



Improvement of heating system in different types of buildings *Sofia Energy Center, Bulgaria*

Summary

This case study highlights the package of technical measures, leading to improvement of heating systems by installation of equipment for biomass burning, which were undertaken at the end user level in a number of buildings – housing, industrial and public. The main goal of the project is implementation of technical measures for reduction of the cost in two residential, four production and three public buildings through substitution of light fuel oil or electricity with biomass-wood wastes. The scheme for financing the elaboration of the project includes borrowed capital (89,28%) and own participation of the investor (10,72%). As a result to the complete implementation of such a project, the costs for heating the buildings are expected to be reduced by 30 % compared to the present ones.

End-user area

- New buildings
- Refurbishment of buildings
- Transport and mobility
- Financial instruments
- Industry
- Legal initiatives (regulations, directives, etc)
- Planning issues
- Sustainable communities
- User behaviour
- Education
- Other

Target Audience

- Citizens
- Households
- Property owners
- Schools and universities
- Decision makers
- Local and regional authorities
- Transport companies
- Utilities
- ESCOs
- Architects and engineers
- Financial institutions
- Other

Technical

- Energy efficiency
- Heating
- Cooling
- Appliances
- Lighting
- CHP
- District Heating
- Solar energy
- Biomass
- Wind
- Geothermal
- Hydro power
- Other

Context

The required energy for heating and supply of hot water in the nine buildings under question had been provided by light fuel oil and electricity. Taking into consideration the high and constantly rising prices of these energy carriers, the nine buildings needed a more cost effective and energy efficient solution. The project consists of construction of nine heating boiler facilities for production and delivery of heat through burning of biomass. Biomass is in the form of wood wastes – bark, covers, shavings from wood processing, at 20 % humidity and 10,5 GJ/ton calorificity. The boilers are type ATMOS with different capacities depending of requirements of the buildings.

Objectives

The main objective of the project is reduction of the energy costs, through installation of biomass fuelled boilers and substitution of liquid fuel and/or electricity.

Process

This is an energy delivery project for supply of nine buildings with thermal energy by installation of biomass boiler facilities with total installed capacity 1,2 MW. The boiler types are ATMOS of different capacities according to building heat requirements.



The annual energy production of boilers amounts to 12 403 GJ or 3 445 MWh while wood consumption of boilers is 1481 tons. The boilers also consume 25 157 kWh electricity/year.

There are three groups of buildings involved in the project:

- 2 residential buildings with total heated volume of 11 180 m³, total annual energy consumption of 807,84 MWh, and total installed capacity of 367 kW;
- 4 production buildings with total heated volume of 15 668 m³, total annual energy consumption of 1807,92 MWh and total installed capacity of 597 kW;
- 3 administrative buildings with total heated volume of 6000 m³, total annual energy consumption of 829,44 MWh and total installed capacity of 269 kW.

The capital financial indicators demonstrate the feasibility of the project and its attractiveness for realization. The cumulative cash flow during the credit period is enough for the flawless servicing of the obligations till the end of the credit period.



Wood chips boiler

Financial resources and partners

The total project costs amount to 412 thousand Euro. Financing will be provided with 89,28 % UBB bank loan and 10,72 % equity. The project also has 8002 Euro/year operational costs, including personnel salary, maintenance of equipment and transportation of wood wastes to the boiler stations. The expected pay-back period of the investment is 3,5 years.

The partnership is formed among EnCon Services (one of participating in Biomass Partnership stated by a Letter of intent) – company providing assistance in feasibility studies and in getting bank financing through EBRD credit line in Bulgaria, Erato Holding (both as equipment supplier and owner of buildings) and the representatives of buildings owners. The role of Sofia Energy Centre was to assist in forming the partnership and bringing together equipment supplier, consultant, financier and building owners.

Results

The total annual quantities of energy from biomass as a result of the project amount to 12 403 GJ or 3 445 MWh. The total installed capacity of biomass fueled boilers is 1,2 MW.

Other benefits of the project include substitution of 349 tons/year of light fuel oil leading to annual emissions reduction of 1075 CO₂ equivalents, almost 7 tons annual emissions reduction of SO_x and about 2 tons of NO_x annual emissions reduction.

Lessons learned and repeatability

A key barrier to introduction of energy efficiency in public and/or residential buildings is not the technology itself, but the limited sources of finance and the policy framework which limits the state subsidies which have to catalyse investments for energy efficiency improvements. The state with its regulative function shall encourage investments and facilitate the process of technology and finance transfer.

The project reveals that the partnership concept when all interested parties can successfully overcome the barriers and end-up with installation of biomass fueled facilities. The concept is able to be replicated both within Bulgaria and elsewhere in Europe. A very important moment is to involve organizations providing technical assistance to the owners in preparation of feasibility studies and also access to credit lines or other financing sources available at place.



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