

Survey of Existing CHP Plants with Solid Biomass in Europe

Gerfried Jungmeier¹, Hannes Schwaiger¹, Calliope Panoutsou², Keith Richard³, Bengt Hillring⁴, Martti Flyktman⁵, Marie-Maud Gerard⁶, Nike Krajnc⁷, Nicolay Mihailov⁸, Fehmi Akgun⁹, Charlotte Bruton¹⁰

ISO 9001:2000 certified

Purpose

The purpose was to analyse existing CHP plants with solid biomass in Europe, as part of the EU project Biomass Cogeneration Network (BIOCOGEN), to summarize European experiences and the actual performance of the various existing biomass CHP applications.

Results

About 90 commercial CHP plants with solid biomass already exist in Europe, whereas the other 70 plants are demonstration, pilot or testing plants. Most solid biomass CHP plants are located in countries of considerable forest industry (Figure 1, Figure 2). The main solid biomass fuels are wood chips from forest residues and from industrial residues (Figure 3). The most dominating CHP technology are steam based systems: steam turbine and steam engine (Figure 4). In addition there are some outstanding examples for successfully proven innovative CHP systems like Organic Rankine cycle, gasification with gas engine and gas turbine as well as Stirling engine. The electric efficiency is between 6 % up to 37 %, where the total fuel efficiency is between 70 to 92 % (Figure 5). The specific investment costs for steam cycle based technologies are in the range of 5 to 8 Mio €/MW_{el} (Figure 6).

Conclusions

In Europe there are already many successfully operating CHP plants with solid biomass on a high common technical level based on steam cycle technologies. New innovative CHP technologies like ORC, gasification are already demonstrated successfully on commercial level. Main future trends must lead to a further decrease of the investment costs to further stimulate activities in the field of CHP plants to support highly sustainable development of the European electricity and heat system.

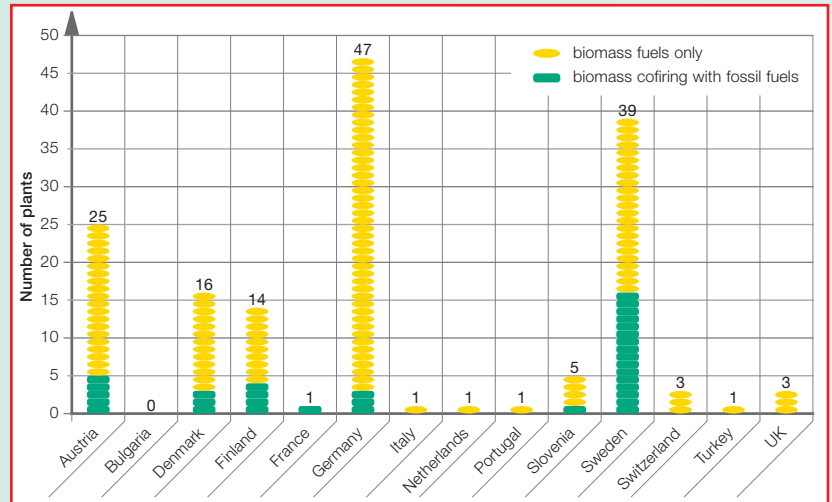


Figure 1: Number of biomass CHP plants in the considered countries

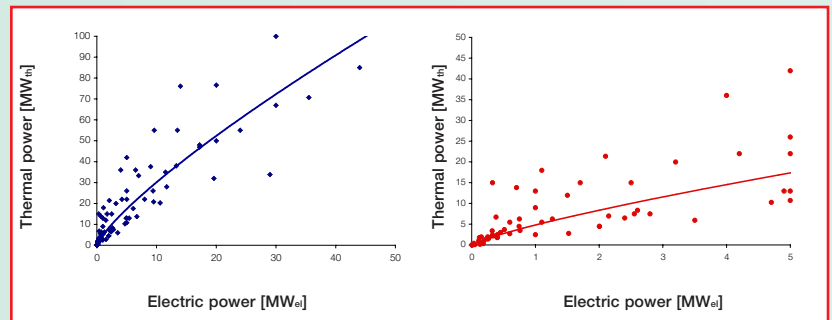


Figure 2: Installed capacity of considered biomass CHP plants, left < 50 MW_{el}, right < 5 MW_{el}

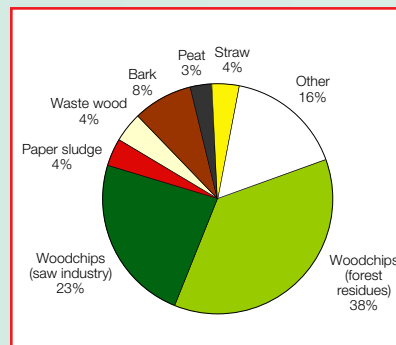


Figure 3: Kind of biomass fuel of CHP plants

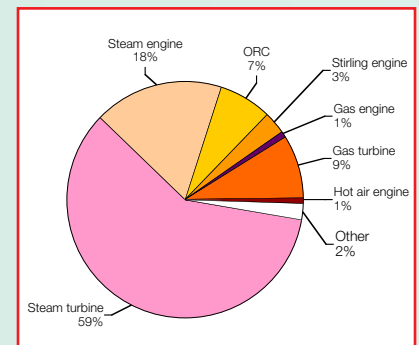


Figure 4: Technologies of CHP plants

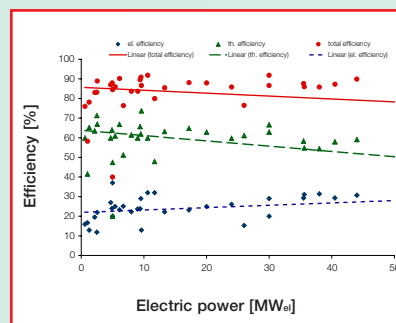


Figure 5: Efficiencies of CHP plants

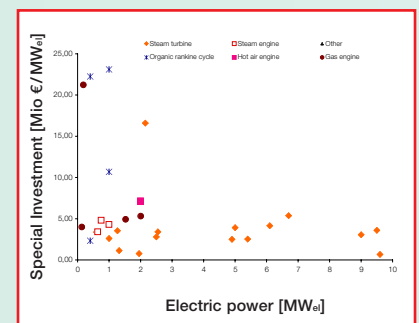


Figure 6: Specific investment costs of CHP plants (< 10 MW_{el})

- 1 JOANNEUM RESEARCH
Forschungsgesellschaft mbH
- Institute of Energy Research
Elisabethstrasse 5
A-8010 Graz, Austria
Phone: +43 316 876-13 13
Fax: +43 316 876-13 20
gerfried.jungmeier@joanneum.at
www.joanneum.at/ief
- 2 CRES
Greece
- 3 TV Energy
United Kingdom
- 4 SLU
Sweden
- 5 VTT
Finland
- 6 ITEBE
France
- 7 Slovenian Forestry Institute
Slovenia
- 8 Ecolinks
Bulgaria
- 9 MRC
Turkey
- 10 EnergieGruppen Jylland
Denmark