

# THE DECENTRAL DISTRICT HEATING NETWORK IN HAMBURG WILHELMSBURG

03.06.2014, Hamburg



# AGENDA

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**1**

**HAMBURG ENERGIE**

**2**

**PROJECTS IN WILHELMSBURG**

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**HAMBURG ENERGIE**

**2**

**PROJECTS IN WILHELMSBURG**

# HAMBURG ENERGIE – OVERVIEW

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**The municipal energy utility HAMBURG ENERGIE GmbH was founded in 2009**

**HAMBURG ENERGIE provides a renewable and sustainable energy supply for the metropolitan area of Hamburg**

## **Main goals:**

- Energy supply: in the best interests of the public and region of Hamburg
- Electricity market: offering favourable products free of coal- and nuclear-power
- Electricity retailing: 50% demand-coverage by own renewable energy production facilities

## **Products:**

- Electricity, Natural Gas, Thermal Energy/District Heating, Energy Services (e.g. Balance Energy, Smart Metering,...)





# HAMBURG ENERGIE

## Value chain

### Energy supply

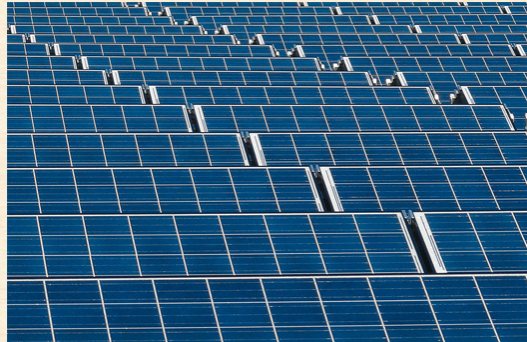
- Favourable products
- Free of coal- and nuclear power
- Electricity, Natural Gas, Thermal Energy/ District Heating

### Production

- Production of heat and power by own regenerative production facilities
- Independence of centralized power plants
- Citizen-participation-models to finance power plants

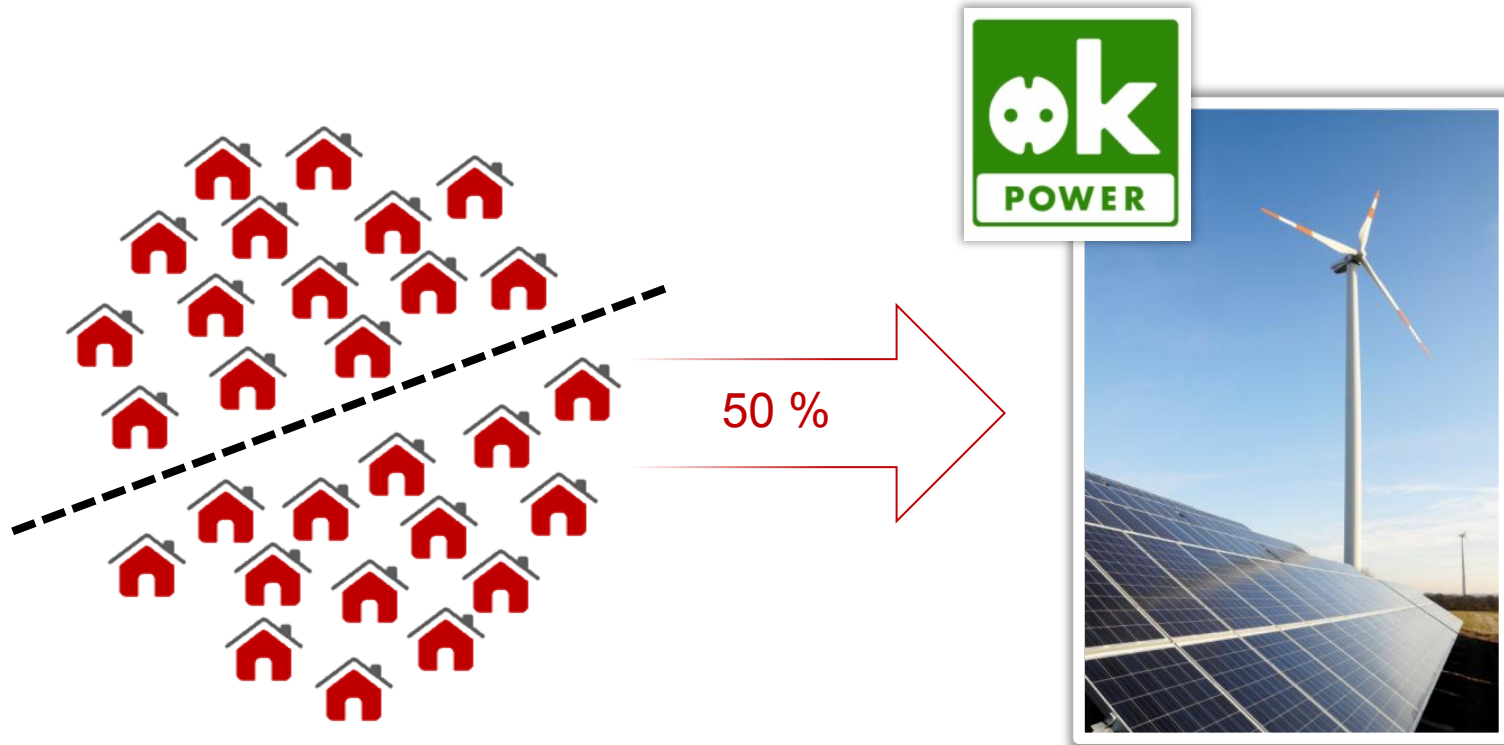
### Services

- Coverage of entire energy supply chain
- Contracting
- Direct marketing
- Control reserve



