

### Setting

Country	Poland
Location	Kielce
Project start date	
Project end date	2008
Technology keywords	CHP, biomass
Host sector	Polish Energy Group - PGE S.A.

### Technical summary of the project

Objective of the project	The investment was voluntary action of the company but influenced by EU/national regulations.
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### Project description

#### Project Type:

(New Generating Capacity: Renewables) - EG 04

The new heat and power cogeneration unit in Kielce CHP has been put into operation in December 2008. The unit consist of separated coal and biomass boilers and following devices:

- steam boiler OR 50, fuel: coal, steam production: 50 t/h;
- steam boiler OR 50, fuel: biomass, steam production 20 t/h;
- back-pressure turbine set, installed capacity: 10,5 MWe, additionally heat station: 30 MWt.



Two separated steam boilers are working on one turbine. Applied technology is using BFU (BI-FUEL UNIT) technology. The new unit in Kielce CHP is very unique and the first one in Poland that enables to burn coal and biomass (energetic willow, wood chips) separately. This is quite innovative solution both on polish and international level. In comparison with the most common technology of coal and biomass coburning in one combustion chamber, this solution is significantly more efficient. The unit fulfills EU criteria determined for heat and power high efficient cogeneration. It is able to generate about 63 GWh of electricity. Heat generation level is estimated for about 660.000 GJ. About 20% of above mentioned generation comes from biomass.

New unit is characterized by high efficiency of chemical energy conversion into heat and electricity. It reaches over 80%. Achievable efficiency is much higher in comparison with conventional condensation boilers efficiency. This project enabled displacing of high emitting sources (old fashioned coal fired water boilers) by a new high efficient unit. It is flexible and easily adapted to heat demand changes in winter and summer period. It has been designed in accordance with BAT following LCP BREF document.

The project realization brings positive impact on environment, improves chemical energy conversion level and decreases GHG emissions. New unit exploitation is connected with the higher efficiency of generation process, significant coal usage decrease and in consequence CO<sub>2</sub> emissions reduction.

#### Project Appraisal and Estimation Methods:

The project resulted in significant environmental (e.g. lower CO<sub>2</sub> emissions, lower power consumption) economic (e.g. power savings) and social (e.g. improvement of the power plant's image) benefits. For the estimation of CO<sub>2</sub> emissions reductions, the following calculation was made:

Emission with project:

Emission with project comes from biomass burning and is recognized as avoided emission. According to this fact, CO<sub>2</sub> reductions have been estimated on the basis of avoided emission for the same amount of heat production previously based on hard coal in Kielce CHP.

**New renewable energy generating capacity installed -  
biomass displacing higher emitting sources**

Emission with project (biomass):  $ECO_2 = \text{recognized as non emitted} = 0$  [tCO<sub>2</sub>]

Emission without project:

Calculation is based on chemical energy of used coal, that would have been burned to achieve the same generation level.

Example for 2008:

- fuel (coal) consumption = 11.000 [t] - *Do*;
- heating value = 23,4 [MJ/kg] - *Dz*;
- oxidation factor = 0,957 - *Wu*;
- CO<sub>2</sub> emission factor = 96,3 [kgCO<sub>2</sub>/GJ] - *WeCO<sub>2</sub>*

Emission without project (coal):

- $ECO_2 = Do \times Dz \times WeCO_2 \times Wu$
- $ECO_2 = 11.000$  [t] x 0,0234 [GJ/kg] x 96,3 [kgCO<sub>2</sub>/GJ] x 0,957 = 23.722 [tCO<sub>2</sub>].

Achieved CO<sub>2</sub> emission reduction: 23.722 [tCO<sub>2</sub>].

Fuel savings:

Coal consumption for heat generation in Kielce CHP before project implementation was on the level of 11.000 [t]. Coal has been displaced by biomass (energetic willow, wood chips) since project implementation. Fuel saving results from coal switch to "non-emissive" biomass. Fuel saved in 2009: 11.000 tones of hard coal.

**Environmental and social benefits**

<b>(Estimate of) Greenhouse Gases abated</b>	Annual:
	Up to and including 2012: tCO <sub>2</sub> -equivalent
	Up to a period of 10 years: tCO <sub>2</sub> -equivalent
	Up to a period of 15 years: tCO <sub>2</sub> -equivalent

**Host organisation**

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