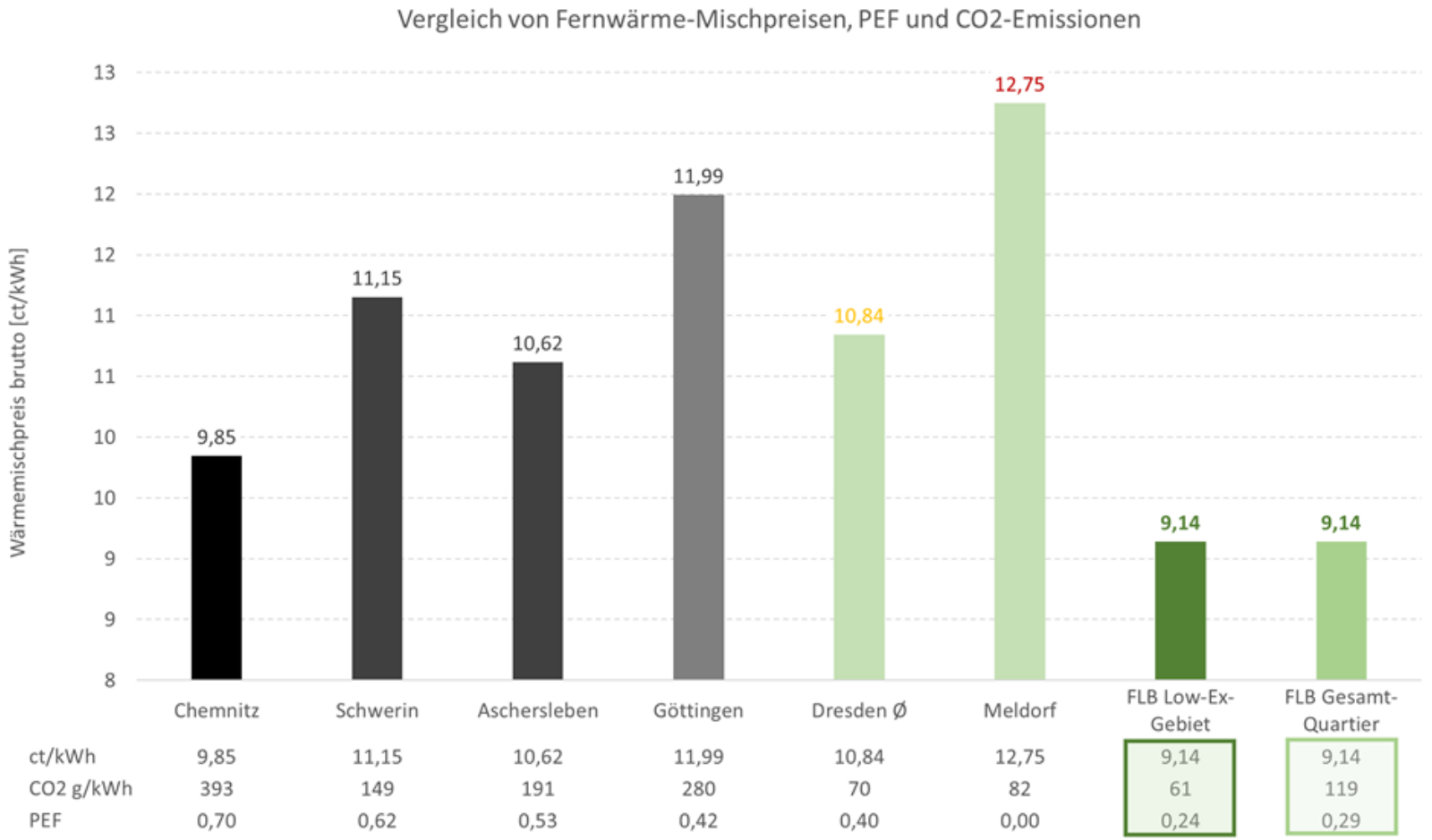
SIMULATION JAHRESLASTGANG WÄRME



VERGLEICH VON PRIMÄRENERGIEFAKTOREN



VERGLEICH VON FW-MISCHPREISEN, PEF UND CO2



- Andere Netze: KWK 90%...98%: Künftig bei GEG-Carnot- statt Stromgutschriftmethode deren PEF wesentlich schlechter
- Preise entspr. Beispielwohnung mit Wohnfläche von 75 m² und Wärmeverbrauch von 4.469 kWh/a
- Preise anderer Städte laut deren aktuellen Preisblättern (2019)

MESSBARE WERTE SCHAFFEN

VIELEN DANK!