# HAMBURG ENERGIE

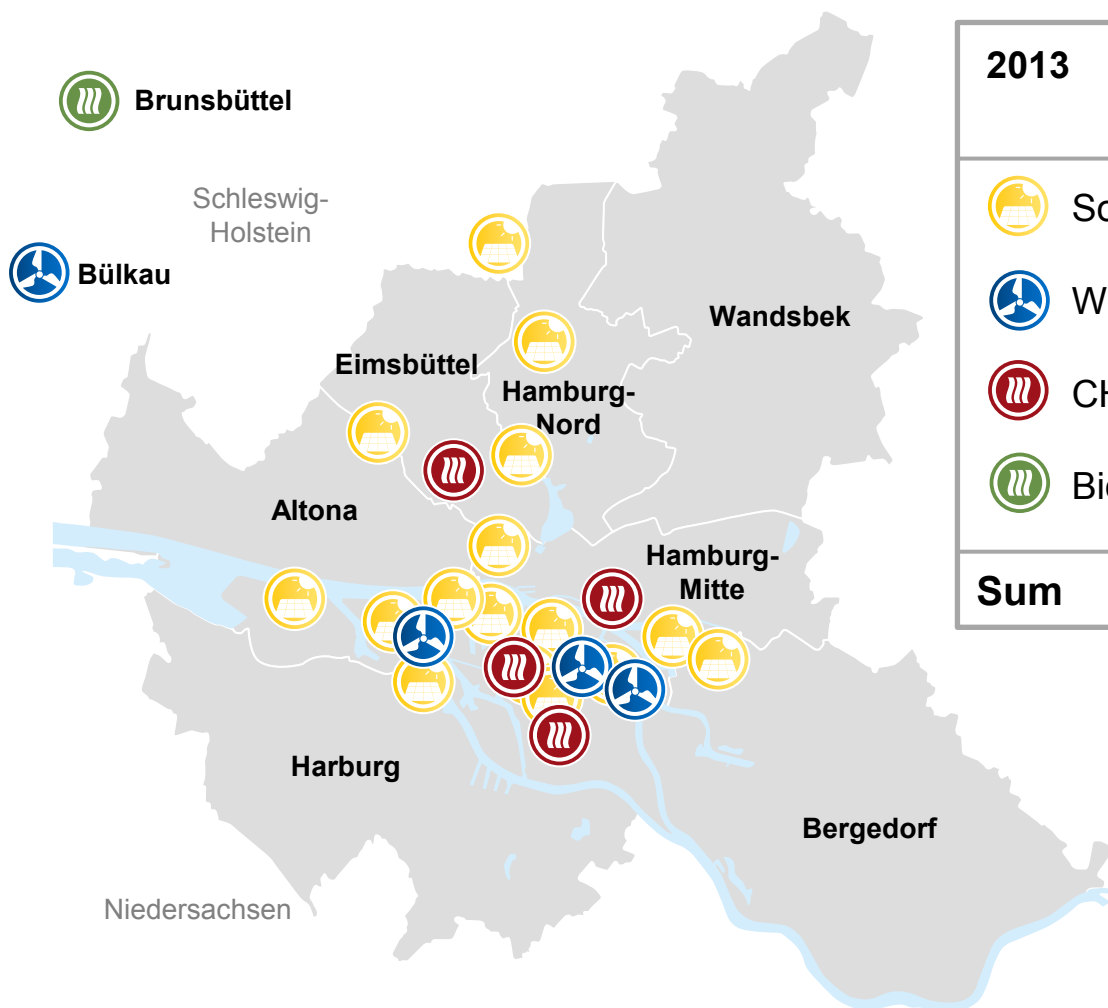
Electricity retailing







**commitment: producing 50 % of energy sold by own renewable production facilities within 5 years.**

# HAMBURG ENERGIE

## Production sites within Hamburg

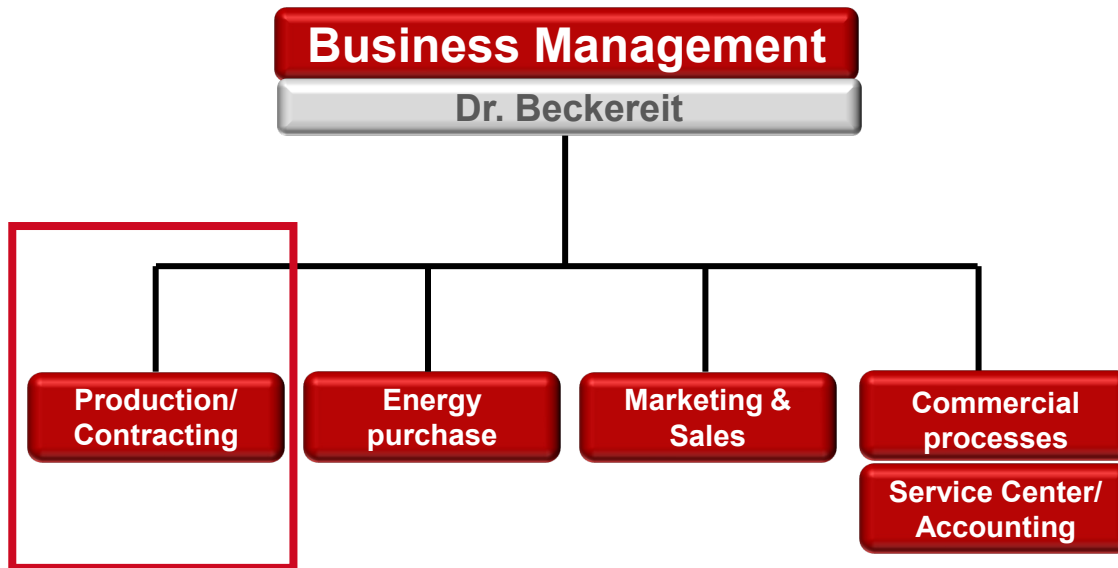


2013		No.	Power [kW <sub>el</sub> ]	Work [Mio. kWh <sub>el</sub> ]
	Solar	27	11.900	11,1
	Wind	6	13.400	28,9
	CHP	4	1.500	10,0
	Biomass	1	5.400	31,5
Sum			32.200 kW <sub>el</sub>	81,5 Mio. kWh <sub>el</sub>

