

Setting	
Country	Poland
Location	Gorzów
Project start date	
Project end date	2008
Technology keywords)	CHP
Host sector	Polish Energy Group - PGE S.A.

Technical summary of the project	
Objective of the project	The core of this project was to switch off two back-pressure turbine sets (T4, T5) integrated with combined cycle unit and to replace them by more efficient pass-out and condensing turbine (T6). Furthermore it is noteworthy that T6 turbine was primary integrated with high emissive coal fired boiler that has been shut down.

Project description

Project Type:
This Project concept is based on optimal usage of generating devices during summer season (ca. 4 months). The main purpose is to achieve maximal efficiency of power generation and simultaneously minimize CO₂ emissions.

The project results:

- lower CO₂ emissions;
- electricity generation process efficiency improvement;
- coal usage decrease resulting from coal fired boiler shut down during summer period
- social benefits - image improvement.



Project reasons

The investment was made for commercial reasons and was voluntary action of the company.

Project Appraisal and Estimation Methods:

The CO₂ reduction results from two below mentioned elements:

- 1) Electricity generation efficiency improvement resulting from turbines replacement on combined cycle unit. Low efficient turbines T4 & T5 are shut down and replaced by more efficient one (T6).

Emission without project:

Calculation is based on generation efficiency improvement. Example for 2008:

- Electricity generation efficiency on combined cycle unit working with turbines T4 & T5 during summer period: $\eta_1 = 0,379$;
- Chemical energy consumption per electricity generation unit: $eq_1 = 9,50 \text{ GJ/MWh}$;
- Operating time: 3,5 month;
- Fuel (natural gas) consumption: 392.202 GJ (108945 MWh);
- Electricity production: $A = 3,5 * 108.945 \text{ MWh} * 0,379 = 144.515 \text{ MWh}$;
- CO₂ emission factor: $WCO_2 = 0,055 \text{ Mg CO}_2/\text{GJ}$;

- CO₂ emission: $ECO_2 = 144.515 \text{ MWh} * 9,50 \text{ GJ/MWh} * 0,055 \text{ Mg CO}_2/\text{GJ} = 75.509 \text{ Mg CO}_2$;
- Emission with project:
- Electricity generation efficiency on combined cycle unit working with turbine T6 during summer period $\eta_2 = 0,423$;
 - Chemical energy consumption per electricity generation unit: $eq_2 = 8,51 \text{ GJ/MWh}$;
 - Operating time: 3,5 month;
 - Fuel (natural gas) consumption: 392.202 GJ (108945 MWh);
 - Electricity production: $A = 3,5 * 108.945 \text{ MWh} * 0,379 = 144.515 \text{ MWh}$;
 - CO₂ emission factor: $WCO_2 = 0,055 \text{ Mg CO}_2/\text{GJ}$;
 - CO₂ emission:
 $ECO_2 = 144.515 \text{ MWh} * 8,51 \text{ GJ/MWh} * 0,055 \text{ Mg CO}_2/\text{GJ} = 67\ 640 \text{ Mg CO}_2$.
 $CO_2 \text{ reduction} = 75.509 \text{ Mg CO}_2 - 67.640 \text{ Mg CO}_2 = 7869 \text{ Mg CO}_2$
- 2) Coal fired boiler shut down during summer period.
- Fuel chemical energy consumption (summer period): $E = 189.634 \text{ GJ}$;
 - Coal CO₂ emission factor: $WCO_2 = 0,1 \text{ Mg CO}_2/\text{GJ}$;
 - Avoided CO₂ emission: $= ECO_2 = 189.634 \text{ GJ} * 0,1 \text{ Mg CO}_2/\text{GJ} = 18.963 \text{ Mg CO}_2$
 - Total CO₂ reduction during one year of operation = $7869 \text{ Mg CO}_2 + 18.963 \text{ Mg CO}_2 = 26.832 \text{ Mg CO}_2$

Environmental and social benefits

(Estimate of) Greenhouse Gases abated	Annual:
	Up to and including 2012: CO ₂ -equivalent
	Up to a period of 10 years: tCO ₂ -equivalent
	Up to a period of 15 years: tCO ₂ -equivalent

Host organisation

Name of Host organisation	Polish Energy Group - PGE S.A.
E-mail and/or web address	Karolina.Modlinska@pgesa.pl
Contact person	Karolina Modlińska