
BERLINER energie AGENTUR

# Financing Climate Protection Measures in an International Context

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- Energy services
- Financing models
- Business Case: District cooling and trigeneration

# Berlin Energy Agency (BEA)

- **30 years of experience** in energy efficiency (energy supply and demand)
- founded in 1992 by the State of Berlin to develop and implement **innovative, replicable pilot projects and services**
- specialist in **energy efficiency in buildings** by means of **energy services**
- owns and operates more than **150 decentralized energy generation systems** (mostly micro-CHP units and PV systems)
- uses technical know-how to provide **consultancy on energy concepts, energy management and user behaviour** in Berlin, Germany and beyond
- internationally a leading advisor on energy service models and energy-efficient technologies


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# International Activities – EPC Market Development (selection)

| | |
|---|---|
| **Monaco** | Preparation and successful tender of **EPC pilot project** for public buildings |
| **Romania** | Support to **EPC pilot projects in municipalities** for public buildings and street lighting |
| **Saudi Arabia** | **Development of a national ESCO programme** and support to the establishment of a Super-ESCO structure |
| **Indonesia** | Development of an **ESCO business model for industrial areas** |
| **Mongolia** | Project development for **EPC in a public building** |
| **Buenos Aires** | **Implementation of a CHP** system in a hospital |
| **Chile** | Feasibility study on **CHP use in hospitals** |


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# Energy Services – Types and Definitions

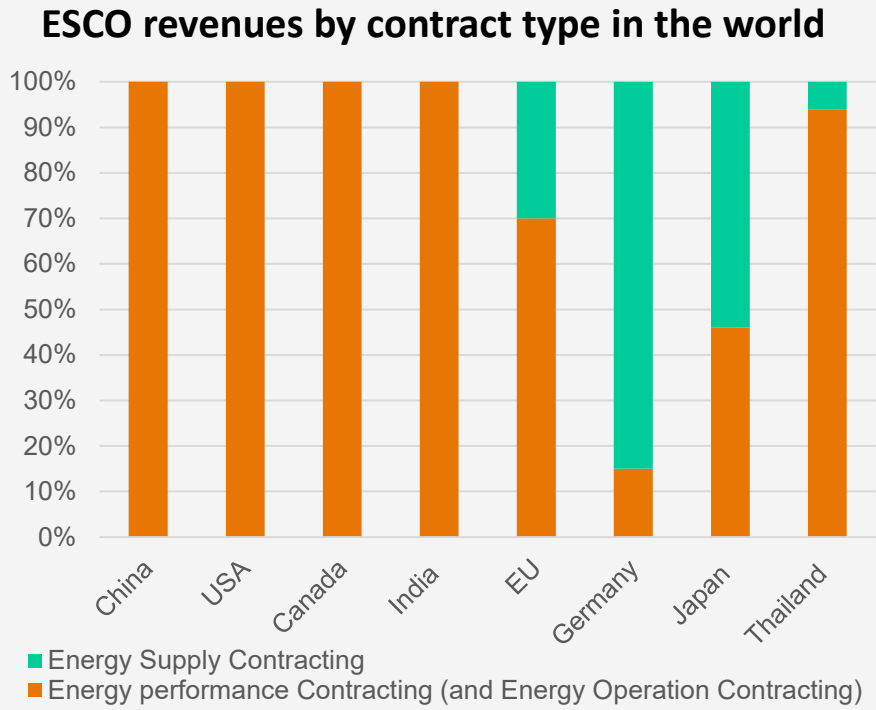
| Energy operation Contracting / Energy Warden | Equipment Installation | Energy Supply Contracting | Energy Performance Contracting |
|---|---|---|---|
| Energy efficient operation of existing equip-ment/appliances (no investment) | Delivery & installation of equipment/parts of equipment | ➢ Planning, financing, implementation<br>➢ Operation | ➢ System analysis, planning, financing, implementation & operation<br>➢ System responsibility for equipment & users' behaviour |
| Invoicing of operation cost | Invoicing of installation | Invoicing of energy delivered | Invoicing of reduced energy consumption |

# Energy Services – ESCO in the world

According to the International Energy Agency the ESCO market volume in 2017 was 28.6 billion USD.

