FIELD TRIALS FOR CHP SYSTEMS TO REDUCE GREENHOUSE GAS CO_2 IN A GERMAN DISTRICT

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Introduction

WHAT ARE WE DOING?

A scientific analyses of:

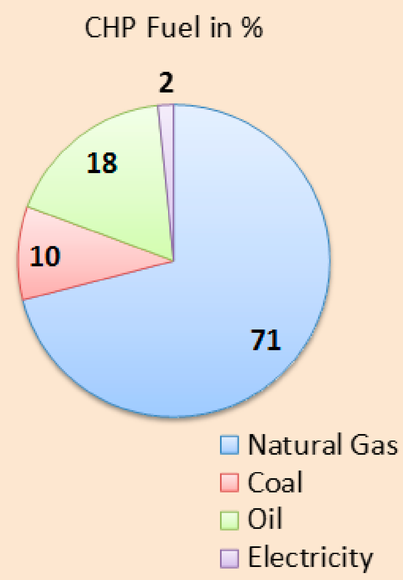
- a "before and after" comparison of **energy demand** and **CO_2** savings after replacing the previous existing heating systems with CHP system
- the influence of the new amendment on **CHP Act** of 2016 in comparison with **CHP Act** 2012 within the economical analysis during the pilot project "100 CHP plants in Bottrop"

WHY ARE WE DOING IT?

- To reduce **CO_2** emissions and **primary energy** demand by using CHP systems. Also to achieve the potential aim of NRW government by exceeding 25% of CHP electricity supply by 2020
- To **increase** the number of **CHP systems** in the residential and commercial sector in order to speed up the usage of micro-CHP and fuel cell systems

Methodology

- The evaluated data have been measured between 07/2015 and 06/2016 in the pilot project "100 CHP in Bottrop"
- The total evaluated CHP units number is 62
- During the entire project the energy sources were all replaced by natural gas. The fuel type of the previous heating system is shown in the chart



Economical Evaluation

A comparison according to VDI 2067 between CHP Act 2012 **(KWKG12)** and CHP Act 2016 **(KWKG16)**

Ecological Evaluation

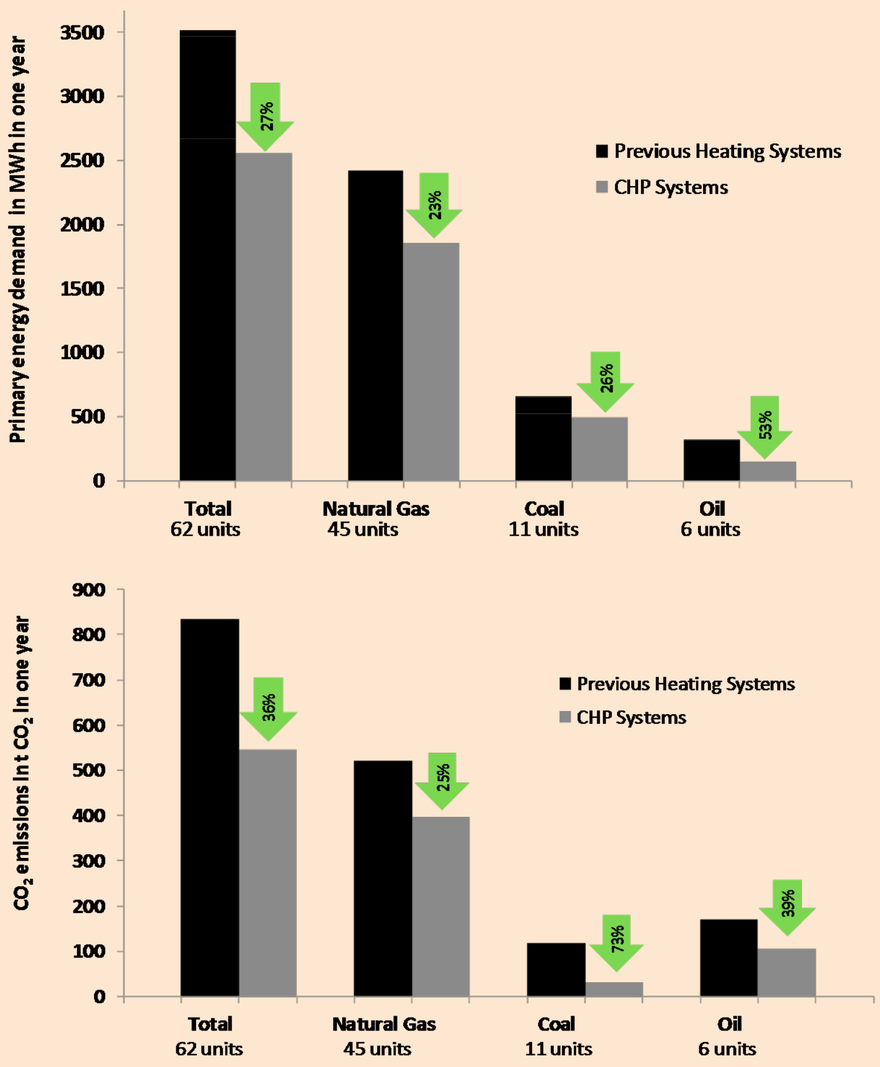
- The balance of the CO_2 emissions are based on both heat and power of the different compared systems
- The specific factor of CO_2 emission used in the balance is shown in the table

