

Setting	
Country	Bulgaria
Location	Pleven
Project start date	2007
Project end date	February 2008
Technology keywords	Combined Heat and Power, District Heating
Host sector	District Heating Company

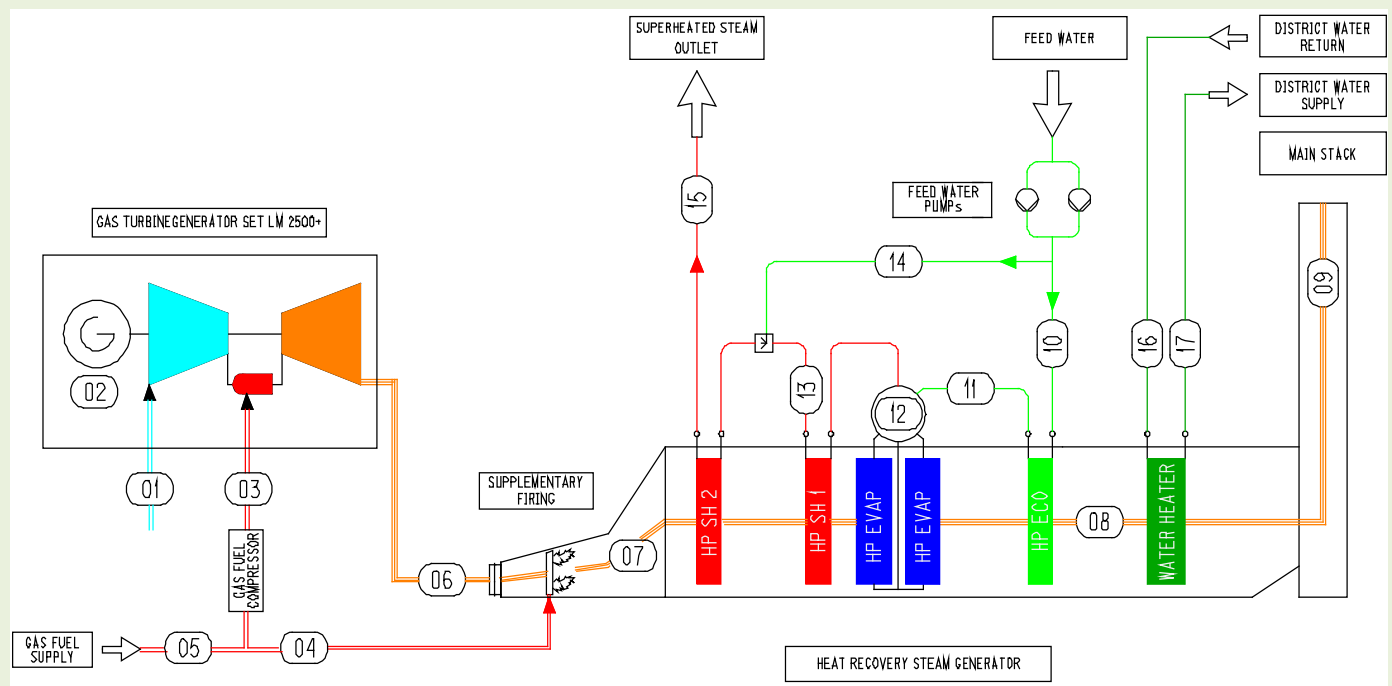
Technical summary of the project

Objective of the project	To carry out a renovation of district heating station implementing a CHP unit based on a gas turbine.
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Project description:

The project was executed in DHC Pleven, Bulgaria. It included installation of a gas turbine and boiler-utilisator, after which the produced steam is fed to the existing main steam collector and feeds the respective steam turbine. A heat exchanger is installed at the outlet of the boiler-utilisator to utilize the heat of exhaust gases using water as a heat carrier. The overall capacity of the unit is 108 MW of which 32 MW electrical capacity.

Scheme of CHP installation in Pleven district heating



The overall efficiency of the cycle is 84 % while only the electrical efficiency is max. 38 % depending on the workload of the turbine, the working regime and the ambient temperature.

Technical data of the gas-turbine LM - 2500+ are given below:

1. Electrical capacity - 32 056 kW_{el}.
2. Natural gas consumption - 9 670 kJ/kWh
3. NO_x emissions < 51 mg/Nm³ at 15% O₂
4. CO emissions < 31 mg/Nm³ at 15% O₂
5. Capacity of the heat exchanger:
 - without additional burners - 10.4 MW
 - with additional burners - 9.8 MW
6. Total cycle efficiency:
 - without additional burners - 84.15%
 - with additional burners - 88.26%

Project results:

Annual production of 227000 MWh electricity and 381000 MWh heat energy in the new installation;

Project benefits include:

- Combined heat and power production with high overall efficiency;
- Production of energy based on natural gas fuels with low emission factor;
- Greenhouse gas emission reductions

The generated electricity is fed to the national grid at 110 kV and the generated heat to the consumers of Pleven town, respectively steam for industrial consumers and hot water for space heating and domestic hot water.

Lessons learned and conclusions:

This type of equipment for combined heat and power based on gas turbine is very appropriate in cases of consumption of both steam for industrial purposes and hot water for space heating and domestic hot water preparation. The industrial steam consumption ensures better capacity utilization of the CHP unit.

The cycle has high overall efficiency over 80 % and is very suitable for replication in DH stations where there is all-year-round consumption of heat.

Environmental and social benefits

(Estimate of) Greenhouse Gases abated (in metric tons of CO ₂ -equivalent)	Annual: 154 000 tCO ₂ -equivalent in average Up to and including 2012: 770 000 tCO ₂ -equivalent Up to a period of 10 years: 1 540 000 tCO ₂ -equivalent Up to a period of 15 years: 2 310 000 tCO ₂ -equivalent
Number of reduction units (EAU, CER, ERU, AAU)	770 000 ERU till 2012

Socio-economic aspects What social and economic effects can be attributed to the project and which would not have occurred in a comparable situation without that project?	Significant improvement of technical and economic performance of DH Pleven, increased efficiency of the system compared to separate production leading to more attractive heat prices for final consumers and better competitiveness of the company. Additional revenues from sales of produced electricity, which improve the cash flows and economic results of the project.
Methodology used (if applicable: approved baseline methodology or study done - refer to this; and monitoring organisation)	The methodology for CO ₂ calculations is based on the approved by the Bulgarian Ministry of Environment and Waters emission factors. The project has been approved as a JI Project.
Economic data	
Capital costs	37 million leva
Financing scheme	Bank loan
Financing organisation	N.A.
Project developer	
Name of the project developer	District Heating Pleven - Toplofikacia Pleven
E-mail and/or web address	http://www.toplo-pleven.com/
Contact person	Eng. Erdinaj Muratov
Host organisation	
Name of Host organisation	District Heating Pleven - Toplofikacia Pleven
E-mail and/or web address	http://www.toplo-pleven.com/
Contact person	Eng. Erdinaj Muratov
Technology provider	
Name of Technology provider	GE / General Electric/
E-mail and/or web address	-
Contact person	-