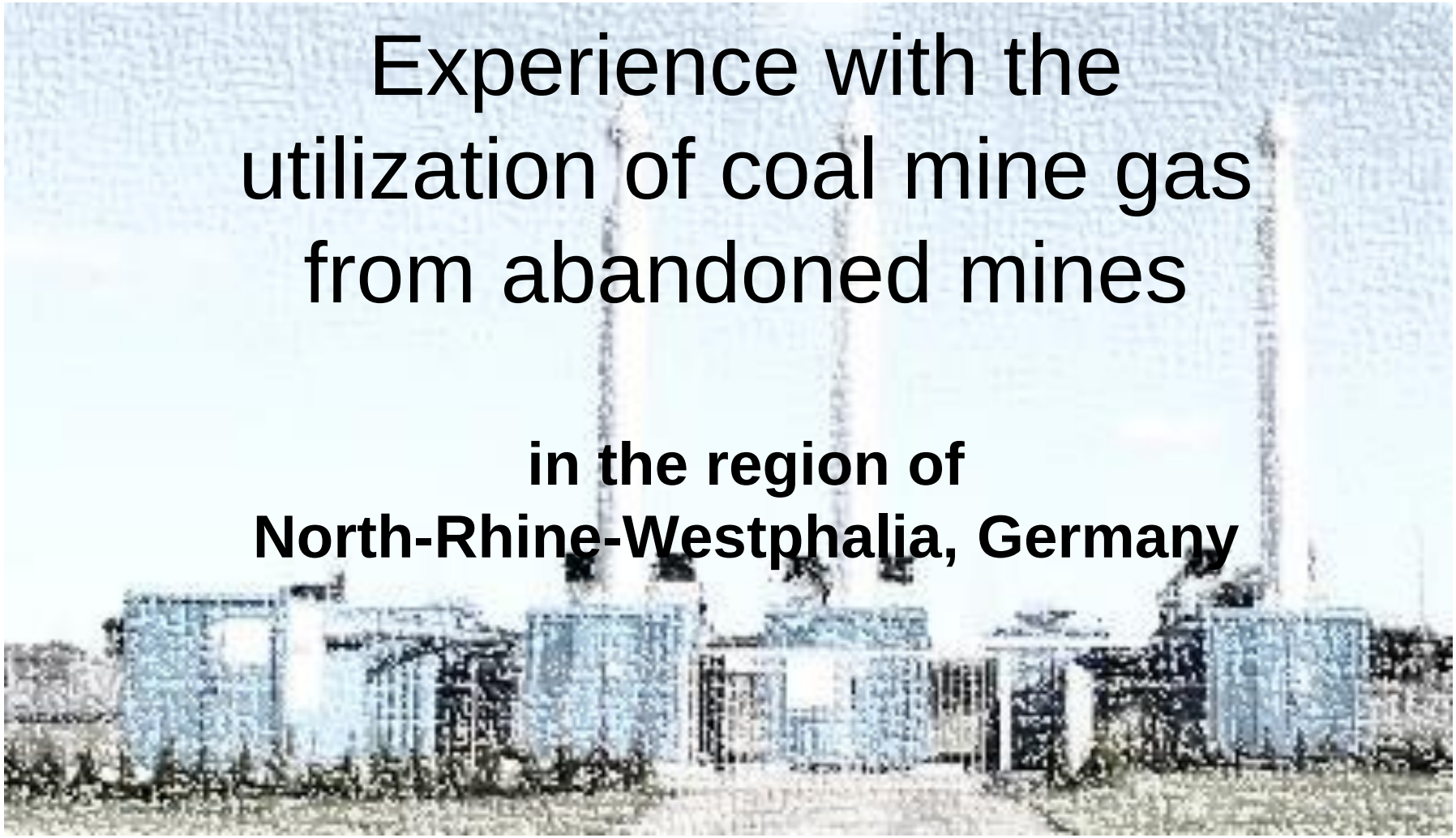
Experience with the utilization of coal mine gas from abandoned mines

in the region of North-Rhine-Westphalia, Germany



History of coal mining in Germany

- **Industrial coal mining started in the 19th century in Germany**
- **The peak was reached in the middle of the 1950th**

- **Some data:**

	1956	2015	2018
Coal extraction in tons (t)	***150 mil.***	***12 mil.***	***0***
Number of employees	***> 600.000***	***12.000***	***??***
Number of mines	***183***	***3***	***0***

- **The coal resource would last for approx. 500 to 600 years**

- **The coal geographic is difficult (up to 1500m), therefore the costs are very high and hardly economic.**

History of the use of methane

- **From abandoned mines it started already in 1990.**

- **Until 1997, methane was only of interest in areas with abandoned mines when the leaking gas represented danger for the inhabitants.**

Degassing pipes

Sucking station

History of the use of methane

- **Methane is 25 times more harmful for the environment than CO2**
- **Not using this energy would be like missing a good opportunity**