**HE invested more than  
75 Mio.€**

# HAMBURG ENERGIE

## Sectors





# AGENDA

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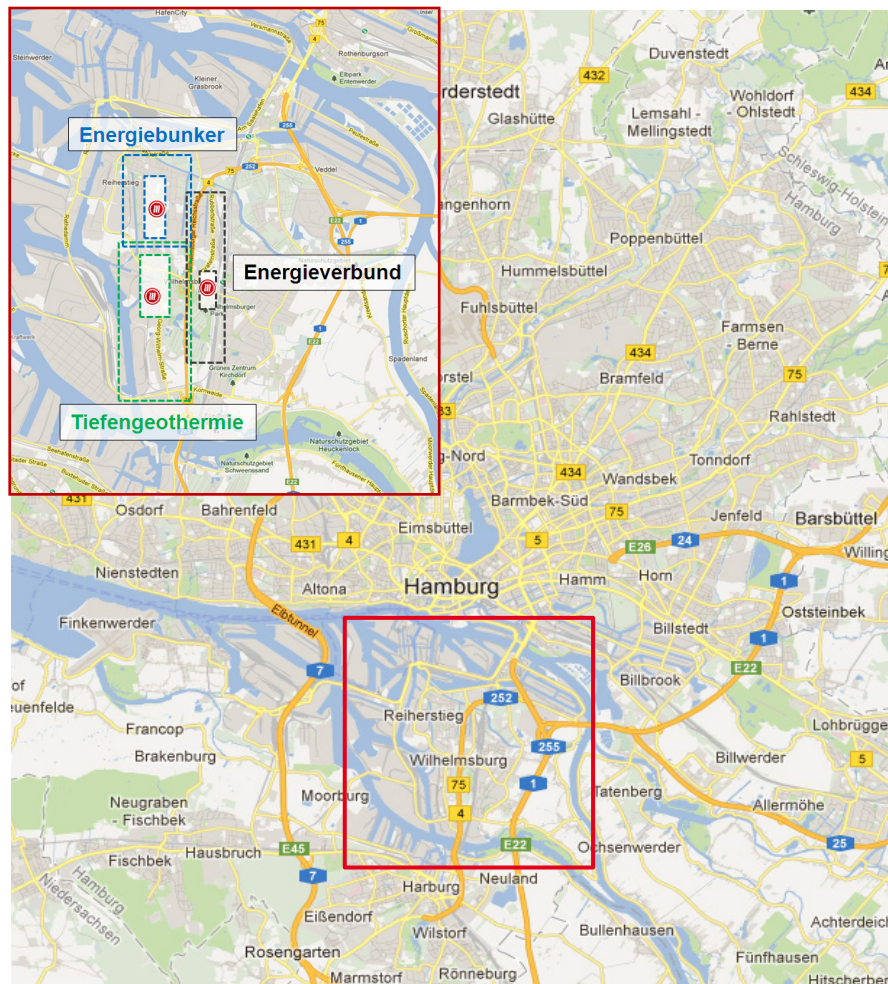
**HAMBURG ENERGIE**

2

**PROJECTS IN WILHELMSBURG**

# DISTRICT HEATING SYSTEMS

## Projects in Wilhelmsburg



# ENERGIEBUNKER WILHELMSBURG

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## Energiebunker Wilhelmsburg – a project idea of the IBA Hamburg

- Located on the Elbe island “Wilhelmsburg” - the building exhibition “Internationale Bauausstellung (IBA) Hamburg” develops solutions for the future of the metropolis.
- One key theme of the IBA Hamburg: “Cities and Climate Change”
- In this context several projects for an energy-supply based on renewable energies have been initiated - amongst others the

### Energiebunker Wilhelmsburg

- The project Energiebunker is funded by the European Regional Development Fund (ERDF)



EUROPÄISCHE UNION  
Europäischer Fonds für  
regionale Entwicklung

# ENERGIEBUNKER WILHELMSBURG

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## History of the Energiebunker

- > 1943      Completion of the anti-aircraft bunker as part of the aerial defence Hamburg
- > 1947      „Softening“ & destabilization of the bunker's structure due to detonations by the British Army
- > 1947-2010    63 years the Energiebunker remains unused
- > 2010-2013    Refurbishment of the bunker by IBA Hamburg.



