

From cereal straw to district heat: case Kisielice

The district heating system in the municipality of Kisielice was the starting element in building the municipality's energy independence based on renewable energy sources. Low-efficiency and high-emission local boilers were started to be replaced in 2004, when two biomass boilers, with the capacity of 1 and 2 MW, were installed. Next, by 2007, the heating plant had been expanded by installing another boiler, with the capacity of 3 MW, and a 100 kW photovoltaic power plant. This structure of the heating plant improves the rational operation of the boilers, depending on needs and maintenance of the boilers. Electricity is sold to the national electric grid.

The source of biomass is cereal straw, pressed in rectangular bales to the density of 150 kg/m³, each bale measuring of 80x120 cm in the cross-section and 200-300 cm of length. The heating plant, having 40-60 contract agreements with local farmers, gathers straw directly after cereal harvest, from 1,300 ha at the most. The cost of buying straw from a farmer is €11/t. The total cost incurred to the heat plant, covering the purchase, transport, preparation of straw for storage, is €21/t. The heating plant can easily acquire sufficient quantities of straw. Straw is transported to the heating plant and stored in two heaps under a roof. Biomass is fed with a front loader to a self-propelled telescope loader and then, having been cut with shredders, it is fed to a boiler through a system of belt conveyors, rotary lock and screw feeder. The biomass storehouse, adjacent to the boiler room, has a capacity for storing 240 tons of pressed straw. At the average efficiency of the boilers, reaching 90%, the annual average consumption of straw is 3 500 tons. The ash obtained in the process is collected by local farmers for free and applied as a fertilizer on their fields. The potential use of ash that is suitable for being managed is even greater than today. Thus, the heating plant corresponds well to the EU zero pollution action plan.

Currently the district heating network is 15.9 km long. The heat is supplied to residential houses, multi-flat buildings and detached houses, shops, public buildings and health care buildings, in total 260 contracts, including 200 single-family houses. The cost of heat for final user is €3/kW. The total contracted capacity is 2.6 MW (approximately 50 GWh/year), which implicates a potential for the expansion of the number of users. Among the factors that can stimulate the development of the heating network, the following are indicated: improved quality of fuel achieved by investing in roofed storage facilities, and modernization of district heating substations, including new heat exchangers.



KEY WORDS

Energy independence, heat-planting, solar PV

COUNTRY

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AUTHORS

Janusz Gołaszewski (UWM)
janusz.golaszewski@uwm.edu.pl
 Maciej Neugebauer (UWM)
maciej.neugebauer@uwm.edu.pl
 Wojciech Miąskowski (UWM)
wojciech.miaskowski@uwm.edu.pl

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ADDITIONAL INFORMATION

Transforming low-cost straw into high-value heating energy is a locally generated added value. First, straw is cheaper than fossil fuels and biomass from dedicated production. Second, straw is a by-product that does not need an advanced processing. Third, the low-cost heating is based on local resources and contributes to the local farmer's profitability and overall well-being of local and general society by reducing household's energy costs. And last, a part of straw yield harvested by the municipal company for energy purposes is partly compensated by returning minerals (ash) to the arable land.

Coordinator: Johanna Routa – (Luke) johanna.routa@luke.fi

Dissemination: itabia@mclink.it www.branchesproject.eu

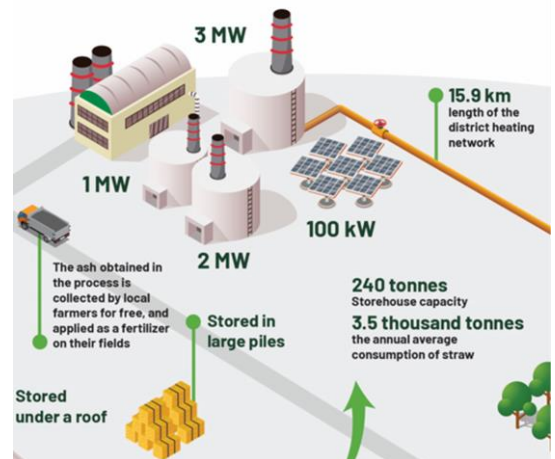


Photo sources: Program Ochrony Środowiska dla Gminy Kisielice; Założenia do planu zaopatrzenia w ciepło, energię elektryczną i paliwa gazowe na lata 2011 – 2026.

ABOUT BRANCHES

BRANCHES is a H2020 “Coordination Support Action” project, that brings together 12 partners from 5 different countries. The overall objective of **BRANCHES** is to foster knowledge transfer and innovation in rural areas (agriculture and forestry), enhancing the viability and competitiveness of biomass supply chains and promoting innovative technologies, rural bioeconomy solutions and sustainable agricultural and forest management.



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