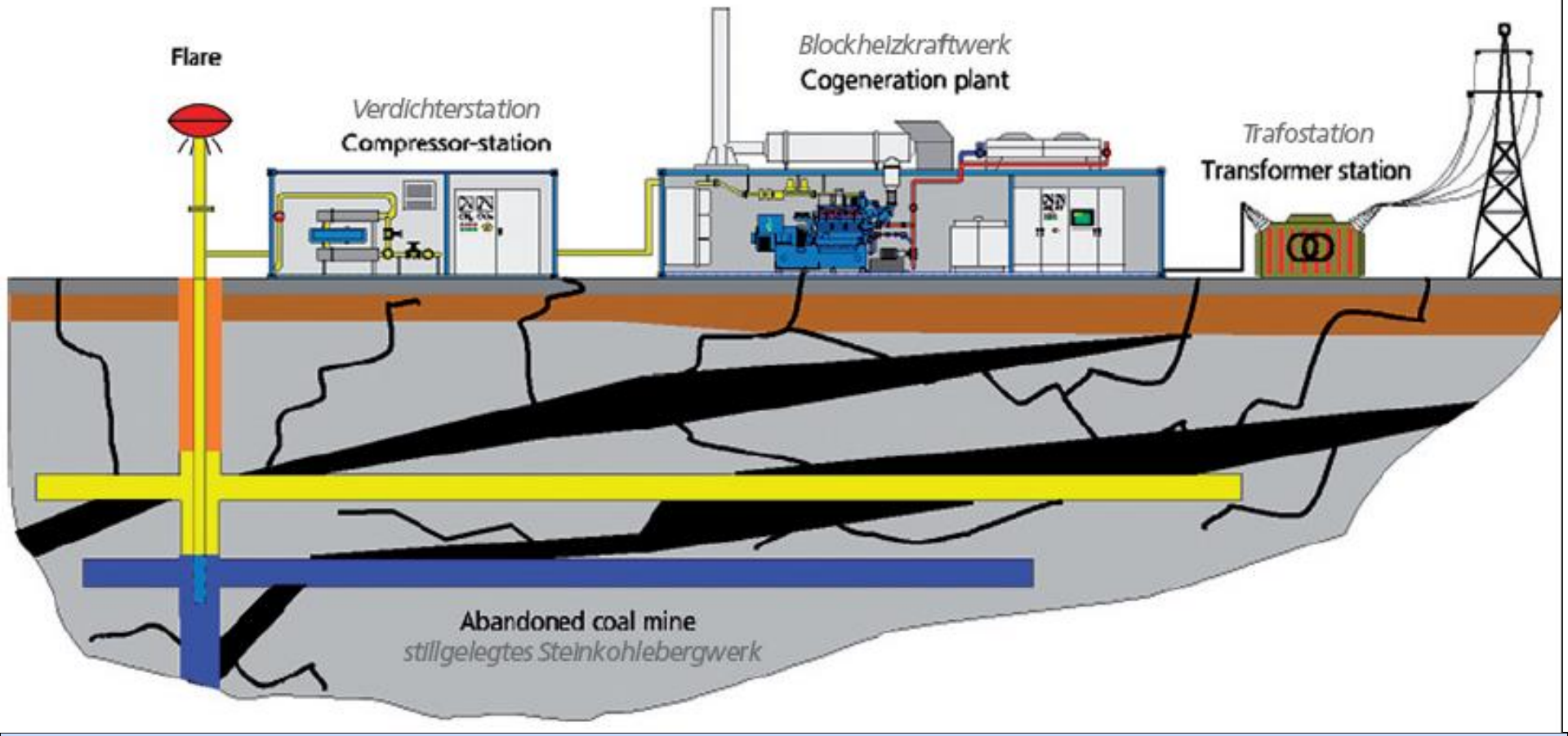
The first plant „Mont-Cenis“

- **The first plant was established in the course of the production of an energy park in the town of Herne (Ruhr District) in 1997.**

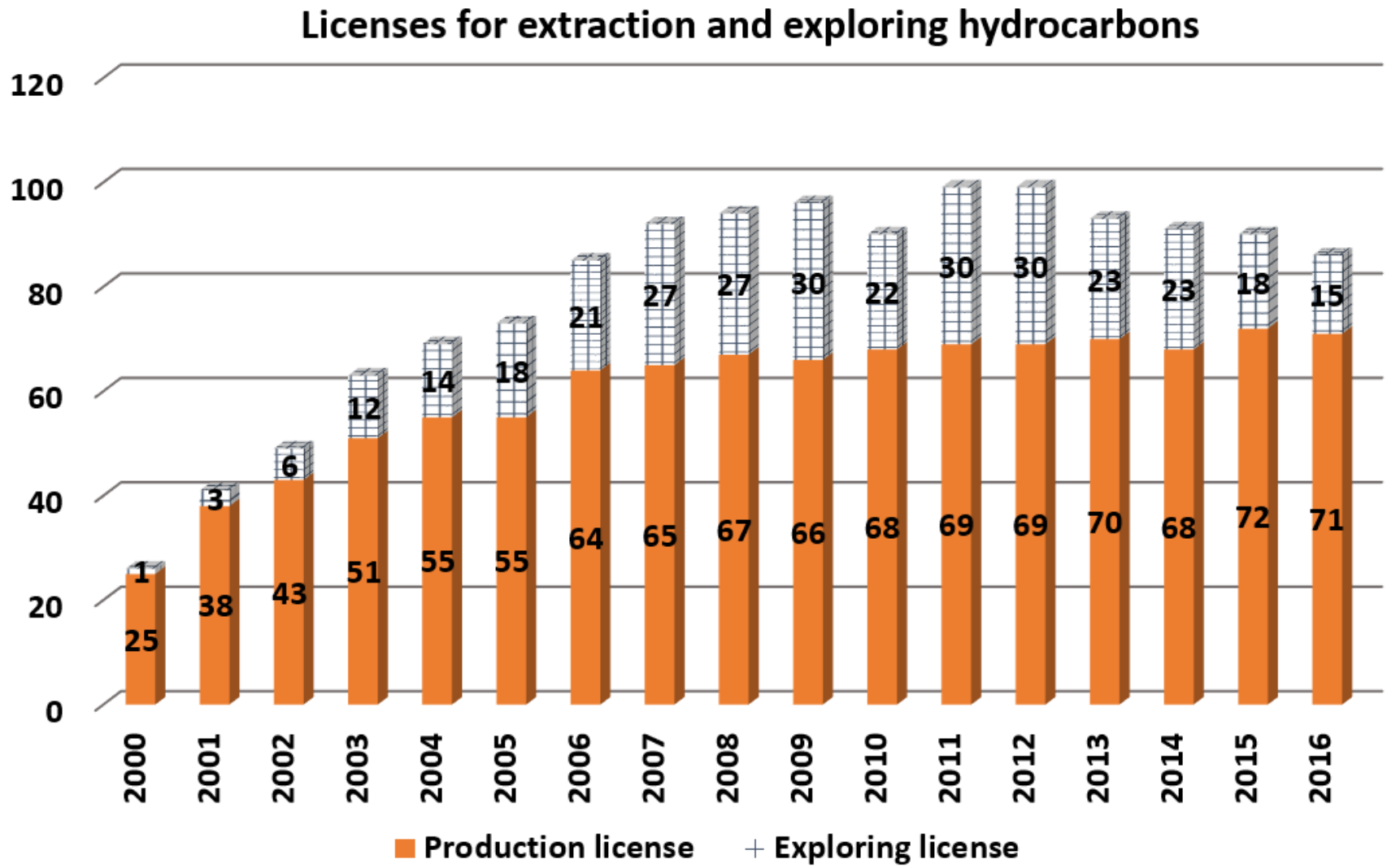
- **In 2000 Renewable Energy Law (0,0767 €/kWh$_{el}$) includes coal mine methane**
  Power prices in 2017
  P < 1000 kW -> 0,0654 €/kWh$_{el}$

  P > 1 MW < 5 MW -> 0,0417 €/kWh$_{el}$
  P > 5 MW -> 0,0369 €/kWh$_{el}$
  } **not used uneconomical**

