

Utilization of biomass from municipal green areas for heating purposes - Pilot Joint Implementation project in Poland

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Summary

The first pilot Joint Implementation (JI) project in Poland, at the City Greenery Unit in Jelenia Góra, replaced two low-efficient coal-fired boilers with a high efficient boiler burning wood chips obtained as waste from the management of the city green areas. It has brought many environmental benefits such as reduction of GHG emissions as a result of fuel conversion (coal to biomass), avoidance of methane emissions from wood decay at the landfill, reductions of emissions resulted from avoided transportation of coal and waste wood. The project started in 1998 and was commissioned in 2000. Since then monitoring for JI purposes has been continued.

Key words: Joint Implementation, biomass, and fuel switch

End-user area	Target Audience	Technical
<input type="checkbox"/> New buildings	<input type="checkbox"/> Citizens	<input type="checkbox"/> Energy efficiency
<input type="checkbox"/> Refurbishment of buildings	<input type="checkbox"/> Households	<input type="checkbox"/> Heating
<input type="checkbox"/> Transport and mobility	<input type="checkbox"/> Property owners	<input type="checkbox"/> Cooling
<input type="checkbox"/> Financial instruments	<input type="checkbox"/> Schools and universities	<input type="checkbox"/> Appliances
<input type="checkbox"/> Industry	<input type="checkbox"/> Decision makers	<input type="checkbox"/> Lighting
<input type="checkbox"/> Legal initiatives (municipal regulations, directives, etc)	<input type="checkbox"/> Local and regional authorities	<input type="checkbox"/> CHP
<input checked="" type="checkbox"/> Planning issues	<input type="checkbox"/> Transport companies	<input type="checkbox"/> District Heating
<input type="checkbox"/> Sustainable communities	<input checked="" type="checkbox"/> Utilities	<input type="checkbox"/> Solar energy
<input type="checkbox"/> User behaviour	<input type="checkbox"/> ESCOs	<input checked="" type="checkbox"/> Biomass
<input type="checkbox"/> Education	<input type="checkbox"/> Architects and engineers	<input type="checkbox"/> Wind
<input type="checkbox"/> Other	<input type="checkbox"/> Financial institutions	<input type="checkbox"/> Geothermal
	<input type="checkbox"/> Other	<input type="checkbox"/> Hydro power
		<input type="checkbox"/> Other

Context

It was estimated, that within the city of Jelenia Gora and its neighbourhood, the potential of waste wood from green areas maintenance, to be utilised immediately for energy production purposes is 700 m³ and the entire technical potential is equal to 2.540 m³. Directly, it refers to the potential of 2.100 and 7.500 GJ respectively.

Such a potential provided the possibility for the energy production in the tanks of the capacity of 350 and 1.250 kW respectively.

Objectives

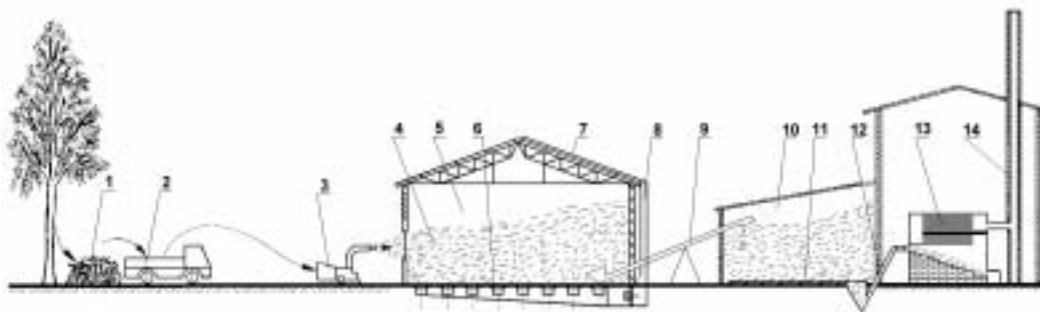
Main concept of the project was to replace two exploited coal-burning boilers with the capacity 256 kW each and efficiency below 50%, belonging to the Municipal Waste Disposal Company of Jelenia Gora and located at a local complex of greenhouses operated by this company. The described investment was realised within the frameworks of Joint Implementation (JI), where the donor country was The Netherlands.

Process

Due to the fact that the same company is also responsible for the maintenance of green areas, the concept arose to replace the low efficiency coal-fired boilers with an automatic installation of high efficiency designed for the utilisation of for waste wood.

The plant is located on the area of the Municipal Waste Disposal Company, which simultaneously is the owner of the plant, and serves for providing heat to the complex of greenhouses of the total area of 1200 m². The green areas served by the Municipal Waste Disposal Company embrace the city of Jelenia Gora and the neighbouring towns of Cieplice Zdroj and Sobieszowo.

