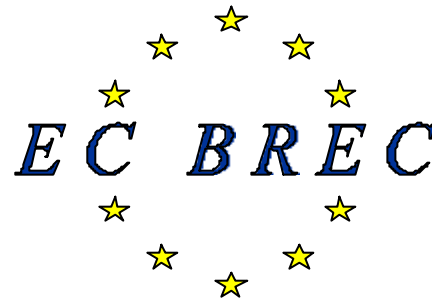


Biomass DHP/ CHP – benefits at local and regional level



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“Renewable Energy – Good practices at local and regional level”
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Biomass DHP/ CHP in Poland

- Plan of the presentation
 - Promotion and dissemination of best practices („Promotion of conversion to biomass CHP at larger sites in PL”, OPET)
 - Technical assistance („Feasibility for an agricultural biogas CHP plant integrated with a wood-chip DHP”)
 - Implementation („Utilization of biomass from municipal green areas for heating purposes. Pilot Joint Implementation project in Poland”)

Promotion of conversion to biomass CHP at larger sites in Poland (behavioral approach)

- Promotional campaign implemented by EC Baltic Renewable Energy Centre (RES-OPET Poland/ EC BREC) and OPET Sweden and Merinova (OPET Arctic, Finland) with OPET Network in 2001-2002
- Central objective: promotion of conversion of existing municipal coal-fired district heating plants to combined heat and power with utilisation of biomass in Poland

Promotion of conversion to biomass CHP at larger sites in Poland (behavioral approach)

- Background (why the project was implemented)
 - Many studies clearly indicate large potential of biomass resource in Poland (400 PJ of technical potential)
 - Many local DHP in rural areas and smaller towns need to be substantially refurbished
 - EU and Polish RES Policy favours utilisation of biomass and combined heat and power
 - Obligation for power purchase from renewables and from CHP with overall efficiency over 65%
 - National RES Strategy of Poland: Target to increase the share of RES in the primary energy consumption of Poland from 2.5% in 1999 to 7.5% in 2010 (additional 1200 MW in biomass CHP in 2000-2010)

Promotion of conversion to biomass CHP at larger sites in Poland (behavioral approach)

- Barriers to be broken
 - Lack of experience with handling biomass at larger sites
 - Lack of knowledge of biomass CHP practices among managers of DHP companies and decision-makers from local authorities
 - Except for pulp and paper industry - no reference biomass CHP plant up till now in Poland

Promotion of conversion to biomass CHP at larger sites in Poland (behavioral approach)

- Actions implemented
 - organisation of an international seminar on biomass CHP held in Gdansk, northern Poland, February 2001
 - study tour for selected decision-makers and managers to southern Sweden in late March 2001
 - series of articles in technical press and publication of a guidebook for investors in biomass CHP
 - training workshop for pre-selected group of local managers and decision-makers on conversion/upgrading to biomass CHP at existing inefficient coal-fired district heating plants, May 2002

Promotion of conversion to biomass CHP at larger sites in Poland

(behavioral approach – good practice criteria)

- Energy effective – difficult to quantify precisely in promotion/dissemination-type project (identified medium-term opportunities for at least 3 projects with the total capacity around 60-70 MW (electricity + heat))
- Legally acceptable – the project exactly responds to the EU and Polish policies for RES and CHP to stimulate start up of pilot municipal biomass CHP in Poland)
- Socially acceptable – biomass among other RES sectors creates most of new sustainable jobs in the full biomass supply and utilisation chain (at this level of the project quantification of the impact from the action is not possible)
- Technically sound – the activities focused on technologies already well proven in the EU (eg. steam cycle, Vaporel type CHP, etc, rather than full gasification and pyrolysis)

Promotion of conversion to biomass CHP at larger sites in Poland

(behavioral approach - good practice criteria)

- Economically viable – It became clear that conversion to biomass CHP in Poland especially at first pilot plants will require higher level of grants and external finance including Joint Implementation mechanisms (detailed economic analyses are now being done for the first 3 plants)
- Environmentally benign – conversion to biomass CHP will result in direct reduction of CO₂ and SO₂ emissions (replacement of coal at the plant) and reduction of emissions from coal-based power plants (embedded generation)
- Replicable – Promotional campaign for biomass CHP can be repeated in other countries with obsolete DHP systems and should be continued in Poland itself

Feasibility for an agricultural biogas CHP plant integrated with a wood-chip DHP (technical approach)

