CASE EXAMPLE OF JOINT IMPLEMENTATION APPLICATION FOR MUNICIPAL COGENERATION IN A MEDIUM SIZE CITY

The basic conditions for this case study refer to a Municipality having an old coal (lignite) fired cogeneration power plant that is going to be shutdown and replaced with a gas fired TG plant with recuperative boiler. The gas comes from the city landfill and, as support only, from the gas grid to which the city is connected. We will not discuss the gas supply part but consider it done and analyze only the creation of Emission Reduction Units from the phasing out of coal conversion technology and the phasing in of the gas one.

We will also consider the project in its initial state and comment on the potential partners giving the characteristics of local and foreign partners. All these data are based on real situations in existence in a Romanian medium size city. The basic calculation tables for the determination of ERUs are given in the UNFCCC-URF Appendix having been done in accordance with the UNFCCC requirements.

The proposal is to build a new Co-generation plant with 26 MWe capacity and to rehabilitate the existing heat only boilers and heat transport and distribution networks. The project will reinforce heat supply in the city, enabling the existing polluting lignite fired plant to be shutdown, diminish actual losses and produce electricity and heat at lower cost and more environmental friendly than at present. The project will be based on the well-established gas engine technology, renown for reliability and robustness, and also for safely operating at very low gas pressure, what is a prerequisite in the given context.

Content

Supplier

Project company a public private partnership with a Foreign company.

Amount of ERUs offered

1,536,140 ERUs

Price:
Undiscounted price 9,08 EUR/ERU
Total ERU contract value 13,948,151 EUR

Justification

Background

Within the scope of a framework agreement between the Foreign Country and Romanian governments, intended to stimulate the development of a number of modern Co-generation projects as commercial Joint Implementation projects, a number of candidate-projects, including one in the Municipality has been selected.

Based on a proposal made by the municipality and the municipally owned Heat distribution company (HEDICO), a study has been started for the analysis of the limitations and shortfalls of the heat and hot water supply delivered at present from the existing thermal production facilities of HEDICO and of the City power plant, and of the possibilities to improve HEDICO's facilities.

The existing heat production facilities are rather old (25 - 30 years), which means not only a limited residual lifetime, but also a relatively poor thermal efficiency. The City power plant is one of the most inefficient and polluting generating capacities of POWER GENERATION COMPANY, the owner and operator of the centralized thermal power generating capacity in Romania.

Besides, the existing facilities are not enough for covering the heat demand during cold spells, leading in such periods to discomfort and unhappiness of the inhabitants. Furthermore, POWER GENERATION COMPANY has indicated an urgent need to permanently shut down the City Co-generation plant. This very polluting plant cannot be closed until a substitute source of heat for the city is identified and constructed. The proposed project would provide this substitute source of heat.

Additionally, the present energy losses during the transportation and distribution of heat are rather high; making it obvious that a project intended to minimize the CO2 emission levels should address not only the generation level, but also the rest of the energetic chain. Within this framework a joint team of Romanian and Foreign Country’s experts performed an extensive analysis of the present heat demand and of the possibilities to decrease it into the future, and of the alternatives to cover the future demand.

From the beginning it was clear that, due to the low efficiency of the existing Romanian electricity generating system, options based on the combined heat and electricity production (Co-generation) are to be preferred, offering the best solution in terms of economics and environmental impact.

To date, a preliminary and a final technical study have been executed, whereby alternative technical solutions have been compared in terms of energy efficiency, reduction of the CO2 emission levels, costs, economics and risks. This activity has been carried out jointly by the Foreign Company and IFC, using IFC/Foreign Country Trust Fund, and in full co-operation between the Romanian and Foreign Country experts. The results were used for the definition of the preferred alternative, based on which preliminary discussions with the International Finance Corporation have been started. IFC contracted ING Barings for the preparation of a financial feasibility study. This study revealed that the project might be feasible under certain conditions, one of the most important being the revenues from the ERUs transaction.

Project partners

Foreign Company

The Foreign Company should be a reliable partner with long enough experience in heat production and distribution and must have an extensive network in its country of origin. The Foreign Company must also be agreed by the Foreign Country's government to participate in the framework of the Joint Implementation agreements with the Government of Romania. Credible relationships should already exist between the Foreign Company and the Local Administration whose experts must be involved in the project from the beginning.

To obtain all permits and licensing for this project a Project Company will be created in Romania in which both the Foreign Company (main shareholder) and the Municipality of the city will participate.

The Municipality of the city

In our case the city has over 100.000 inhabitants. The main fields of activities are industrial (65%), commercial (10%), constructions (20%) and services (5%). The project is of considerable importance for the community. The technical state of the current installations is bad. Parts of closed down units are being used to keep the installations running.

The municipality' s most important reason to participate in the project is the stable provision of energy and heath to its inhabitants and companies.

To achieve this, a significant capital expenditure is required to upgrade and construct new heat production facilities and to completely upgrade the heat transportation and distribution networks. It is clear that the Municipality is not able to supply such funding from its local budget, and borrowing is practically impossible without a sovereign guarantee that cannot be delivered by the central government.

On the basis of the above-mentioned considerations, the municipality agreed to the proposed financial construction, requiring no contribution from the Municipality' s budget for financing the project. The Project Company will be financed on a limited-recourse basis, meaning that their shareholders have only limited obligations for repayment of the Project Companies' debt. It is of course the credibility of the main sponsor to the financial institutions and its equity contribution enabling such a construction. Although a minority shareholder in the Project Company, it is clear that the Municipality, at the end, remains responsible for the welfare and well being of her inhabitants. An important responsibility is to

be secured through a well-balanced concession agreement between the Municipality and the Project Company.