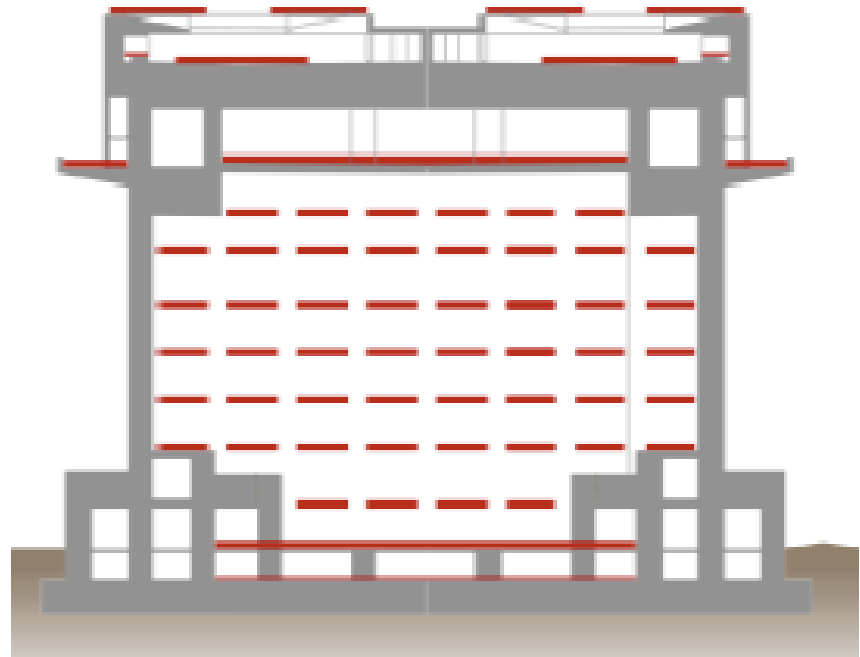


# ENERGIEBUNKER WILHELMSBURG

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## Energiebunker – key figures

- base area: 45 m x 45 m
- height: 47 m
- number of storeys: 10
- 80.000 m<sup>3</sup> of reinforced concrete
- wall thickness: 2 m
- ceiling thickness: 3,5 m





# HAMBURG ENERGIE – ENERGIEBUNKER WILHELMSBURG

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IBA Hamburg GmbH/Johannes Arlt

# HAMBURG ENERGIE – ENERGIEBUNKER WILHELMSBURG

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IBA Hamburg GmbH/Johannes Arlt

# ENERGIEBUNKER WILHELMSBURG

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## Energiebunker – Technical Concept - the project proposal in general

- Conversion of the flak bunker into a regenerative CHP-plant
- Core element: construction of a short-time thermal energy storage unit
- Generation and storage of regenerative thermal energy for the heat supply of several districts in Hamburg Wilhelmsburg
- Generation of renewable electricity





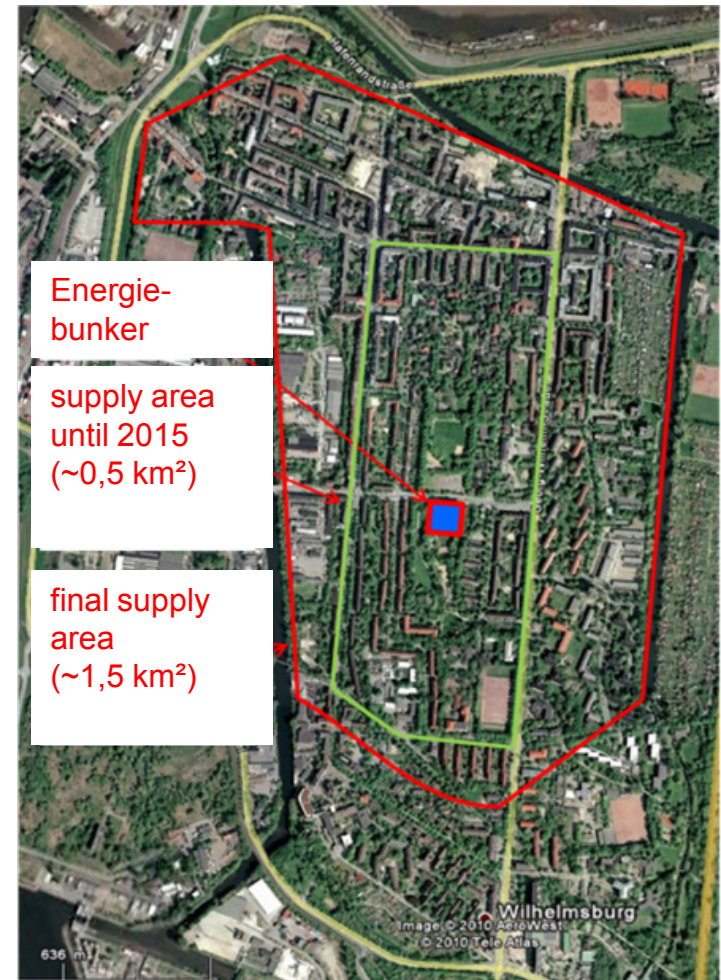
# ENERGIEBUNKER WILHELMSBURG

## Energiebunker – Technical Concept:

### 1. step in the realisation process – evaluation of the heat demand

- ~200 buildings in the main supply area have been identified
- residential buildings, public buildings, several trade and service companies
- overall heat demand:

**~ 21.500 MWh/a**

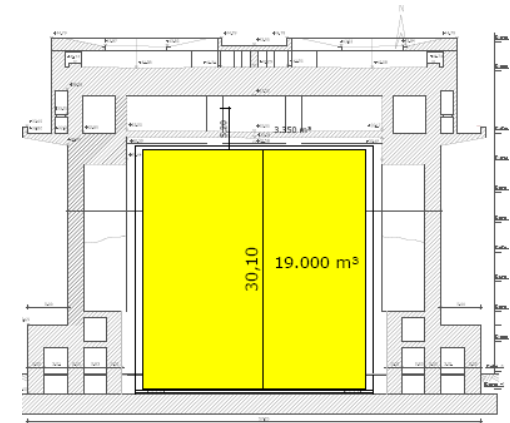
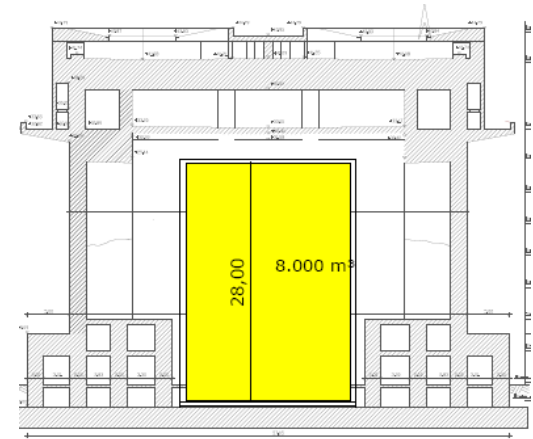