Primary Energy	CO_2-Emission Specific Factor
Natural Gas	241 g/kWh
Coal	427 g/kWh
Oil	313 g/kWh

Results

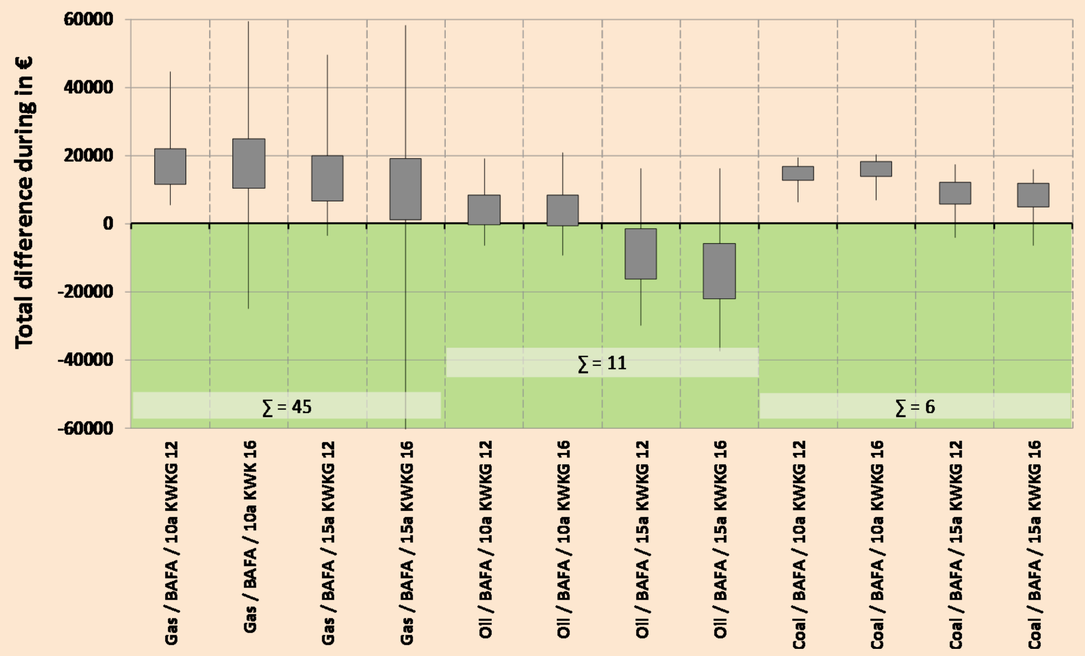
The **ecological analysis** results over one year show:

- 27% of total primary energy demand and 36% of CO_2 emissions are less than before installing CHP units
- Max. saving occurs by coal heating system replacement mainly because of the specific CO_2-emission specific factor (427 g/kWh)



The **economical analysis** results show:

- The difference between max. and min. values in KWKG16 is bigger than in KWKG12 → 5.41 to 4 cents (self-use) and 5.41 to 8 cents (feed-in). This is specially in the case where the power generated by the CHP unit has almost been completely used by the consumer or completely (100%) fed-in in open grids, leading to bigger standard deviations. See figure below
- KWKG12 can be more economic than KWKG16 if the self-used ratio from the generated power is higher than the feed-in in the public grids – with constant hours of full use for both cases
- Increasing the hours of full use from 30,000 h in case KWKG12 to 60,000 h in case KWKG16 makes KWKG16 economical, if the one-time supplement is considered
- The max. potential saving takes place in this project by substituting oil heating system with CHP system according to both CHP Acts



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