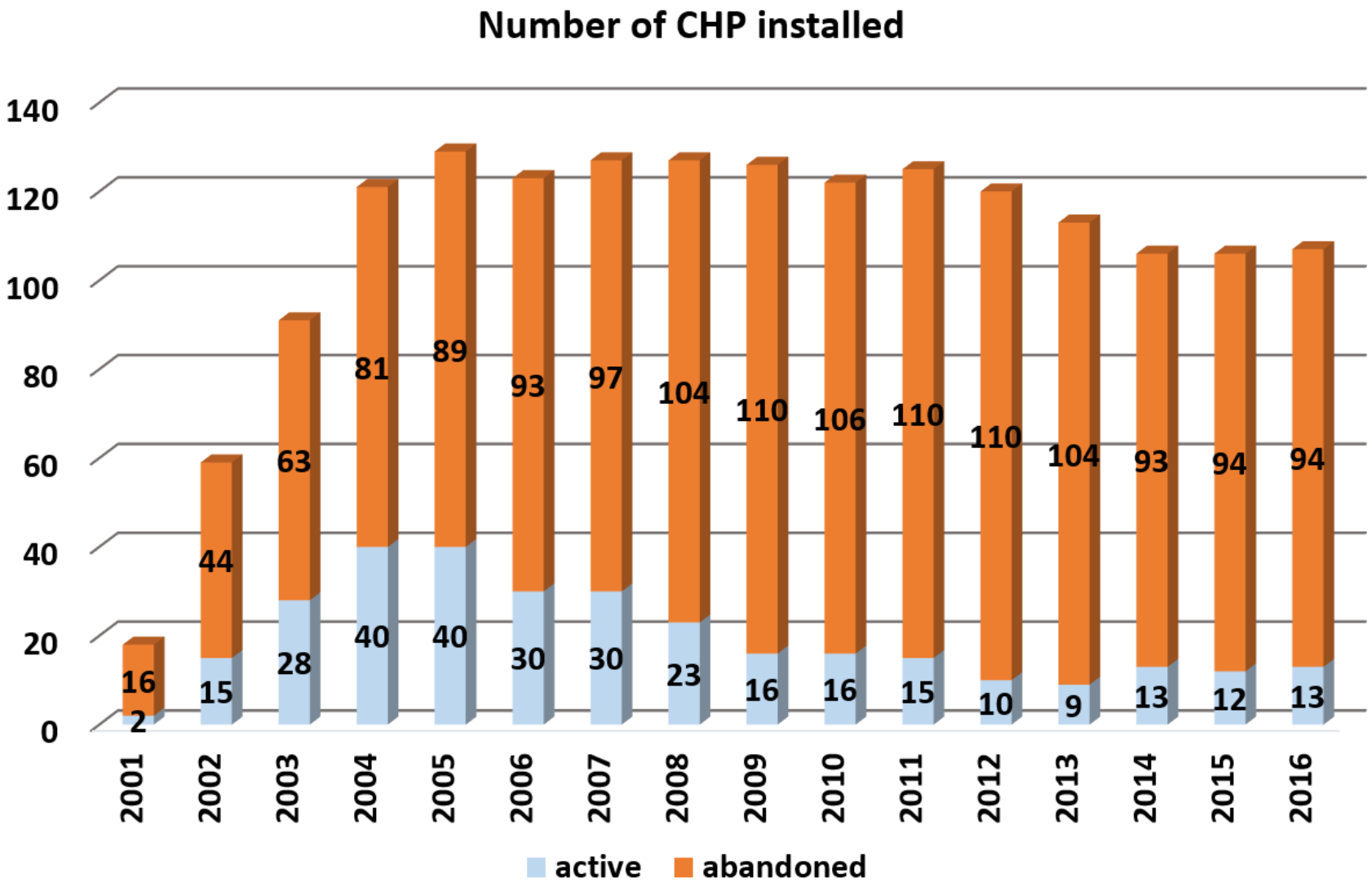
Schematic composition
of coal mine methane utilisation plant