- Technical assistance project implemented by the Institute for Renewable Energy Ltd (IEO, Poland) and NIRAS (Denmark) with support from the Danish Energy Agency in 2000-2002
- Central objective: preparation of a pilot agricultural biogas CHP plant in Poland
- Background
 - Environmental problem (ground water pollution, odours, methane emissions)
 - Target for energy from agricultural biogas plants – 30-40 MW (electricity + heat) in 2000-2010
 - Currently no agricultural plants in operation in Poland

Feasibility for an agricultural biogas CHP plant integrated with a wood-chip DHP (technical approach)

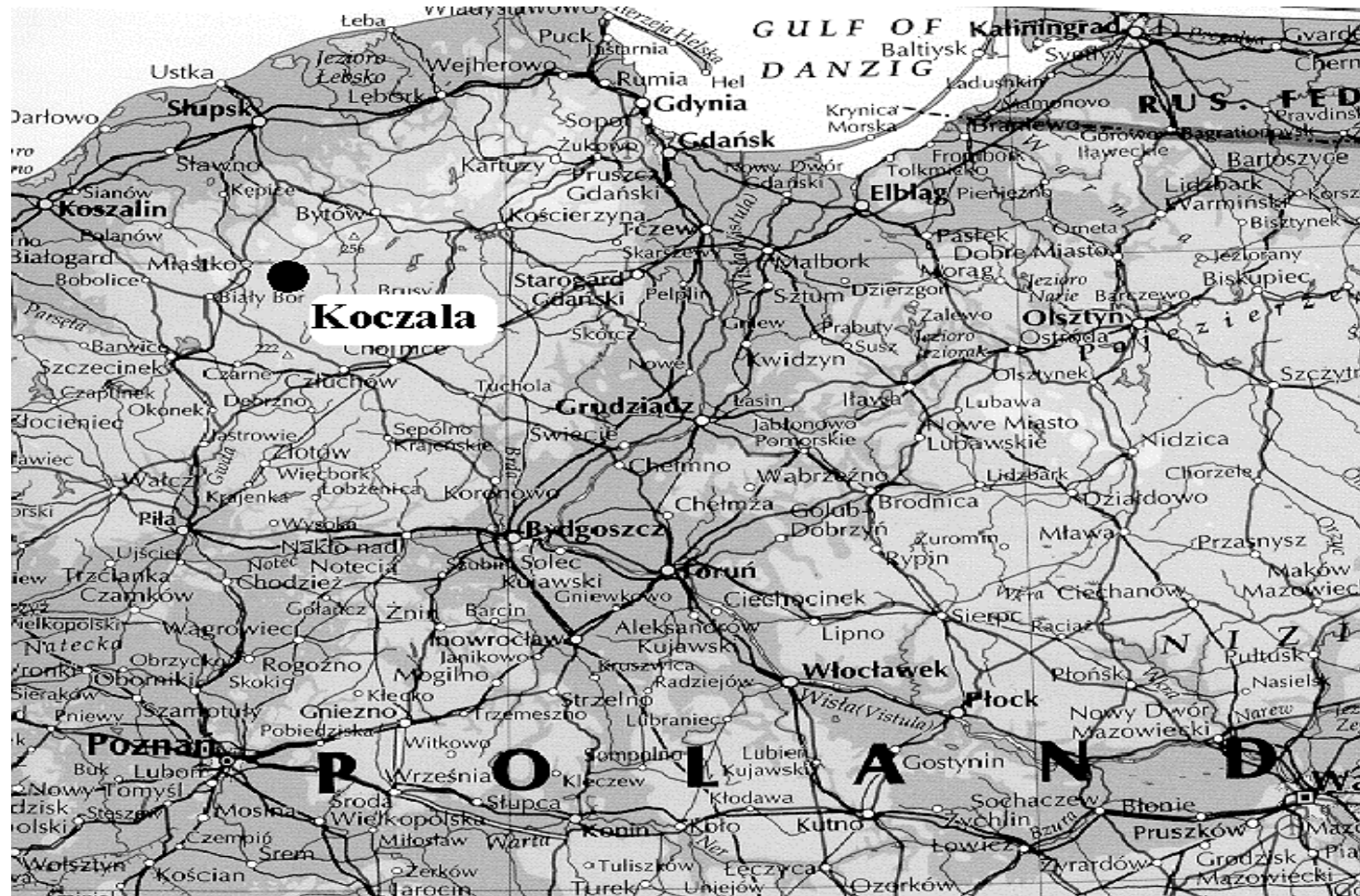
- Barriers to be broken
 - Some discouraging experience with biogas production from animal manure gained in Poland (breaking negative image)
 - Lack of knowledge of biogas and renewables among owners/ managers of pig farms and decision-makers from local authorities (typically very rural and poor)
 - Lack of know-how on designing biogas plants and integrating them in existing municipal energy systems
 - No reference plant in Poland that would demonstrate technical and economic viability of agricultural biogas technologies; administrative procedure not tested yet

