

Setting

Country	Bulgaria
Location	Vratsa
Project start date	2004
Project end date	July 2005
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 internal combustion engine fuelled by natural gas.
--------------------------	---

Project description

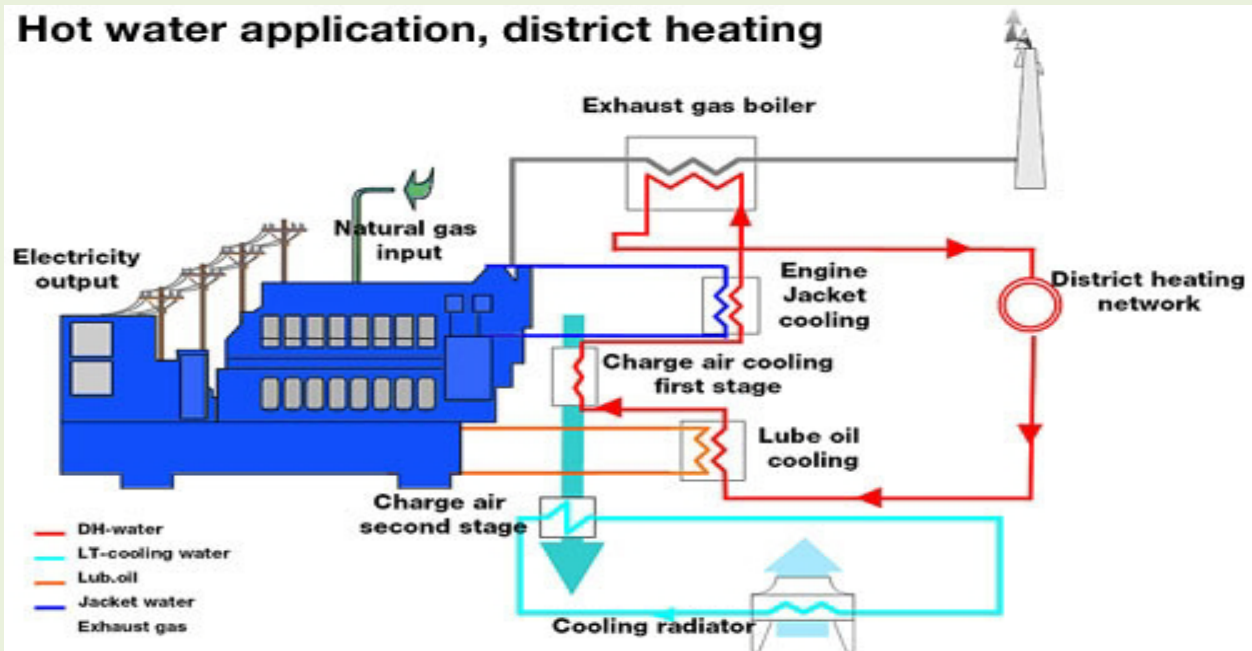
The project was executed in DHC Vratsa, Bulgaria. It included instillation of a CHP unit based on reciprocating gas engine Wartsila 16V25SG plus generator. There are two gas engines + generators + boiler-utilisators installed with the overall capacity of 12,1 MW of which 6 MW electrical capacity.

The overall efficiency of the cycle is 84 % while only the electrical efficiency is 40 %.

Technical data of Wartsila 16V25SG at 100 % work load are given below:

1. Electrical capacity - 3 079 kW_{el}.
2. Natural gas consumption - 8 958.8 kJ/kWh_{el}
3. NOx emissions < 675 mg/Nm³ at 5% O₂
4. CO emissions < 735 mg/Nm³ at 5% O₂
5. Efficiency - 40 %

Hot water application, district heating



Project results:

Annual production of 41 500 MWh electricity and 43 600 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 20 kV and the generated heat to the consumers of Vratsa town hot water for space heating and domestic hot water.

Lessons learned and conclusions

This type of equipment for combined heat and power based on reciprocating engines with unit capacity of up to 3 MW_{el} is very appropriate in cases of consumption of only hot water for space heating and domestic hot water preparation. They are optimal in view of specific investments and the availability of a number of engines (two) ensures flexibility of the overall installation and better adjustment to consumers' needs of hot water.

The cycle has high overall efficiency over 80 % and is very suitable for replication in DH stations with seasonal working schedule. DH stations dispose with qualified personnel for this type of equipment and the technology suppliers provide adequate maintenance at reasonable costs.

Environmental and social benefits

(Estimate of) Greenhouse Gases abated	Annual: 31 000 tCO ₂ -equivalent in average Up to and including 2012: 193 600 tCO ₂ -equivalent Up to a period of 10 years: 310 000 tCO ₂ -equivalent Up to a period of 15 years: 465 000 tCO ₂ -equivalent
Number of reduction units (EAU, CER, ERU, AAU)	-
Socio-economic aspects	Significant improvement of technical and economic performance of DH Vratsa, 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	The methodology for CO ₂ calculations is based on the approved by the Bulgarian Ministry of Environment and Waters emission factors.

Economic data

Capital costs	3,5 million leva
Financing scheme	Bank loan
Financing organisation	N.A.

Project developer

Name of the project developer	District Heating Vratsa - Toplofikacia Vratsa
E-mail and/or web address	http://www.vratza.com/dhc/
Contact person	Eng. Angel Angelov

Host organisation

Name of Host organisation	District Heating Vratsa - Toplofikacia Vratsa
E-mail and/or web address	http://www.vratza.com/dhc/
Contact person	Eng. Angel Angelov

Technology provider

Name of Technology provider	Wartsila, Sweden R.C.Limited, Power Plants Sales Representative for Bulgaria
E-mail and/or web address	-
Contact person	-