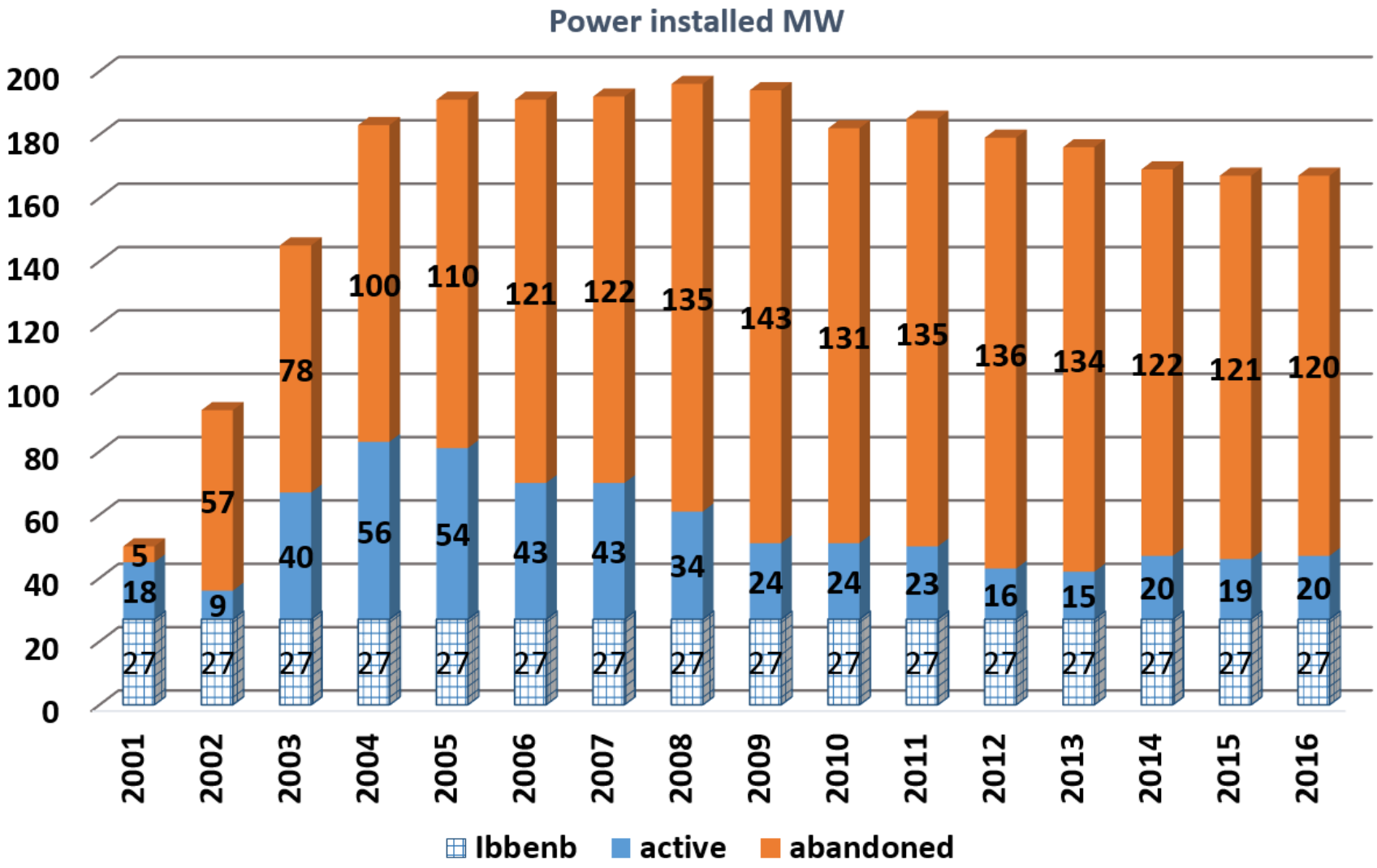
Licenses extraction and exploring



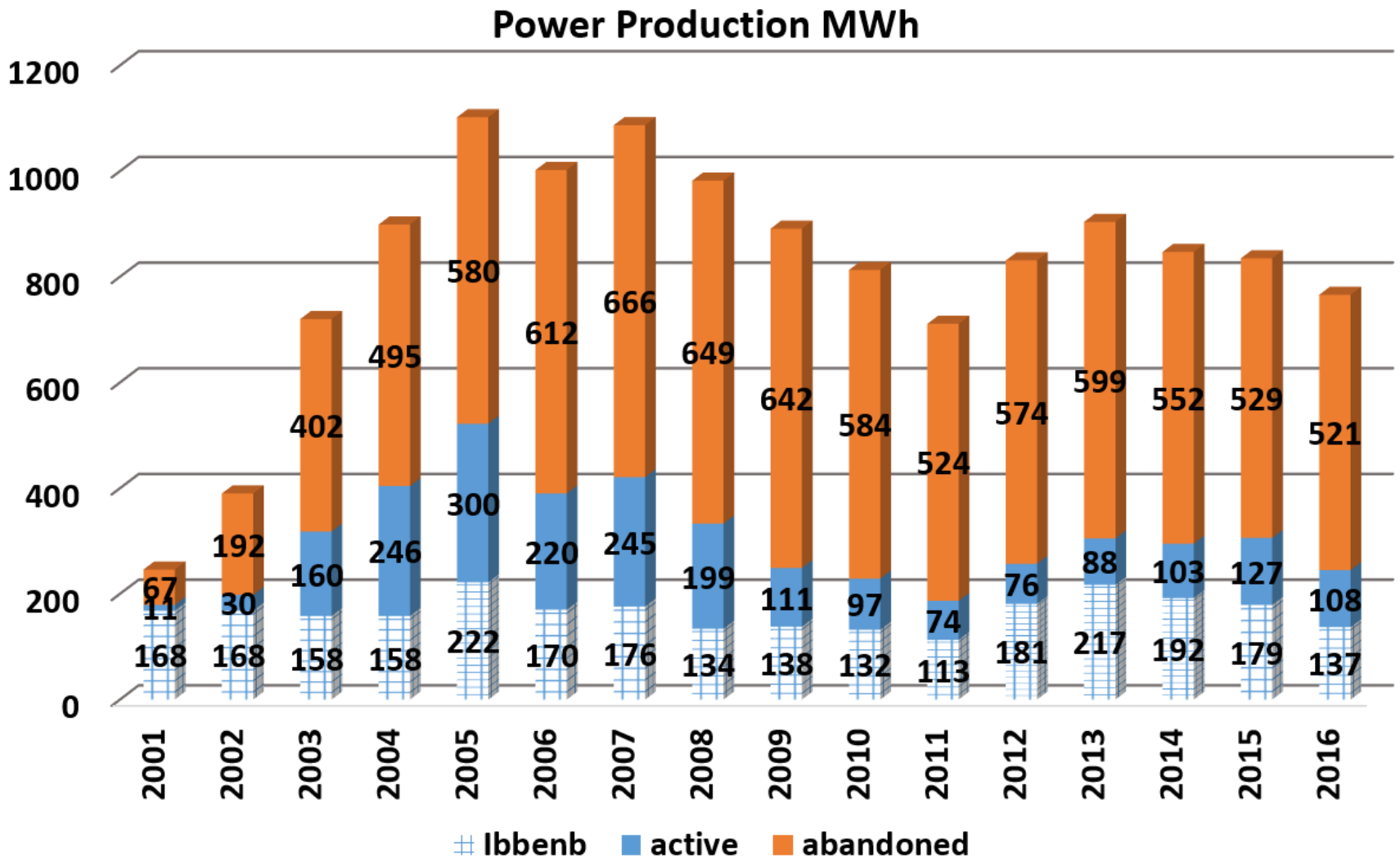
Number of CHP



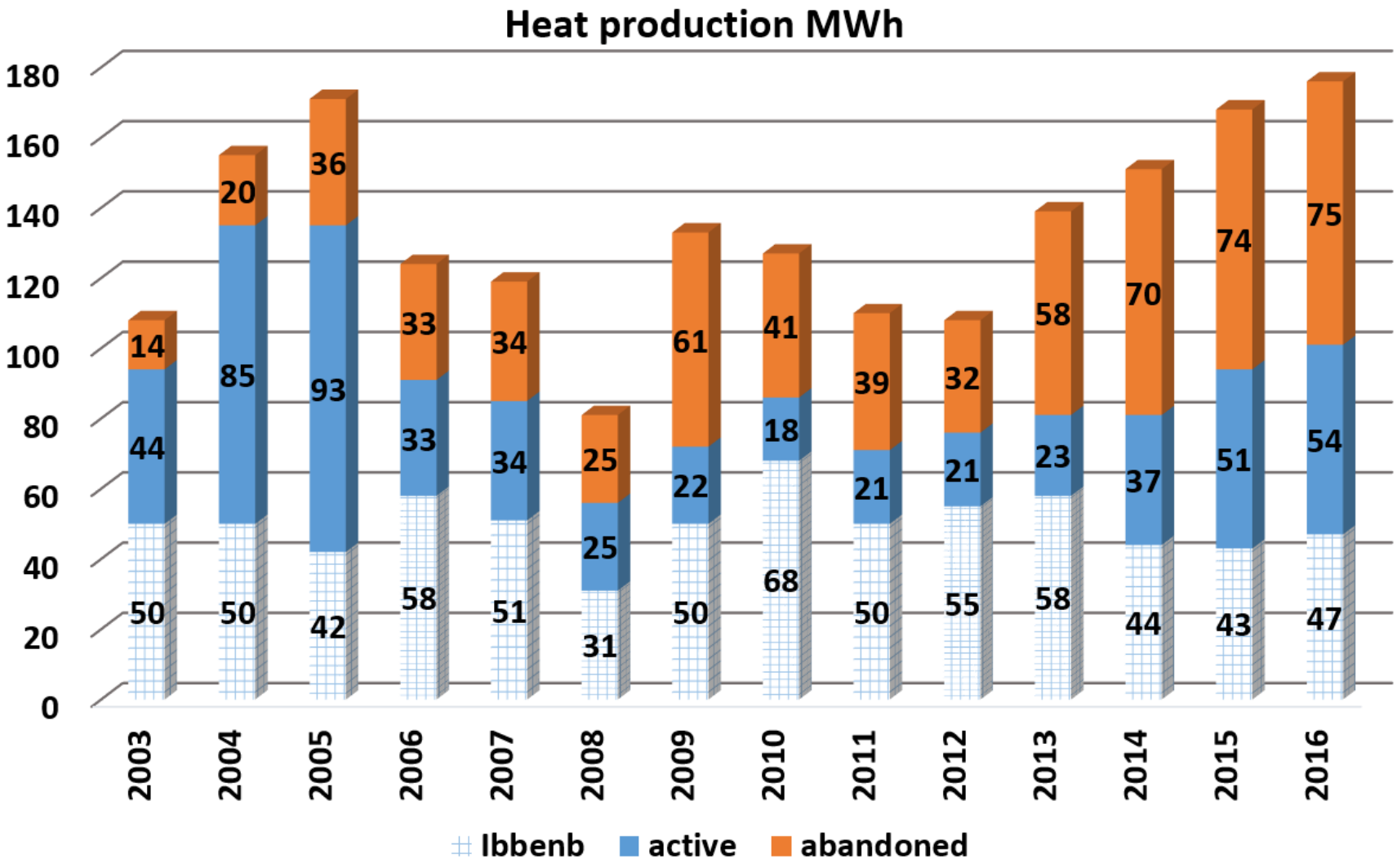