Feasibility for an agricultural biogas CHP plant integrated with a wood-chip DHP (technical approach)

■ Actions implemented

- Prior to the project: identification of 5 potential sites and selection of 1 best location in the Commune of Koczala (160 west of Gdansk)
- Establishment of the project consortium involving local authorities of Koczala and the local pig farming company POLDANOR S.A. (Private-Public Partnership); analysis of the existing energy system (actual demand) in Koczala
- Feasibility studies for a biogas CHP and conversion of the local DHP plant to wood-chips
- Other actions: a study tour to Denmark to visit various biogas CHP plants, promotion workshop at POLAGRA International Trade Fair in Poznan

Feasibility for an agricultural biogas CHP plant integrated with a wood-chip DHP (technical approach)



Feasibility for an agricultural biogas CHP plant integrated with a wood-chip DHP (technical approach)

- Integrated approach:
 - Biogas production plant approx. 1.5km south-east of Koczala (2 digesters 780 m³ each, thermophilic conditions 52 °C; automatic 300 kW wood-chip boiler, co-digestion of pig slurry with energy crops and industrial organic waste; biogas pipeline 1.5 km)
 - Biogas CHP plant in western part of the town at the area of existing old coal-fired boilerhouse (800 kW_{el} + 1 MW_{th}; providing base load for the municipal district heating system)
 - Conversion of an old coal-fired boilerhouse (5 MW installed, 2.2 MW used) to wood-chips (800 kW); 3MW oil/biogas boiler reserve, 100 m³ accumulation tank
 - Refurbishment of DH distribution network (integration of a previous study made by a local company)

Biogas CHP plant integrated with a wood-chip DHP

(technical approach- good practice)

- Energy effective – generation of green energy: 4,844 MWh/year of electricity (to be sold to the grid), 4,825 MWh/year of heat production (from the CHP unit and the wood-chip boiler at DHP plant), 132 MWh/year of heat production (gas boiler)
- Legally acceptable – the project exactly responds to the EU and Polish policies for RES and CHP to stimulate start up of pilot municipal biogas/biomass CHP in Poland)
- Socially acceptable – net job creation minor (2-3 people) but significant stimulation of local development expected; reduction of odours crucial for tourism north of Koczala
- Technically sound – integrated character of the project makes it complicated but such plants already work in Jutland; recommended BAT

Biogas CHP plant integrated with a wood-chip DHP

(technical approach- good practice)

- Economically viable – the biogas project requires 34% grant and soft loans to achieve 10 year payback period (financial closure in progress)
- Environmentally benign – CO₂ emission reduced by 99½% (6800 t/a), emission of SO₂ reduced by 96% (53000 kg/a) and the NO_x emission reduced with around 51% (9900 kg/a); additionally, methane emissions reduced by 30% (4800 t/a of CO₂ equivalent)
- Replicable – 100% financing of the preparation phase of the pilot project by the Danish Energy Agency is unlikely to be repeatable but other sources (eg. European Programmes can be taken into consideration); once the local industry is strengthened investment costs should go down

Utilization of biomass from municipal green areas for heating purposes. Pilot Joint Implementation project in Poland (technical approach)

- Project approved by the Dutch-Polish Joint Implementation Programme supported by the Dutch Agency Senter; project partners included: EC Baltic Renewable Energy Centre (EC BREC, Poland), Biomass Technology Group B.V. (The Netherlands), Municipal Waste Disposal Company of Jelenia Gora, south-west Poland; implemented in 1998-2000)
- Central Objectives:
 - design and implementation of a system to replace coal combustion with a modern wood-chip firing DHP system, where biomass comes from waste produced during maintenance of green areas in the town of Jelenia Gora;
 - testing ground for future larger biomass projects in Poland

Utilization of biomass from municipal green areas for heating purposes. Pilot Joint Implementation project in Poland (technical approach)

■ Background

- First system for utilisation of waste biomass from cuttings in municipal parks and other green areas had been implemented in Otwock near Warsaw; the project in Jelenia Gora was already replication of the system concept (a identification of sites for replication in south-west Poland made under the previous project)
- Some experience with fuel switch from coal to waste biomass at local DHP systems already existing in Poland
- Lack of procedures for Joint Implementation (eg. for the calculation of baselines for biomass projects)