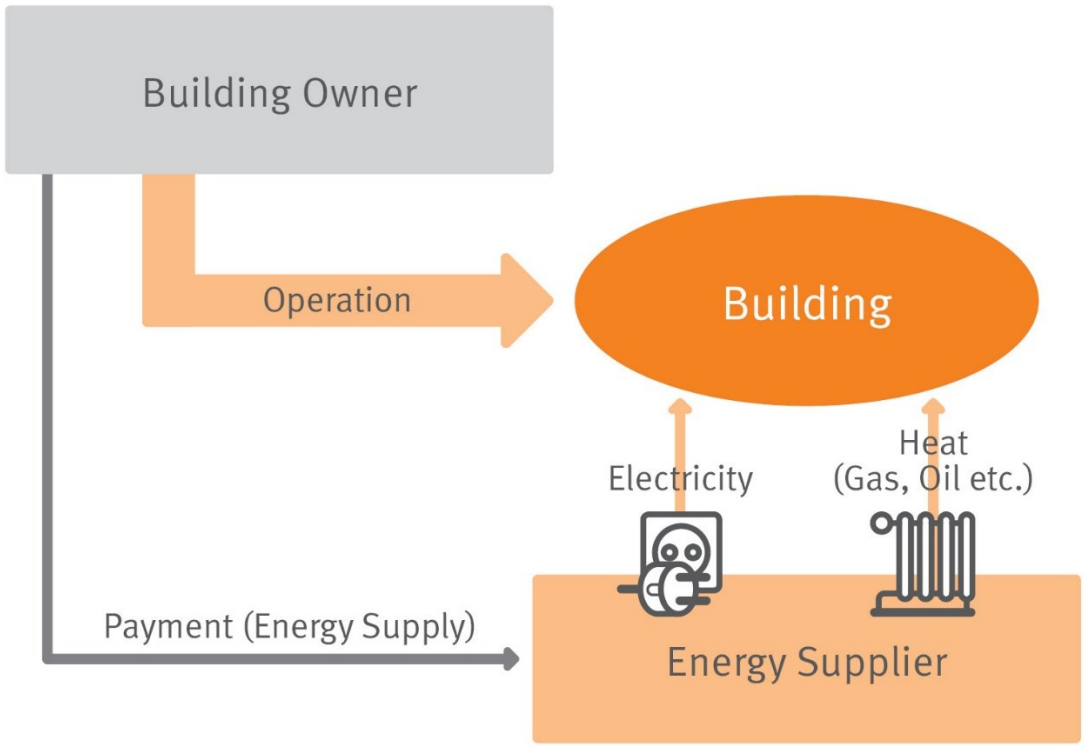
The biggest ESCO Markets in the world are:

- China with 59% of the revenues
- USA with 28% of the revenues
- EU with 10% of the revenues