Install Power of CHP



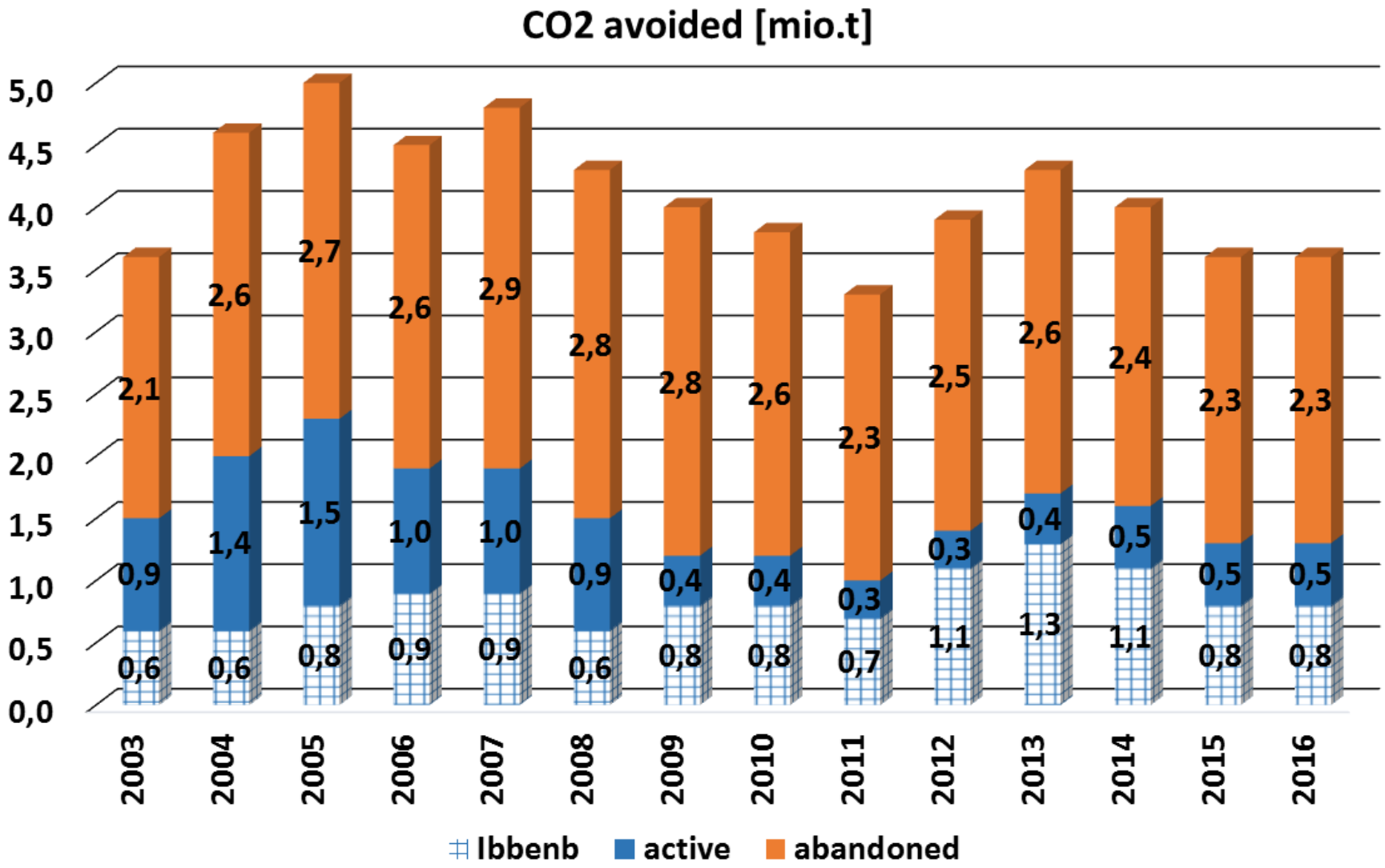
Power produced



Produced heat by CMM CHP



Avoided CO2 emissions by burning CMM

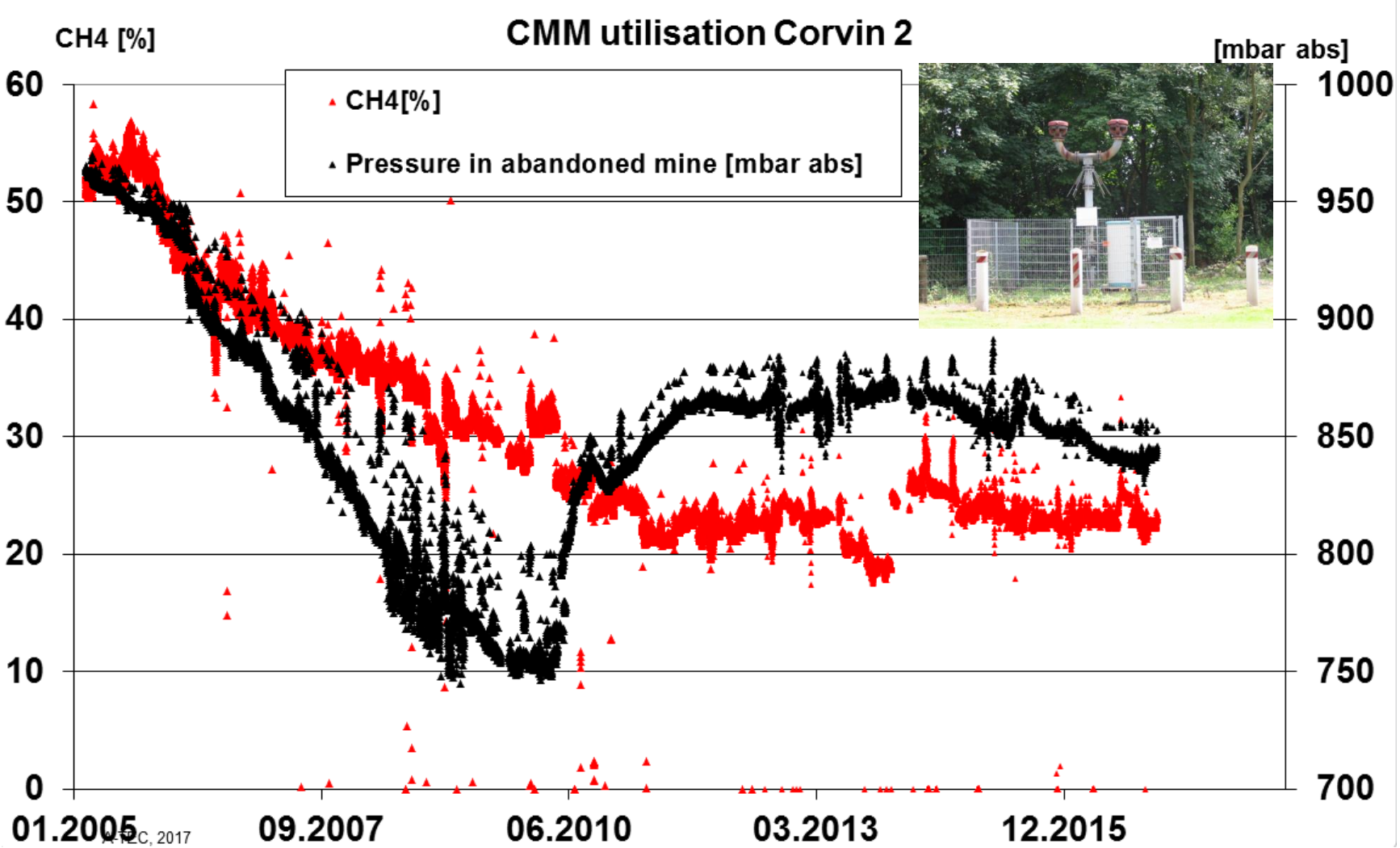


