WP 3.3.2

Need for Demo Projects in Austria

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Contents

1 Introduction

This report contains the WP 3.3.2 elaboration of the 4Biomass project regarding Austria. It comprises the Austrian data collection concerning the regional technical potential and demand potential for biomass (Task 1.1, 1.2.) as well as the installed biomass capacity (Task 1.3.). Additionally regions with high potential for the respective biomass sources are quoted (alternative to Task 2.). Finally, obstacles and hindering factors in Austria are identified (Task 3.).

According to the Austrian national renewable action plan 2010, in 2006 approx. 158 PJ woody biomass in total was used for energy, 25 PJ of which was attributable to waste liquor. In total, this corresponds to approx. 17 million solid cubic meters equivalent of forest biomass. Approx. 20.5 million solid cubic meters equivalent biomass may be estimated from forestry (including wood from non-woodland areas such as shrubs). 80 % is allotted to domestic production, 20 % to net imports. In 2006 approx. 14 PJ of biogenic energy sources from agriculture was used. Approx. 270,000 t (or approx. 10 PJ) of this was considered being imported biodiesel. By 2020, under the prerequisite of suitable framework conditions, approx. 30 PJ of additional biogenic energy sources from agriculture in Austria, compared to 2006, may be applied.

In the Report the technical potentials for biomass (Task 1.1.) from forest, cropland, grassland and livestock farming are displayed as reduced technical potential in chapter 2.1. The reduced technical potentials are calculated as surface potentials and overall potentials by a top-down approach.

The regions with high overall potentials (Task 2.) for different biomass resources are also named in chapter 2.1. Due to the already high number of existing biomass plants and the thereby resulting high utilisation of biomass in Austria, it was not possible nor necessary to include an identification of sites with high *unused* potential.

In chapter 2.2., the demand potential (Task 1.2.) of biomass is only reproduced for heat, due to its dependence on regional generation. This heat demand potential is also shown in a map combining the percentage of heat which local renewable energy sources could generate.

In chapter 2.3 the current Austrian situation of the biomass usage (Task 1.3.) for electricity and heat generation is described.

In chapter 4 obstacles and hindering factors for the further development of biomass in Austria are given (Task 3.). This chapter comprises the results of continuing personal discussions with biomass experts in Austria.

2 Data collection

Main source for the potential analysis, in chapter 2, (Task 1.1., 1.2.) is the report "REGIO Energy – Regional Scenarios renewable energy potentials in the years 2012/2020" (REGIO Energy) written by Stanzer et al., in the year 2010, on behalf of the Austrian Federal Ministry of Transport, Innovation and Technology and the Austrian Federal Ministry of Economy, Family and Youth. This report summarized the results of the examination of the theoretical, technical and realizable potentials of renewable energy on a district level in Austria. In this report the biomass imports are not considered, in contrast to the biomass potentials mentioned in the Austrian renewable action plan 2010.

2.1 Biomass technical potential

(cf. REGIO Energy)

The biomass potentials are displayed as reduced technical potentials and as overall potentials calculated by a top-down approach for each separate region in Austria. The reduced technical potentials include considerations regarding best available technology, legal use restrictions, surface area competition and economic feasibility. The overall potentials do include already used potentials (meaning that already installed plants do not influence the overall potentials). The basis for the top-down approach are potential harvests per surface area.

2.1.1 Forest biomass

Criteria

The reduced technical potential for forest biomass describes the theoretically usable growth of the forest in a region (district) within a year, excluding areas which are not in production. In addition, it is calculated, that around 20% of the biomass is left in the forest areas in order to counter a depletion of soil humus substances and nutrients. It was assumed that the entire timber growth at some point is used for energy, be it as a primary or secondary raw materials (waste paper, waste wood).

Results

In total, Austria had in 2008 a reduced technical potential of 40,482 GWh. Based on the regional distribution of forest area the federal lands Styria, Lower Austria, Carinthia an Upper Austria have the highest potential for biomass from forests. The main production competition comes from paper, pulp and fibre industry.