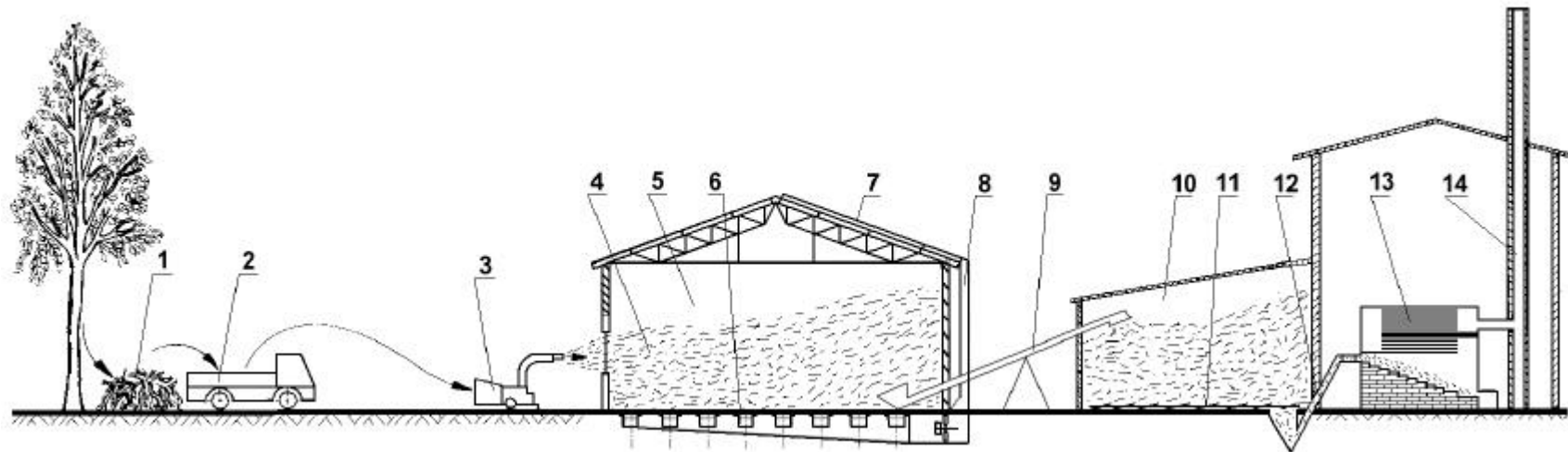
Utilization of biomass from municipal green areas for heating purposes. Pilot Joint Implementation project in Poland (technical approach)

■ The Project

- Replacement of 2 low efficiency boilers 256 kW each with a modern automatic 350 kW biomass boiler at the greenhouses complex owned by the Municipal Waste Management company of Jelenia Gora (MZO)
- MZO annually produces over 2500 m³ of waste wood that used to be landfilled, which has been turned into a fuel
- Local 48 hours storage system for wood chips built inside the existing boilerhouse; pneumatic feeding from the storage to a walking floor and then to the boiler (KARA Energy Systems B.V., The Netherlands)



First Joint Implementation project in Poland *wood chips from city greenery for heat production 350 kW_{th} in Jelenia Gora, 1998-2000*



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

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

(technical approach – good practices)

- Energy effective – generation of green energy from waste biomass (replacement of coal)
- Legally acceptable – utilisation of biomass is a priority of the Polish national RES policy; actual emissions from the new installation comply with Polish emission standards
- Socially acceptable – The project did not create any net job but it has been useful to retain horticulture production at the local greenhouse, which otherwise might have closed down
- Technically sound – state-of-the-art of the Dutch biomass combustion technologies (previous efficiency <50%, now over 80%); some systems (pneumatic transport of wood chips, walking floor) at high technical level

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

(technical approach – good practices)

- Economically viable – total investment cost of 825,000 PLZ (215,000 Euro); savings from decrease of the fees for using the environment, no costs relating to landfilling of waste biomass (=biomass fuel has got a negative value); no costs relating to purchase of coal; purchase of the boiler (110,000 Euro) as 100% grant from JI Poland-NL Programme
- Environmentally benign – 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 subsequent methane emissions), over the period of the project (15 years) total reduction of CO₂ equivalent - 21 thousand tones of.
- Replicable – definitely in any European country; JI biomass projects relevant for Central and Eastern Europe



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