Some data from plants in operation

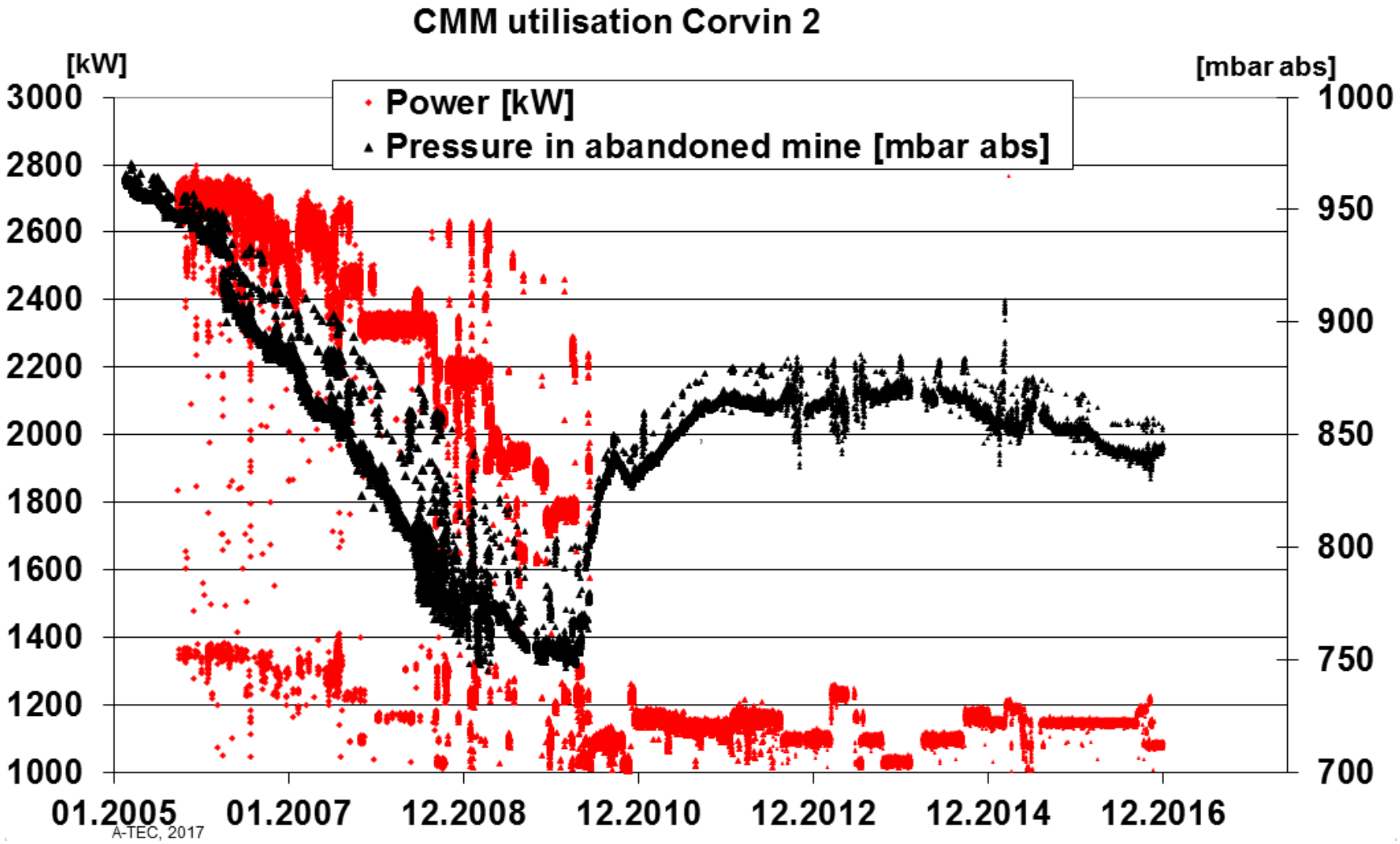
The following diagrams show typical developments in the utilization of gas to the closed mines.