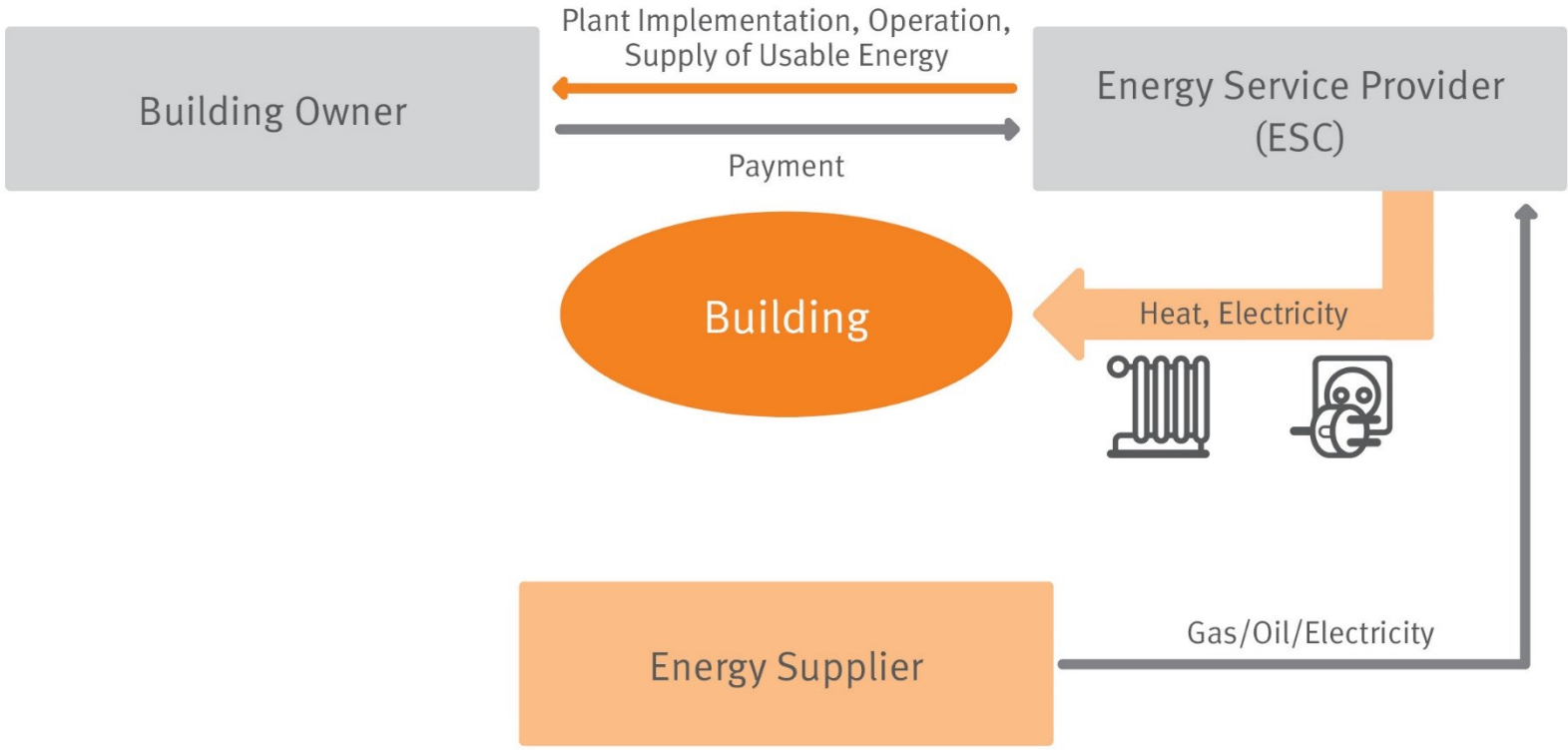



*Source: IEA

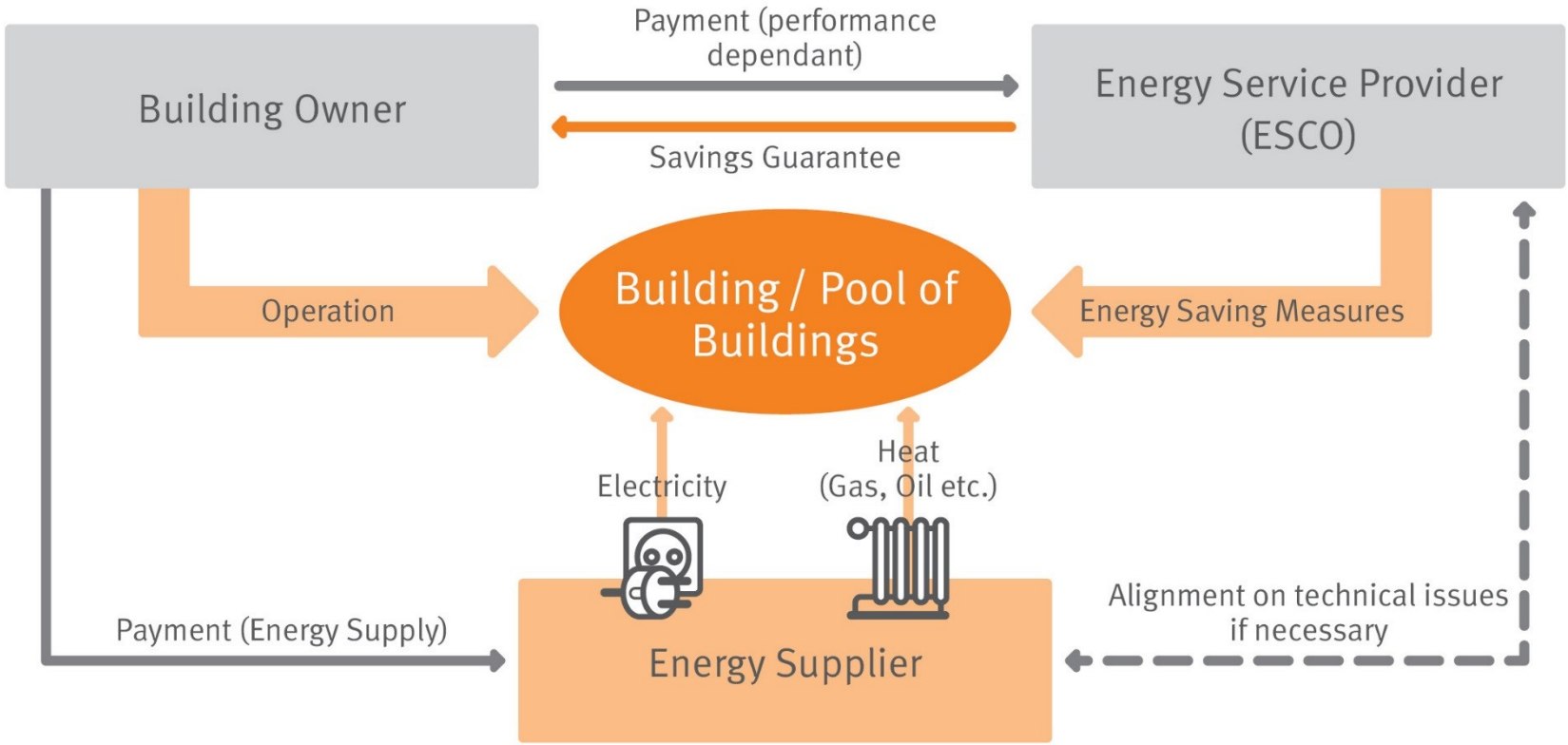
# Typical Energy Supply Situation without Energy Services



# Energy Supply Contracting – General Project Scheme



# Energy Performance Contracting (EPC) – General Project Scheme

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# EPC – Advantages for Potential Customers

- **Guarantees** for savings and operation
- Shifting technical and economical **risks to the ESCO**