S.C. HEDICO S.A.

Actually fully owned by the City and in charge for the production, transportation, distribution and supply of the heat to the customers, is the other partner to the project. They are the present holders of the concession with the municipality, having in use all the assets from the public as well as the private domain. It is expected that the private domain assets will be its participation in kind to the forming of the project company.

The investment

The aim of the project is to build a new 26.4 MWe co-generation plant, rehabilitate the existing heat-only boilers, rehabilitate the heat transport and distribution system, and implement demand side management (DSM) measures in the municipality. In addition to saving energy in the existing boiler house, saving energy for the end-consumers and reducing losses in the transport and distribution system, project removes the need for the City lignite-fired power plant, which can therefore be closed down. DSM measures include the adaptation of radiators, taps and showerheads. In the current situation heat is produced by the gas-fired heat-only boilers and during cold spells- when the capacity of the heat-only boilers is insufficient- by the lignite-fired City power plant (an average of 26 days a year).

The concrete products that the project will deliver so it can achieve its purpose are:

- Decrease of net heat demand: 273,715 GJ/year;
- Decrease of the heat transportation and distribution losses by 10%;
- Heat production in Co-generation: 658,060 GJ/year;
- Heat production by heat only boilers: 280,392 GJ/year;
- Electricity production Co-generation plant: 147,127 MWhe/year;
- CO2 emission reduction: 307.2 kton/year.

Emission reduction

Ktonnes	**Annual (average 2008-2012)**	**Total budget period**
Baseline emissions	372.5	1863
CO2 emissions City electricity	225.0	1098
CO2 emissions City- heat	37.5	188
CO2 emission on-site heat production	115.5	578
Project emissions	70.8	354
CO2 emission on site heat production	95.7	478
Balance electricity production	-24.9	-124
Reduction	307.2	1536
Heat production on site	19.8	99

City: heat replaced	37.5	188
City heat replaced	225	1125
City electricity	24.9	124

In order to get an impression where the largest savings are being achieved within the project, a breakdown is made of the saving by type of measure.

	GJ	**Baseline**	**Project**	**Saving**	**Measure**
Heat consumption	977554	703840	-273714	8%	Implementation of DSM
Heat production	1503930	938453	-565476	10%	Reduction of distribution losses from 35% to 25%
Fuel consumption heat and electricity	4312790	1708585	-2604205	76%	Efficiency improvements and closing of the City plant

As can be seen from this table, the major part of the savings are made by improving the efficiency of the heat production and closing down the City plant.

The detailed calculations are given in the Appendix below for the case described.

Joint Implementation Project: Municipal Cogeneration
Calculation of CO2 Emissions Reduction

Base-Line Definition and calculation of CO_2 emissions

Present heat demand		964887 GJ/year
Transport & Distribution losses	**35.00%**	519555 GJ/year
Present heat production		1484442 GJ/year

Ways of production Gas fired boiler (HOB) and Lignite cogen plant City

Heat production cogen plant	254000 GJ/year
Thermal efficiency heat production (LHV)	25.0%
Lignite consumption heat production	1016000 GJ/year
Electricity production cogen plant	141111 MWhe/year
Thermal efficiency electricity production (LHV)	20.5%
Lignite consumption electricity production	2478049 GJ/year
Total lignite consumption	3494049 GJ/year
Specific CO; emissions	100.00 kgCOs/GJ
C02 emissions electricity & heat production City plant	349.40 kton/year
Heat production HOB	1230442 GJ/year
Thermal efficiency HOB (LHV)	62%
Natural gas consumption	1984583 GJ/year
Specific C02 emissions	56 kg CO2/G
CO2 emissions heat production HOB	111.14 kton/year
Total CO; emissions heat and electricity production	460.54 kton/year

Definition of the alternative and calculation of CO2 emissions

Future heat demand		**964887 GJ/year**
Transport & Distribution losses	25.00%	321629 GJ/year
Future heat production		1286516 GJ/year

Ways of production Gas fired Cogen plant and HOB

Heat production cogen plant	407376 GJ/year
Electricity production cogen plant	91080 Mwhe/year
Thermal electric efficiency cogen plant	39.00%
Natural gas consumption cogen plant	840738 GJ/year
Specific CO2 emissions	56 kg CO2/GJ
CO2 emissions cogen plant (electricity & heat production)	47.08 kton/year
Heat production HOB	879140 GJ/year
Thermal efficiency HOB (LHV)	80%
Natural gas consumption	1098925 GJ/year
Specific C02 emissions	56 kg CO2/GJ
CO2 emissions heat production	61.54 kton/year
Total CO2 emissions heat and electricity production Targoviste	108.62 kton/year
Electricity production (balance elswhere)	50031.11 Mwhe/year

Way of production LiQnite fired plant

Thermal efficiency (LHV)	35.0%
Lignite consumption	514606 GJ/year
Specific CO2 emissions	l00kgCO2/GJ
CO2 emissions balance electricity production	51.46 kton/year;

Total CO2 emissions heat and electricity production 160.08 kton/year

Net CO2 emissions reduction

CO2 emissions reduction 300.46 kton/year