# ENERGIEBUNKER WILHELMSBURG

## Energiebunker – Technical Concept: 2. step: Optimizing of the thermal energy storage concept

- several concepts has been analysed:
  - seasonal heat storage vs. short-time storage systems
  - many small storage units vs. one big heat store
  - 1.000 m<sup>3</sup> - 20.000 m<sup>3</sup>
- the final proposal includes an optimised heat store with 2.000 m<sup>3</sup> storage capacity:

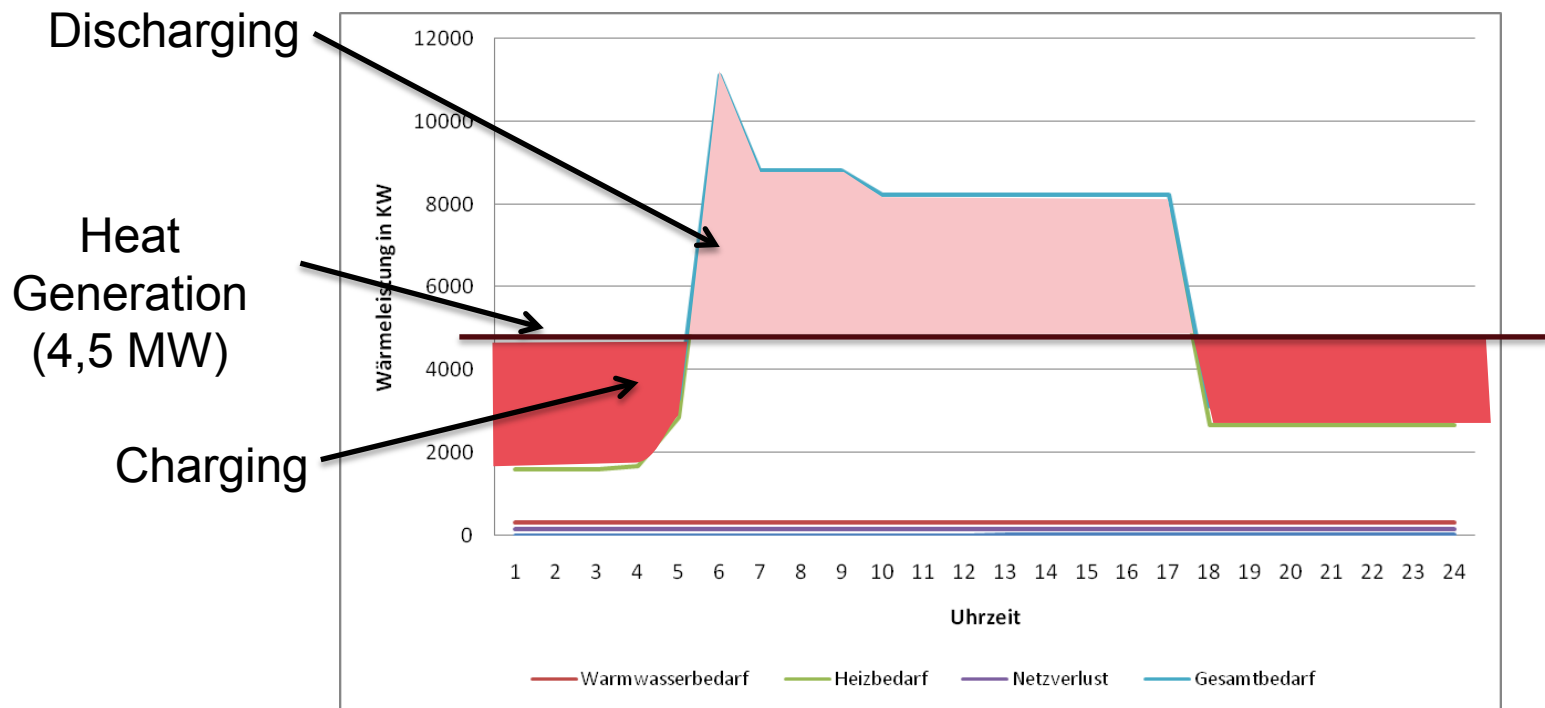
~ 60 MWh





# ENERGIEBUNKER WILHELMSBURG

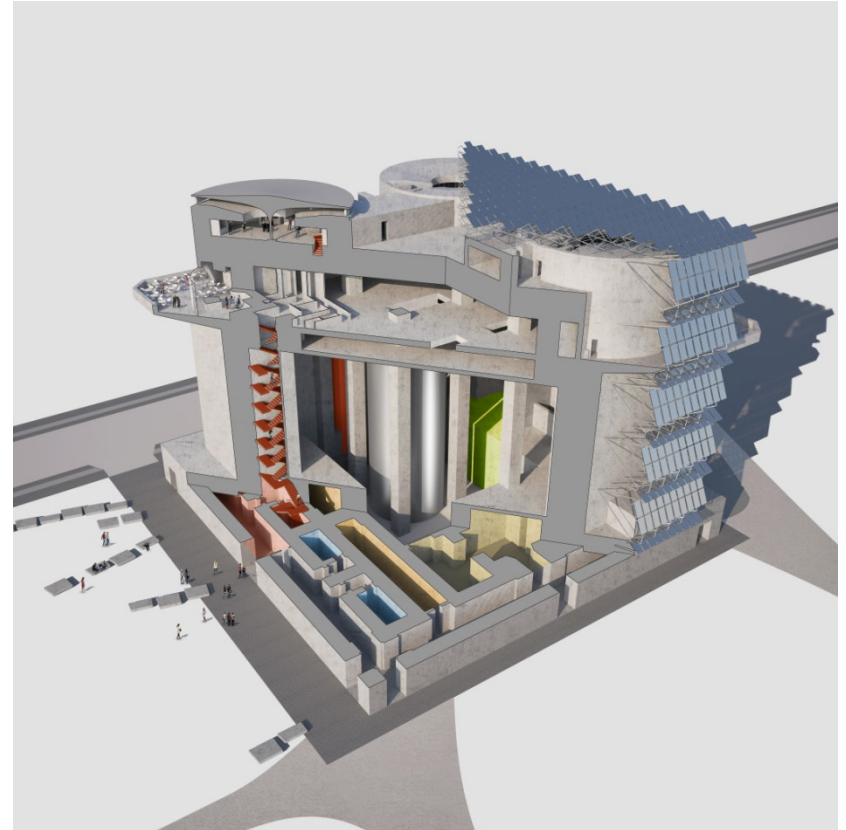