- (Part-) **repayment** from future energy cost savings
- **Saving investment costs** through third-party financing
- **Outsourcing** of interface problems, **focusing** on the own key business
- Eliminating deficiencies, **cash efficiency potentials**
- Long-term increase of **comfort level** and **property value**

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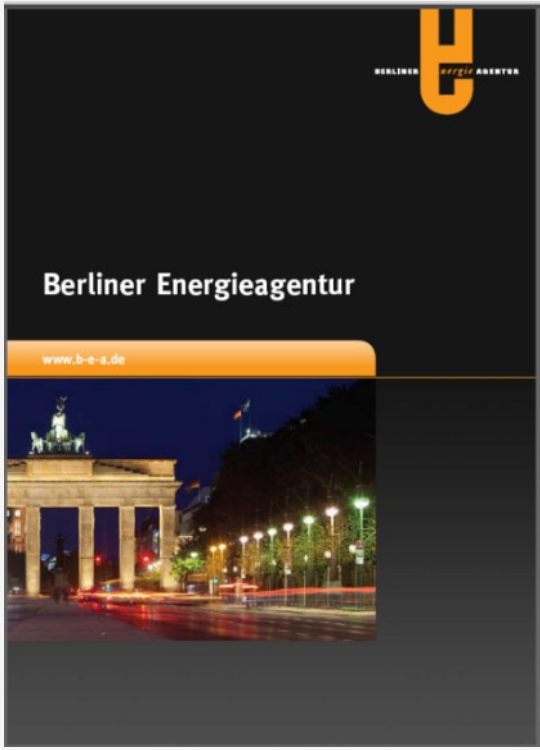
- **Financing models**
- Legal framework and supportive actions
- Business Case: District cooling and trigeneration