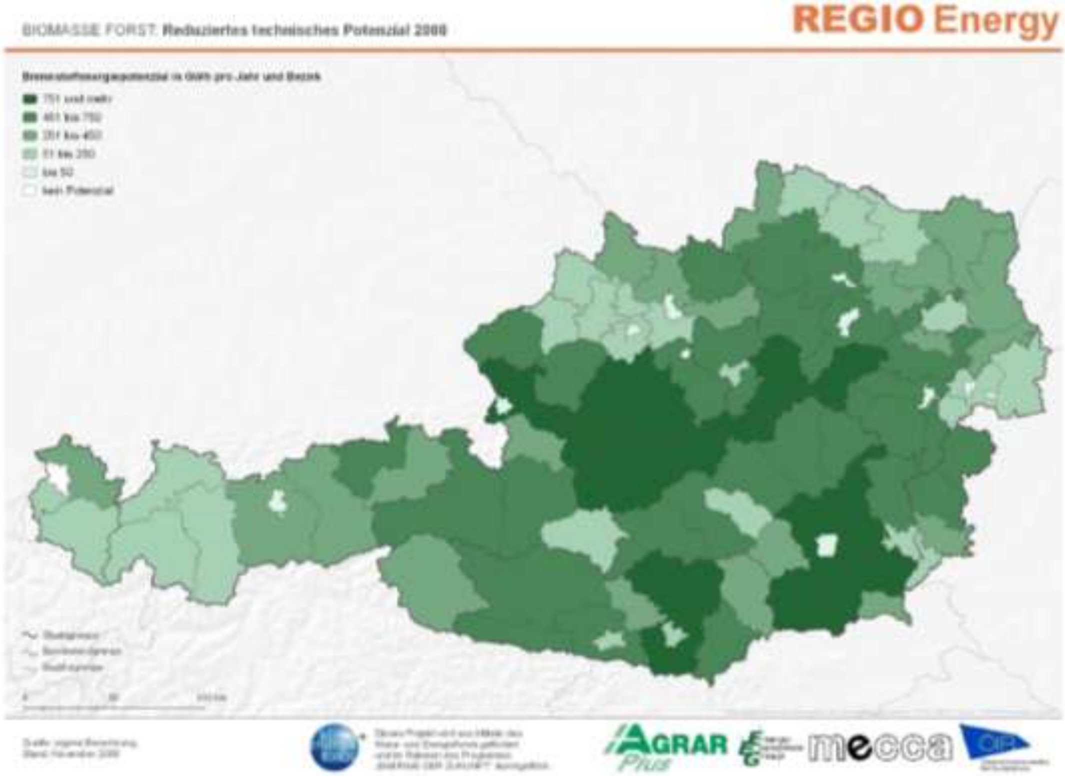

Illustration 1 – Austrian reduced technical potential – Forrest biomass, source: REGIO Energy, explanation: darker green = higher potential in GWh per year and district

The 5 districts with the highest reduced technical potential for woody biomass are: Liezen (1,255 GWh/a), Leibnitz (1,237 GWh/a), Krichdorf an der Krems (969 GWh/a), Klagenfurt Land (954 GWh/a) and St. Veit an der Glan (923 GWh/a)

2.1.2 Biomass from agriculture

Criteria

The cultivated crops in Austria in the year 2007 were the basis for future extrapolations in the REGIO Energy project, due to the high dependence of the potential for agricultural biomass on the cultivated crop. The reduces technical potential of agricultural biomass refers to the cultivated area in 2007 with a technical area of 20% of available space. The total area for energy crop cultivation is weighted and divided over all Austrian districts. The four crops most commonly grown per district are simulated to be used for the production of energy crops. They are calculated to be used according to the best possible suitability either for whole-plant utilization, biogas, vegetable oil, or ethanol production.