The waste wood is shredded in the storage place and then undergoes the process of pre-drying. After some time it is transported to another storage place for long-term storage (a few months). One of the storage places possesses the wiping feeder installed in the floor of the storehouse and screw feeder, which automatically provide the wooden chips directly to the tank.



1- waste wood from tree maintenance, 2- wood chopper, 3- transport vehicle, 4- wood chips, 5- long term store, 6-floor channel dryer, 7,8- solar air collector, 9-screw conveyor, 10 - short term store, 11-walking floor, 12- screw conveyors, 13- boiler, 14 - chimney

Fuel collected in the storage house of a capacity of 50m³, depending on the humidity of the fuel and the ambient temperature, ensures constant heating for the period of c.a. 24 – 48 hours.



System of wood-chip feeders at MPGK in Jelenia Gora

Timetable of implementing the project is shown below.

1998 (autumn) - preparation and submitting of “pilot” JI investment proposal to Dutch SENTER Agency (PSO Programme)

1998 (December) - project proposal approval

1999 (January) - project start-up meeting and contracts finalising

1999 (winter) - finalising of the project technical concept (location of the boiler, wood fuel supply

1999 (spring) establishment and meeting of the project Steering Committee and project promotion and information campaign

1999 (spring - autumn) - technical design of the boiler, boiler house and waste wood storage facility

1999 (summer - autumn) - boiler house rebuilding and disconnection of the old coal fired boiler

2000 (winter) installation of the wood chips fired boiler

2000 (spring - summer) - first boilers trials, installation of the monitoring equipment,

2000 (summer- autumn) - installation of the storage house for wood chips and collecting/purchasing of the wood fuel

2000 (June) - Polish/Dutch Memorandum of Understanding signed up

2000 (October) - official opening of the boiler house and final disconnection of the old coal fired boiler from the heating system

2000 (November) starting of the monitoring

Financial resources and partners

The Dutch company KARA Energy Systems B.V. that provided the wood-chip boiler with 350 kWth provided the installed technology. The infrastructure prepared for the purposes of the actual application in Jelenia Gora included:

- Boiler by KARA with control equipment – 430 000 PLN¹;
- Stack (purchase and mounting) – 10 000 PLN;
- “Moving floor” feeder – 45 000 PLN;
- Additional grid connection – 70 000 PLN;
- Storehouse for wooden chips including drying system located under the floor – 100 000 PLN;
- Air solar collector – 30 000 PLN;
- Shredder – 50 000 PLN;
- Other (truck loader, roads and squares) – 50 000 PLN.

¹ Conversion rate: 1 Euro = 3.7 PLN

Other costs incurred included tank installation (mounting and crane) – 25 000 PLN, documentation – 20 000 PLN. The total cost of the investment was 825 000 PLN.

Results

Before modernisation the heating system for greenhouses in Jelenia Góra had the following parameters:

- Total surplus of 2540 m³ waste wood in the city;
- At least 700 m³ of wood waste deposited in dump;
- 2 coal fired boilers, 256 kW each used;
- Yearly coal consumption - 220 tonnes.

After modernisation the annual quantity of wood used for heating purposes (not dumped) - 388 t. (1100 m³, moisture content 55%), 1 automatic wood chips fired boiler, 350 kW and no coal consumption.

The following benefits were brought by the installation of the biomass technology:

- Savings of 220 tones of coal by its replacement with biomass;
- Abandonment of the storage of 385 tones of waste wood at the landfill, and thus, reduction of the greenhouse gases emission resulting from the decay of organic material;
- Decrease of the fees for using the environment;
- It was estimated that throughout the period of project lasting (15 years), total reduction of carbon dioxide emission would be 21 thousand tones of CO₂ equivalent.

Project lifetime: 15 years

Lessons learned and repeatability

The project has already been replicated through a similar investment in the town of Otwock near Warsaw where waste biomass from cuttings in parks and other green municipal areas was turned into fuel in a modern heating installation. Apart from some technical innovations applied in the project in Jelenia Gora an interesting solution of the Joint Implementation mechanism was used for financing the investment, which has prepared the background and allowed some testing of practices with using various methods for the calculations of baselines for the next larger biomass JI projects to be implemented in Poland. In general, the project has been successful and can be replicated both from a technical and a financing point of view in other countries, as well as inside Poland itself.

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Equipment manufacturer: KARA Energy Systems B.V. (The Netherlands)
Evaluation organisation: Dutch SENTER Agency
EC Baltic Renewable Energy Centre (EC BREC, Poland)
BTG (The Netherlands)