# Financing Alternatives for Energy Efficiency Projects

- **Capital Resources**
- **Loans**
- **Public Grants and Subsidies**
- **Third Party Financing**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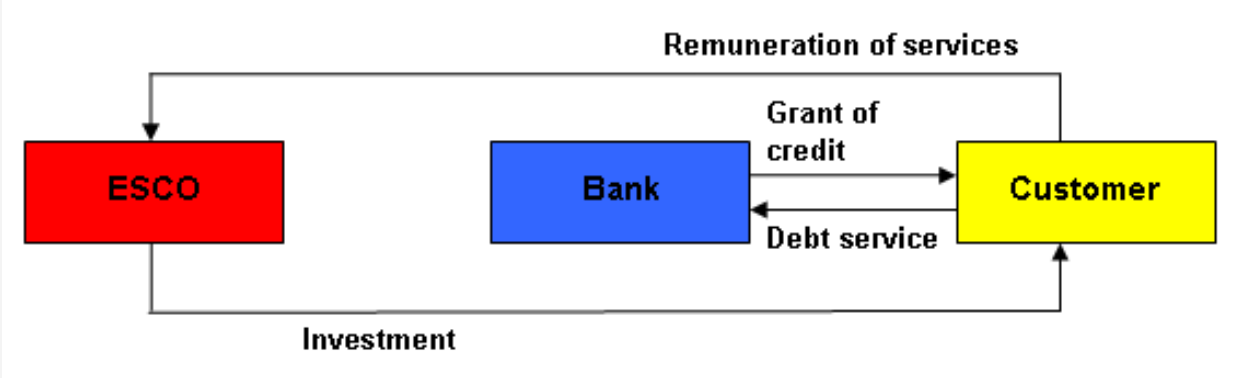
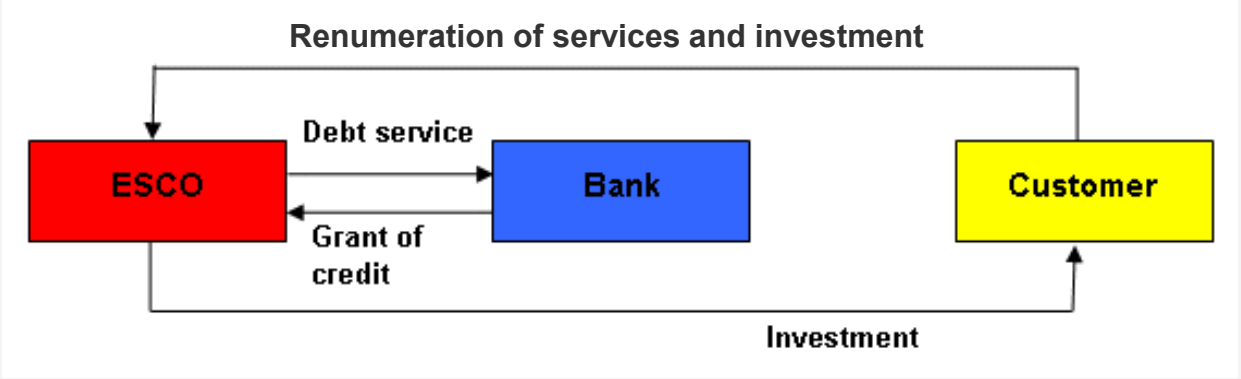
# General financing options for energy services

