

# COGEN Europe Study

## *The Role of Cogeneration in 2050 – Overview & Preliminary Results*

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# Study Overview

**Study Objective:** assess the potential and role of cogeneration in a 2050 decarbonised energy mix.

**User Focus** – Micro-economic assessment from a heat user point of view.

**Plant-size heat applications** simulated to evaluate the cost-efficiency of including CHP in the heat supply mix. Different use cases of technologies, fuels and heat consumption types are covered.

**Main Focus Today**

**System Focus** – Scenario-based assessment from a European systemic point of view.

**Two scenarios** of 2050 European energy mix compared:

## 1.5 TECH Scenario

Our understanding of European Commission Long-Term Strategy scenario

## Increased CHP Scenario

Featuring a Higher CHP Deployment

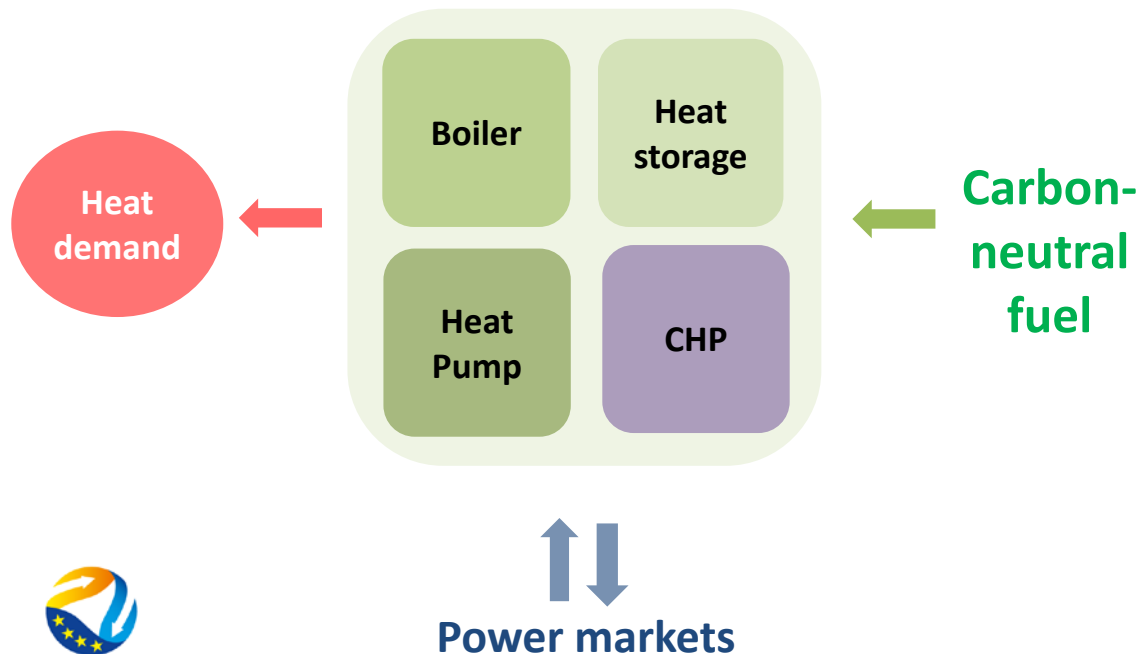
Assess the effect at a EU level of increasing CHP capacities in different sectors on investment and operational costs, on primary energy consumption, etc.

# Modelling approach

Micro-economic assessment from a heat user point of view: **modelling of a single heat consumer**

Simulation at an hourly time step for a year of different use cases (variants on the heat demand, heat generation mix, fuels), **with** and **without** CHP

Example of a simplified use case



CHP technologies covered

- Open cycle turbines
  - Gas turbines
  - Steam turbines
- Combined cycle
- Engines
- Organic Rankine Cycle
- Fuel cells
  - PEM
  - SOFC

Key parameters covered

- Capital expenditures (CAPEX)
- Operational expenditures (OPEX)
- Lifetime
- Conversion efficiency
- Heat-power ratio
- Heat output temperature
- Start-up time / ramping gradients

# Different CHP use cases evaluated

- Domestic heating
- On-site generation in hospital
- On-site generation of industrial heat for medium or high temperature
- District heating for buildings and industry

For each use case, the costs of generating heat (LCOH) are compared in a situation **with** and **without** CHP, for **three representative countries**, based on exogenous assumption for fuel and electricity prices in 2050.

# Preliminary key messages

In a decarbonized 2050 energy system, CHP is:

- ✓ **Competitive** on power markets since power prices are expected to increase significantly
- ✓ **Cost efficient** for heat production, implying potential end-user heat supply costs reduction of 0.5 - 15 €/MWh
- ✓ **Avoided distribution grid reinforcement costs can also be a major advantage of distributed CHP plants**
  - Illustrated for use case 1 on micro-CHP using an avoided distribution cost from the literature and can be applied to other CHP applications.
  - Variable and case-specific: distribution grid will also be determined by decentralised PV, EVs, (hybrid) HPs...
  - Out of scope for this study as it would require a dedicated distribution grid modelling to be assessed

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