## Energiebunker – Technical Concept



# ENERGIEBUNKER WILHELMSBURG

## Energiebunker – Technical Concept: Final step: Integration of the energy generation

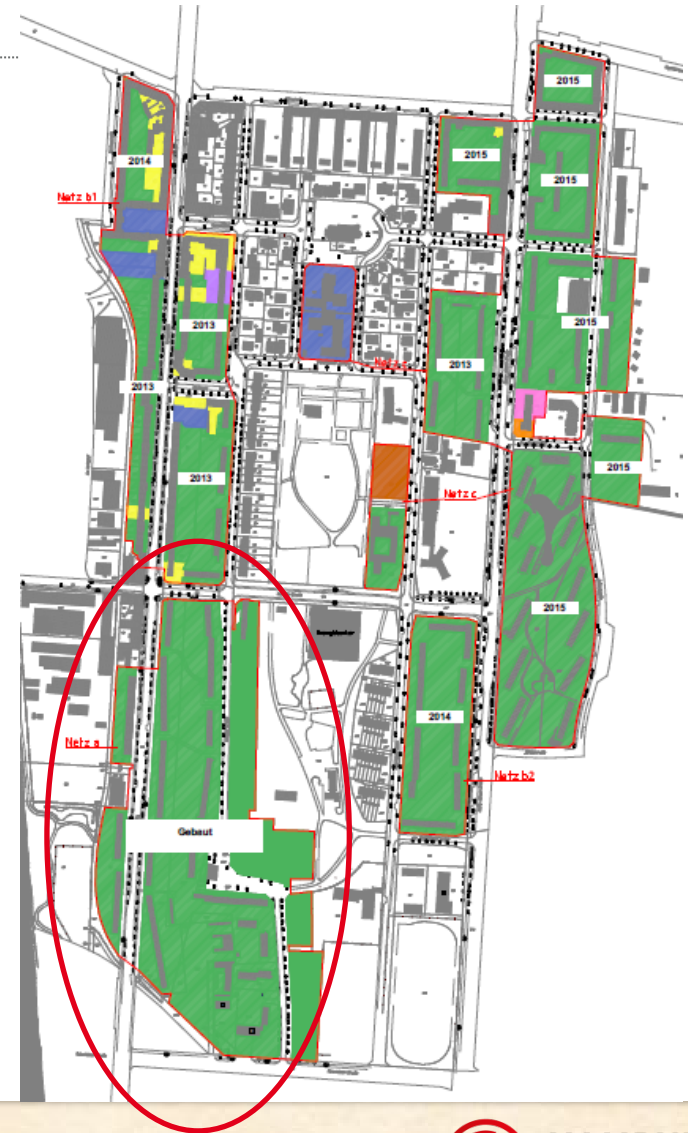
- use of industrial waste heat: 400 kW<sub>th</sub>
- integration of solar-thermal energy produced at the roof of the bunker: 750 kW<sub>th</sub>
- installation of one biomass CHP-unit (~ 610 kW<sub>th</sub>/~510 kW<sub>el</sub>) and one woodchip-plant (2.000 kW<sub>th</sub>)
- 2 natural-gas boiler for peak-load (2 x 2,3 MW)
- heating power: ~ 5 MW