**Financing through client**




**Financing through ESCO (credit)**



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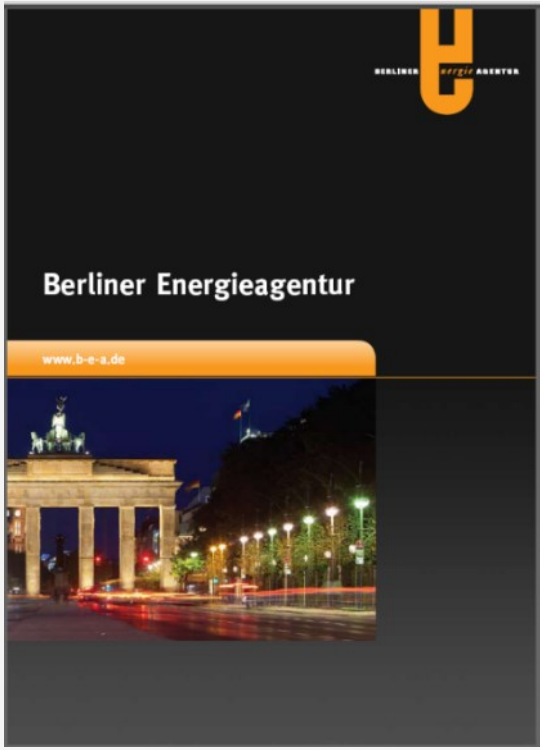


# Trigeneration case study – Service complex „Königstadt-Terrassen“

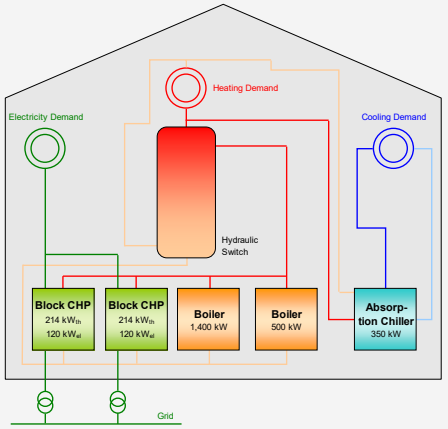
## Services Building Complex „Königstadt-Terrassen”

- Tenants: Shops, medical practices and offices (25 units)
- Size: ca. 42,000 m² heated floor space
- Heating demand: 2,800 MWh/a
- Cooling Demand: 175 MWh/a
- Commissioning of trigeneration system: 1996
- Renewal of CHP systems 2015

Königstadt-Terrassen Schönhauser Allee, Berlin-Prenzlauer Berg

## Technologies used

- Natural gas boiler running at low temperature: 1,900 kW
- 2 natural gas operated CHP units: each 120 $kW_{el}$,214 $kW_{th}$
- Absorption chiller unit: 350 kW



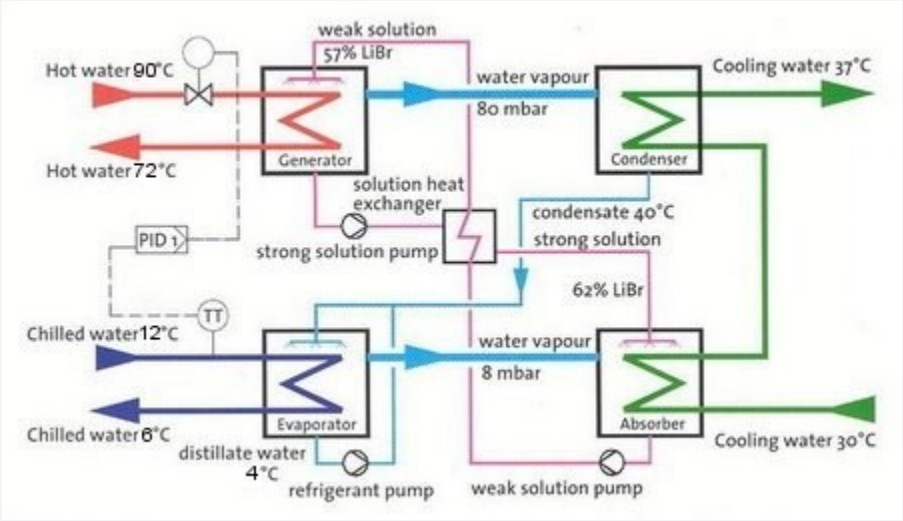
# Covering of the cooling demand - Königstadt-Terrassen

## Absorption Technology

- machine: Carrier 16JB028/047: 350 kW
- refrigerant: water, solvent: lithium bromide
- $COP = \frac{\text{useful energy}}{\text{energy input}} = \frac{Q_o}{Q_H} = 0{,}7$