- **Methan content**
- **Power production**
- **Gas pressure in abandoned mine**

CMM Quality Case 1



CMM Powerproduction Case 1



CMM Utilisation Case 2

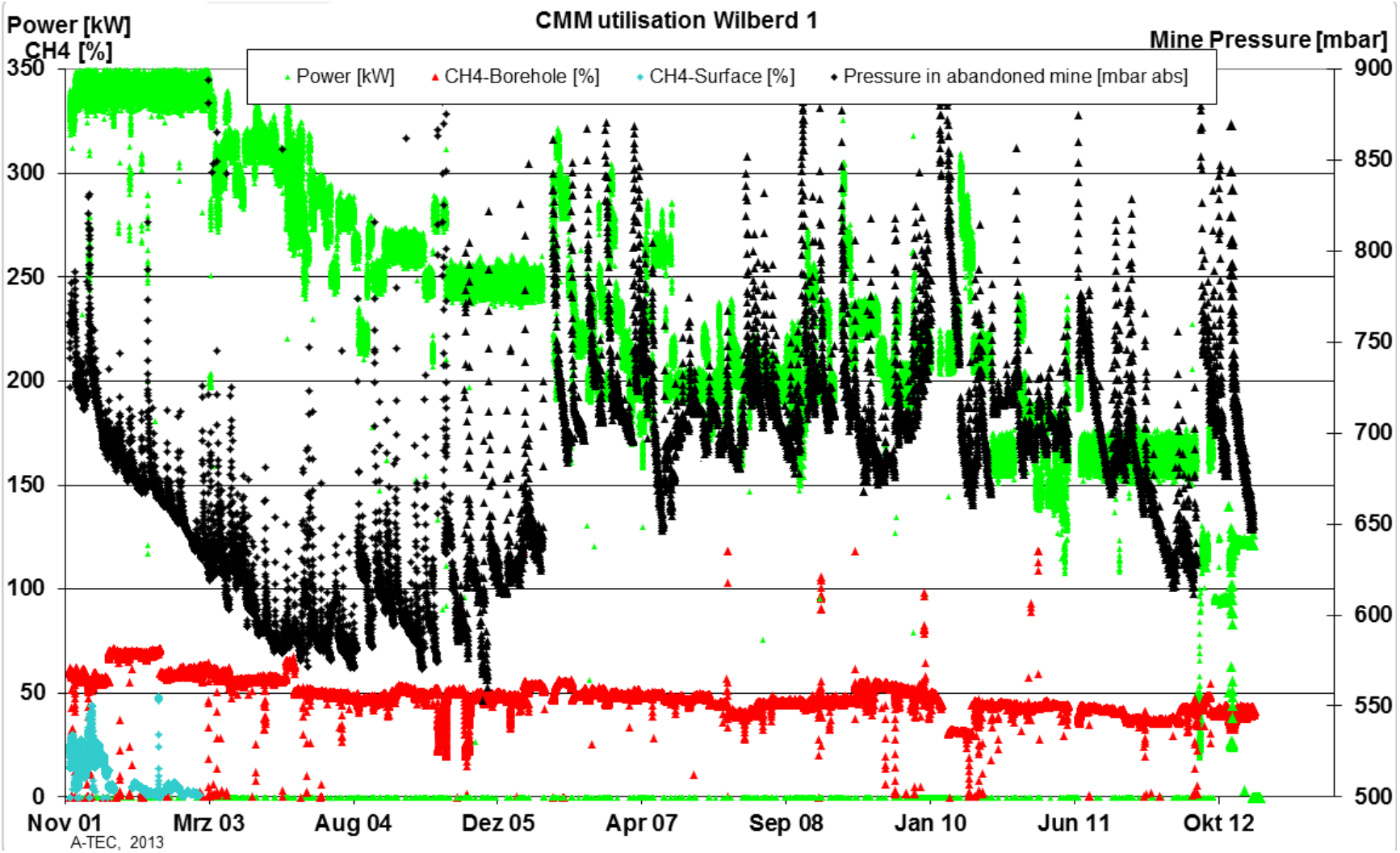
Borehole Degassing Plant

Surface Degassing Plant

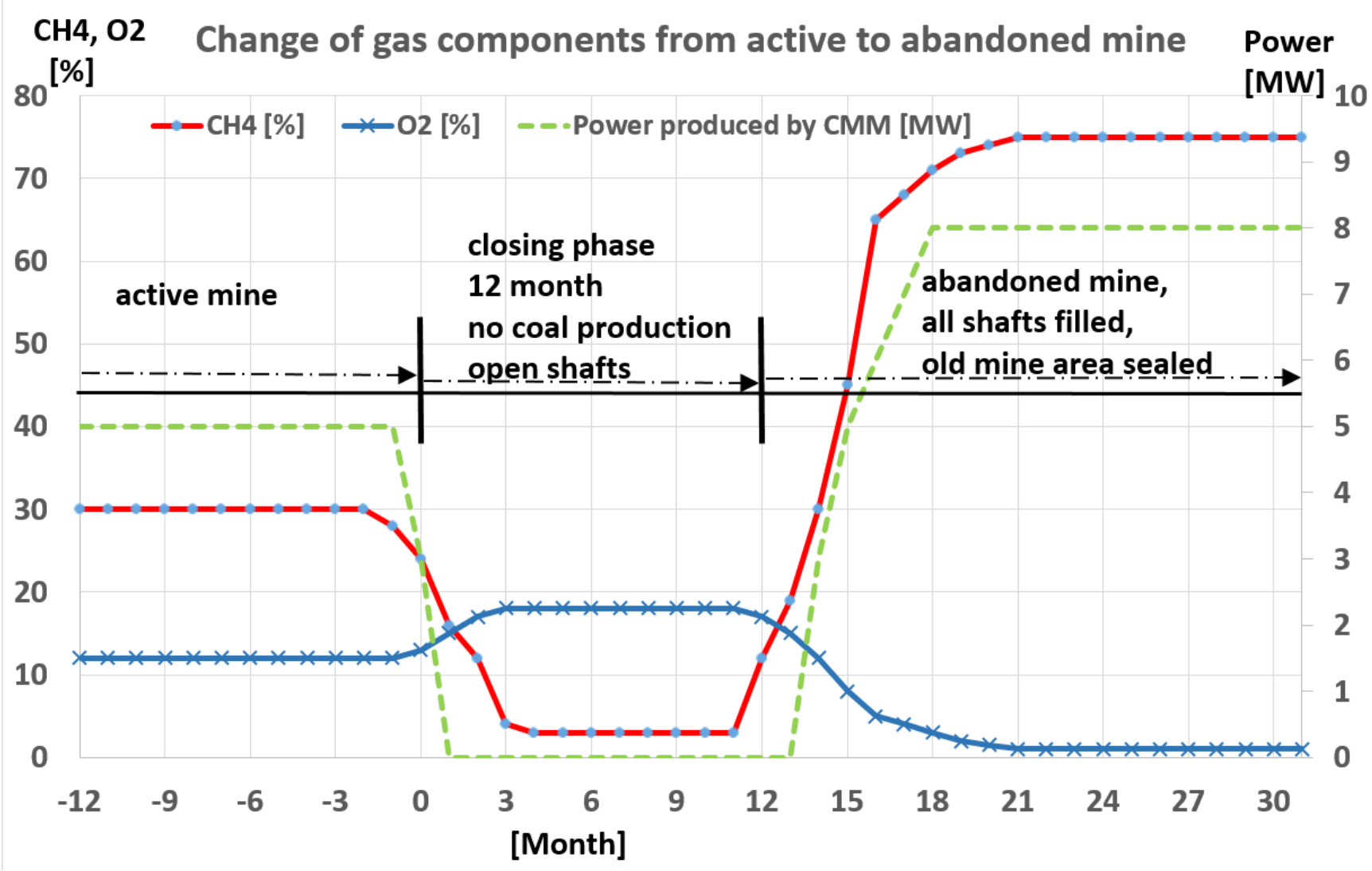
Surface Borehole 30 m

Borehole Gob 106 m