# ENERGIEBUNKER WILHELMSBURG

## Weltquartier – the Energiebunkers first District Heating Grid

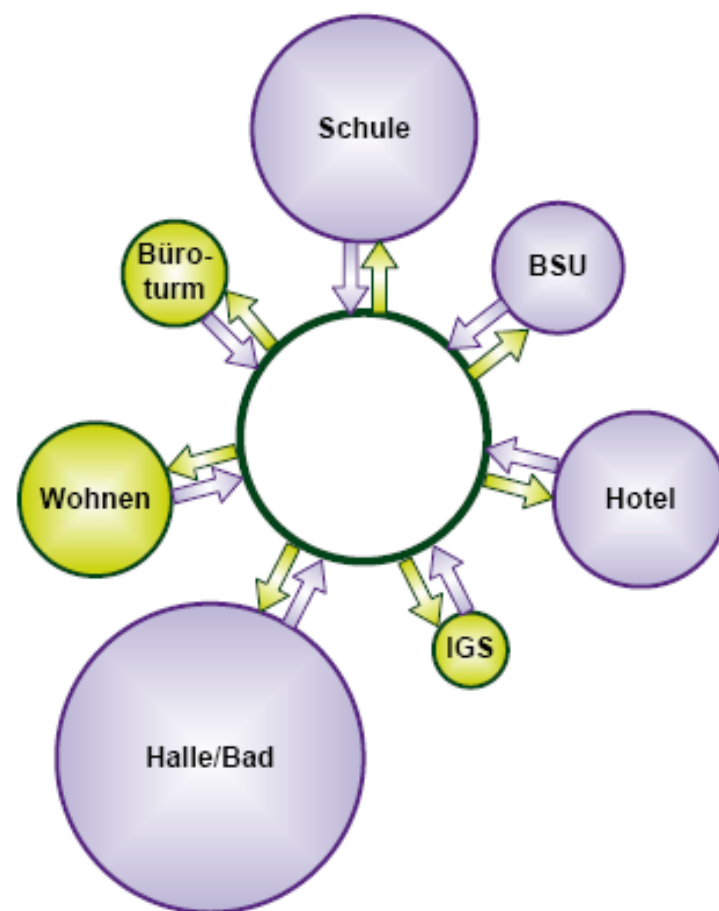
- 20 refurbished or new Building
- Demand: ~ 2,5 MW
- Primary Energy Factor of the delivered Heat:  $\leq 0,3$
- Length: ~ 2.500 m
- Flow-temperature: 70 °C - 90 °C
- Return-temperature: max. 50 °C
- Construction: “Tichelmann-System”
- Basement Installation
- Costs: ~ 700,- €/m



# ENERGIEVERBUND WILHELMSBURG

## Project Idea: Construction of an integrated District Heating Network

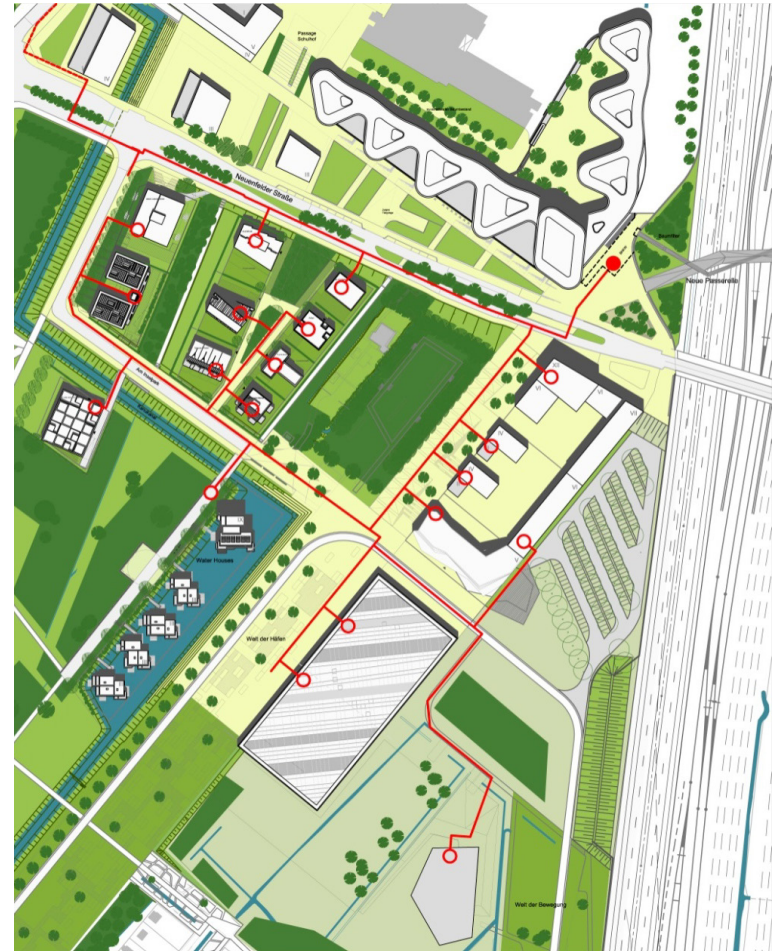
- Installation of one biomass CHP-unit (~ 737 kW<sub>th</sub>/~517 kW<sub>el</sub>)
- 2 natural-gas boiler for peak-load (2 x 1,2 MW)
- Thermal-Storage: 20 m<sup>3</sup>
- Optional: integration of heat from local renewable heating systems (e.g. solar-thermal energy, biomass,..)
- Basis for infeeding thermal Energy is the a connection to the district heating grid
- Max. Infeed/a: 20% of the Demand