**$Q_H$** 250 MWh/a heat from Block CHP´s

**$Q_0$** 175 MWh/a cooling demand




**425 MWh/a waste heat via cooling tower** **$Q_W$**

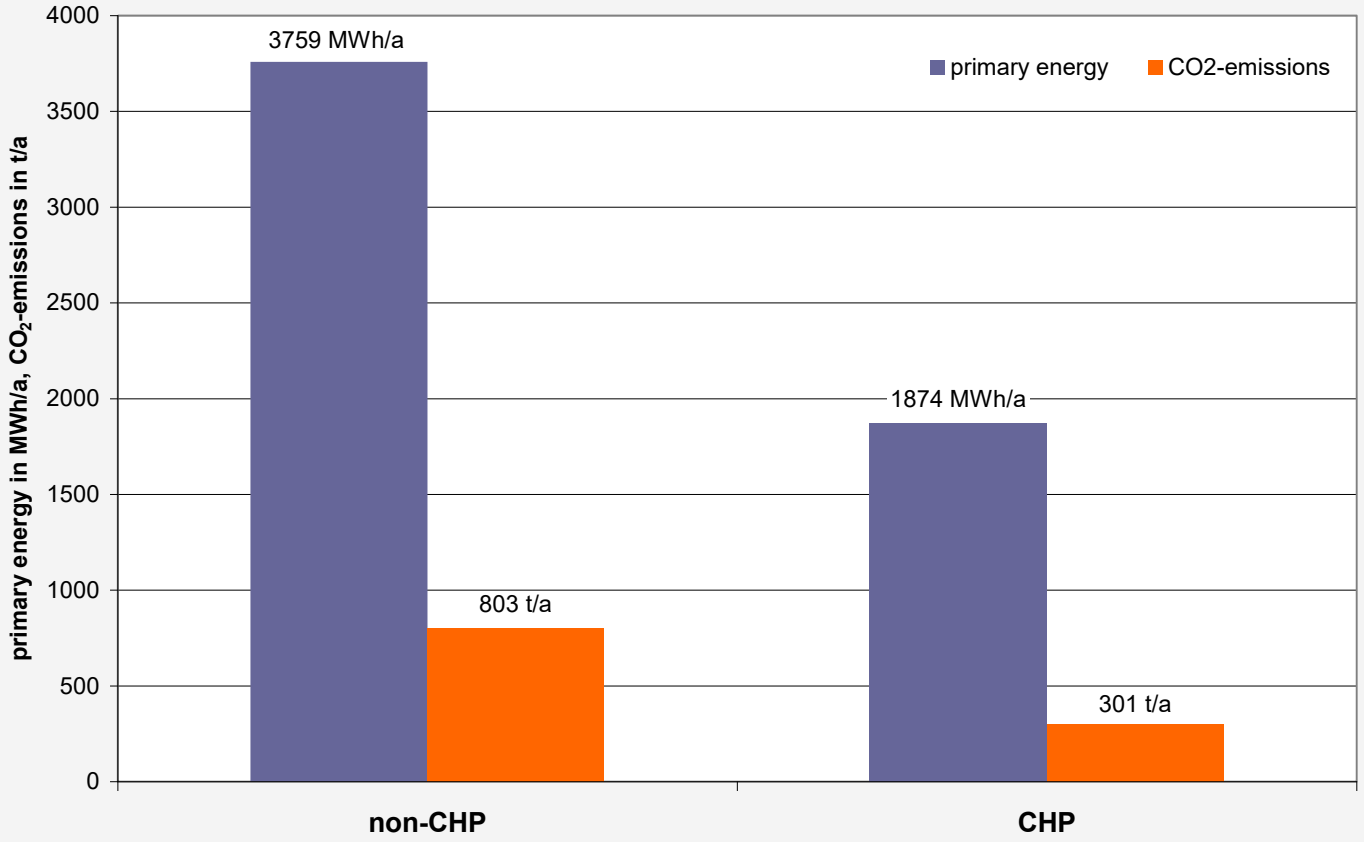
# Energy and emission savings - Königstadt-Terrassen

**total primary energy savings:**

- 1,884 MWh/a
- 50.1%

**total $CO_2$ emission savings:**

- 503 t/a
- 62.2%

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