

## A project of the initiative "Reallabore der Energiewende"

The living laboratory DELTA (funding code: 03EWR002A-K) acts as a showcase for the urban energy transition to demonstrate interacting energy-optimized districts. The aim is to show that proven techniques for increasing energy efficiency and flexibility are economically feasible and socially acceptable. For this purpose, various optimization potentials regarding technological and regulatory scope are identified and tested in seven sub-projects located throughout Darmstadt (see Fig. 1). This includes e.g., a low exergy industry heat network, a flexible urban medium voltage grid and an energy-optimized residential district (sub-project 1), with ISM+D in the lead. Additionally, the development of

Innovative (cooperative) business models is essential in order to be able to operate the emerging energy system without subsidies and to allow all stakeholders of the energy system to participate in the energetic and economic potentials. Within the project, a multi-layered, cross-sectoral approach is pursued. The focus is on consistently increasing the energy efficiency of all sectors, which is already seen today as the greatest usable potential of the energy transition. This will be achieved by intelligently linking individual districts of the urban energy system as well as by sector coupling.

### Sub-project 1: Energy-optimized residential district

To be able to implement the climate and energy policy goals of the German government in the building sector, it is necessary to increase energy efficiency and energy flexibility through the use of innovative building technology in addition to the use of sustainable building materials. In combination with intelligent, electrical and thermal networking, this forms the cornerstone of current energy-optimized residential districts. In the first sub-project, several approaches to climate protection are considered during the development of a new urban district in Darmstadt ("Ludwigshöhviertel", see Fig. 2) with around 3000 residents, daycare centers, a local supermarket and other commercial areas. The approaches consists of:

- the energy efficiency of individual buildings in production, operation and deconstruction
- a heat supply with exclusively locally available renewable energies
- a supplementary generation of electricity from photovoltaics on rented residential buildings including electricity supply for tenants
- the provision of e-charging stations with electricity from renewable energy
- the optimization of own electricity use via control systems of heat pumps and e-charging stations
- the sensitization of tenants to energy-saving living behavior

#### ISM+D Tasks:

As a research institute with experience from previous district-related energy projects, the ISM+D is primarily tasked with implementing, accompanying and coordinating the measures (M 1.1 – M 1.8) mentioned below. The focus is on optimizing the new construction of a residential district with regard to energy-efficient construction and energy system planning, see Fig. 3.



Fig. 1: Multi-layered and cross-sectoral approach of DELTA



Fig. 2: Site plan of Ludwigshöhviertel

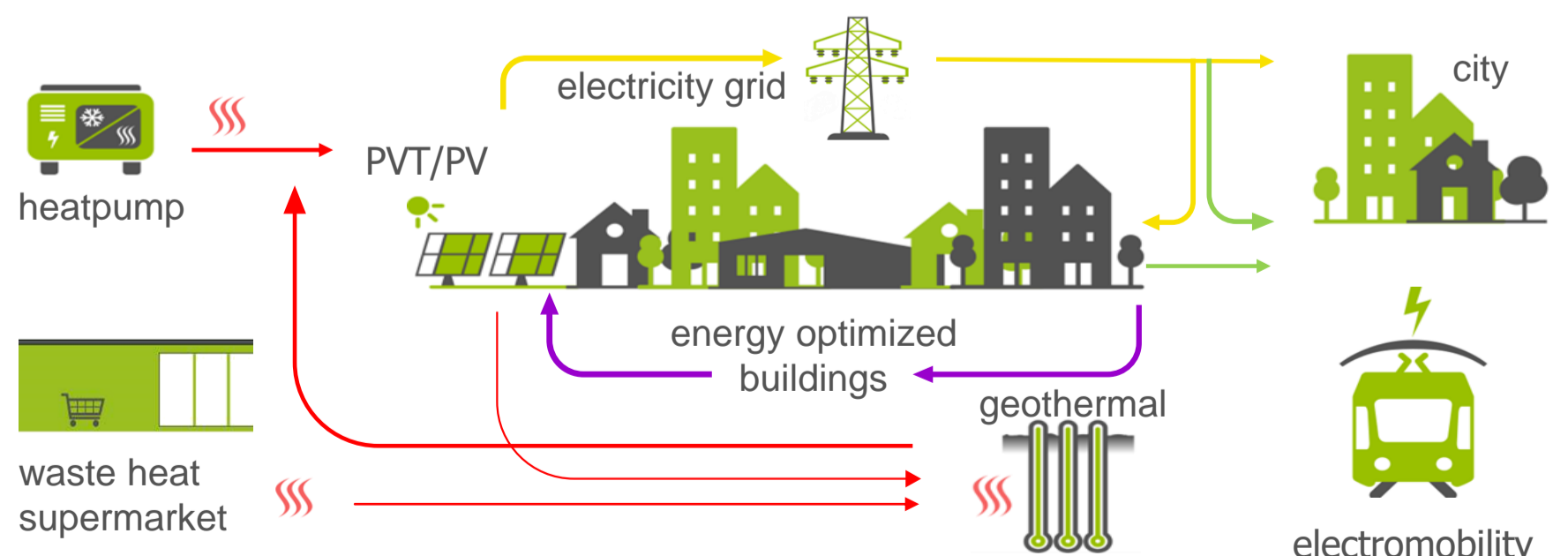


Fig. 3: Energy scheme of Ludwigshöhviertel (low temperature network, electromobility and photovoltaic power)

#### M 1.1

Use of lifecycle-optimized building components and resource-saving materials

#### M 1.2

Energy-active facades and roofs: integration of photovoltaic (PV), photovoltaic-thermal collectors (PVT), or greening

#### M 1.3

Installation of ventilation systems with high heat recovery and low maintenance

#### M 1.4

Creation of a smart energy management system for CO<sub>2</sub>-optimized control of the energy supply system and connected e-charging stations

#### M 1.5

Low temperature heat supply of energy-optimized buildings: geothermal and heat pump technology/regeneration via commercial waste heat, PVT modules and floor cooling

#### M 1.6

Electromobility concept in the district

#### M 1.7

Identification of new business models of innovative system solutions

#### M 1.8

Transferability and scaling of the newly acquired knowledge to further residential districts