# ENERGIEVERBUND WILHELMSBURG

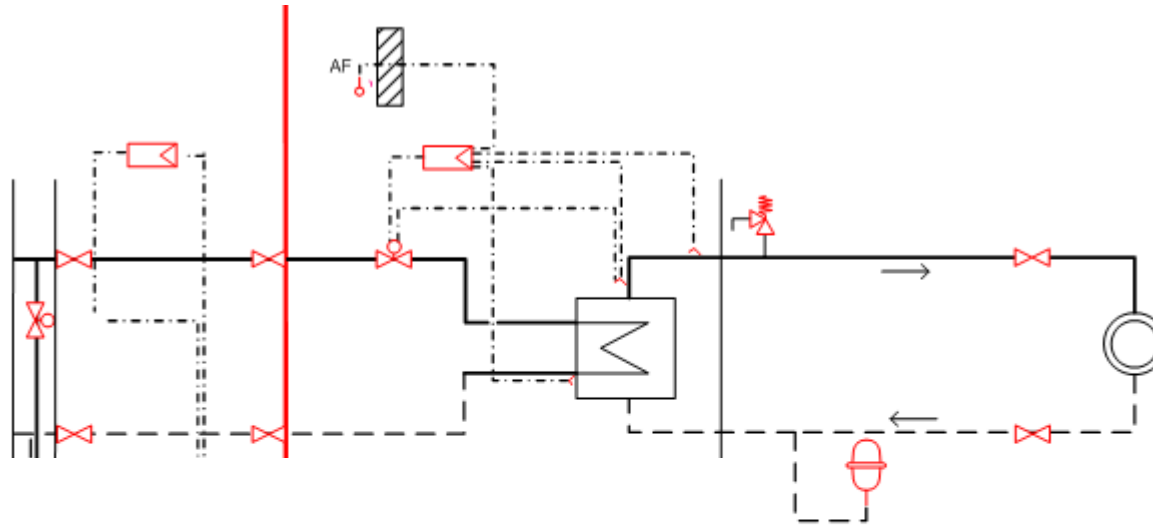
## Key Facts of the District Heating Network

- 19 new Buildings
- Primary Energy Factor of the delivered Heat:  $\leq 0,3$
- Flow-temperature: 70 °C - 90 °C
- Return-temperature: max. 50 °C
- Length: 2.000 m
- Construction: Open Heating-Network
- Costs: ~ 850,- €/m



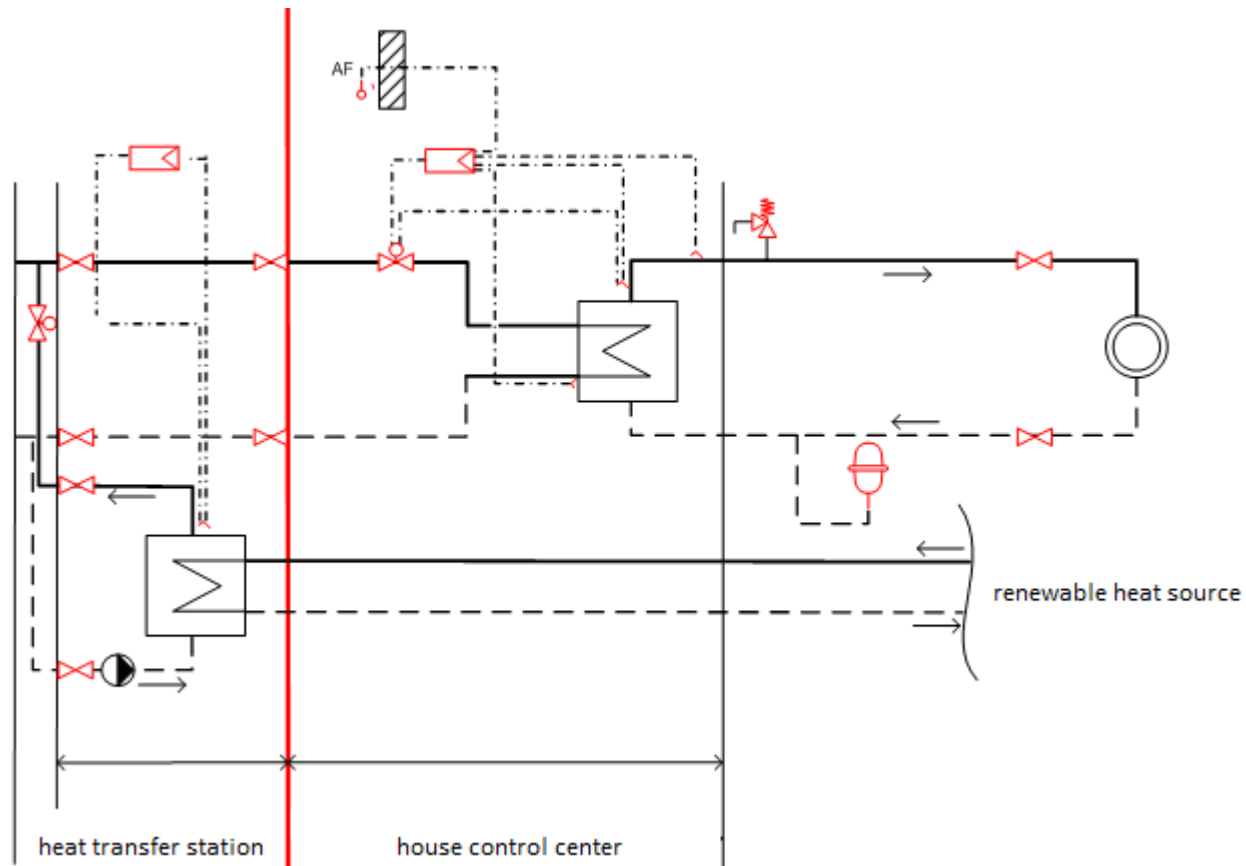


## Principle of feed in renewable heat



- scheme of a standard district-heat house connection

## Principle of feed in renewable heat



➤ district-heat house connection with feed-in possibility

# OUTLOOK

## Future Drivers and SDH within Hamburg Energie

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### In General

- Main goal for a system change (“Energiewende”) in the heating-market:  
**binding shares for the use of renewable heat in case of heating-modernisation**
- Long- term measurement principles for renewable heat in the housing-sector

### HAMBURG ENERGIE

- Expansion of the integrated heating network “Energieverbund” in 2015+
- Integration of the whole district-heating network in Wilhelmsburg

**Many thanks for your attention!**

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