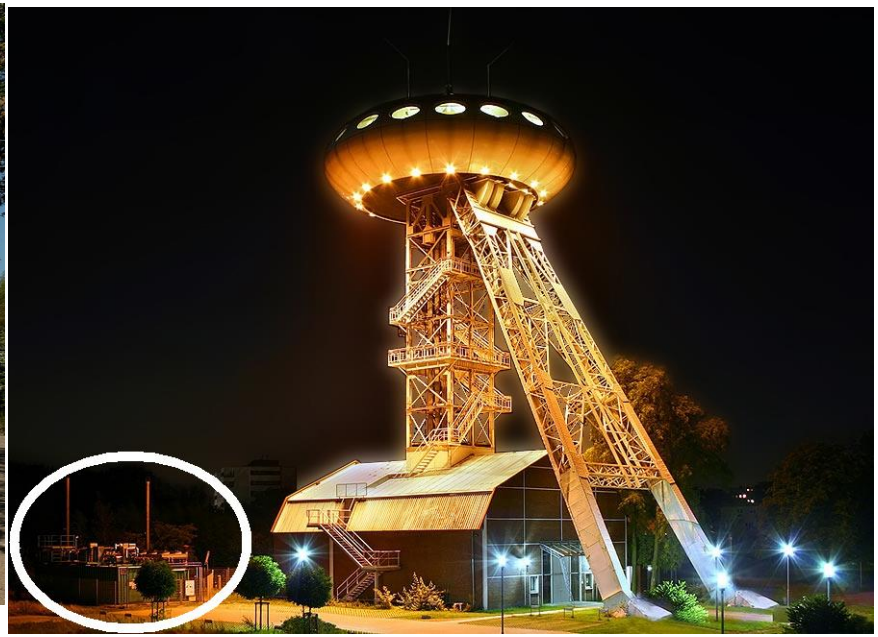
CMM Utilisation Case 2



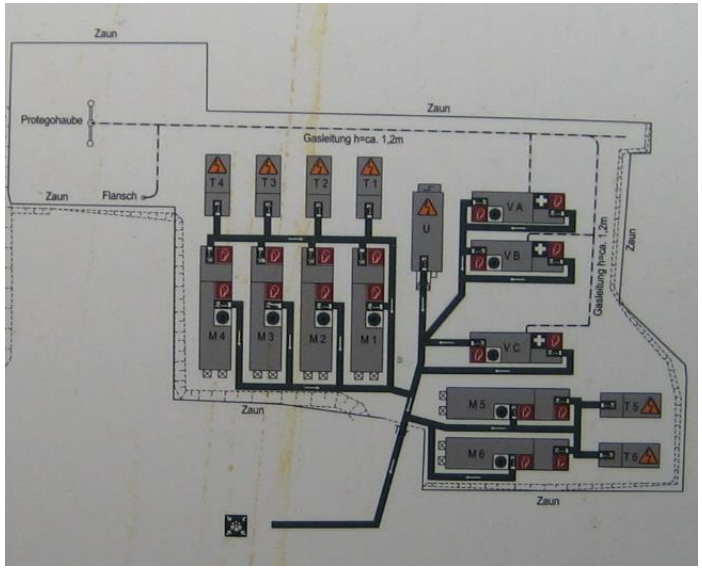
CMM Utilisation Case 2
Active Mine -> Abandoned Mine



CHP plant examples



Drilling installation and CHP plant examples



Thank you for your attention

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