Results

In 2007 the Austrian agriculture surface amounted to 1.38 million hectare. Around 59% of the area were used for the cultivation of grain, 17.7% accounted to forage cropping, 6.8% amounted for oil crop production and 4.7% were used for root crop cultivation. Additional to these main used plants, 17,473 hectare were used for energy crops and 36,418 hectare for renewable resources.

The reduced technical potential for cropland usage for energy generation amounted to 7,300 GWh net energy content (the amount of energy needed for the production is already excluded) for 2007.

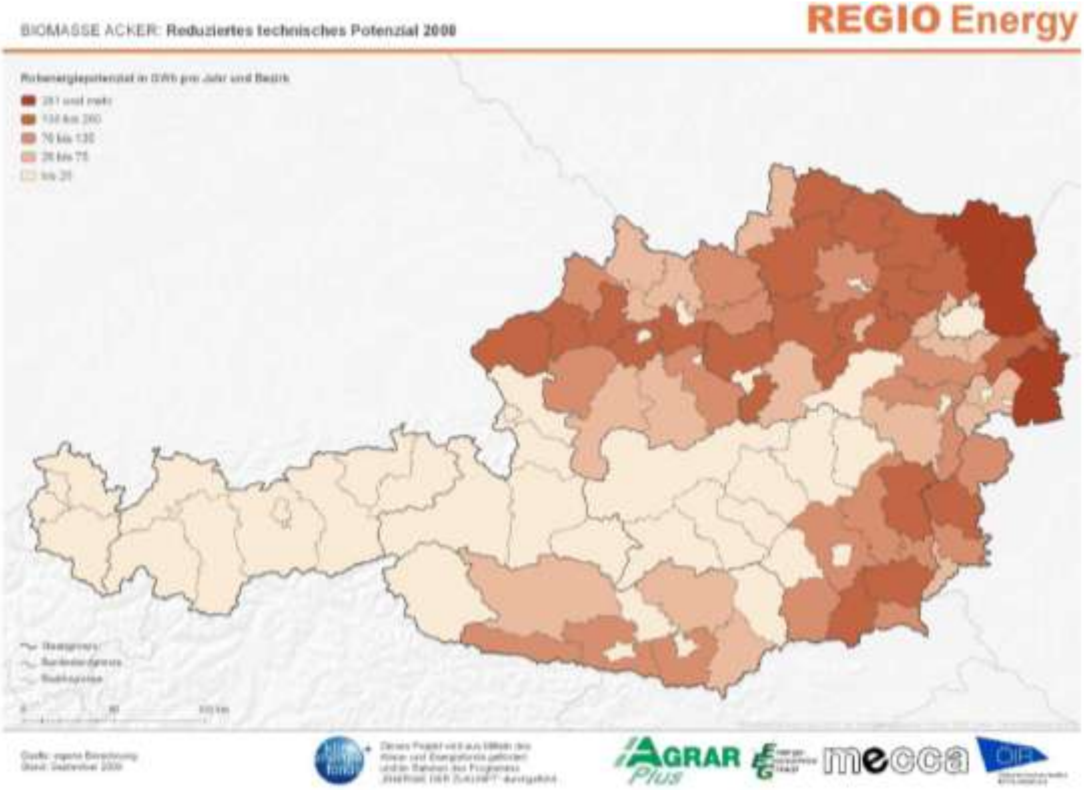

Illustration 2 – Austrian reduced technical potential – cropland biomass, source: REGIO Energy, explanation: darker red = higher potential in GWh per year and district

The 5 districts with the highest potential for agricultural biomass are: Gänserndorf (414 GWh/a), Mistelbach (320 GWh/a), Neusiedl am See (282 GWh/a), Hollabrunn (274 GWh/a) and Amstetten (GWh/a)

2.1.3 Biomass from grassland and livestock farms

Criteria

The basis for the reduced technical potential of livestock farming (mainly methane) was the livestock ascertainment of 2007 with the additional assumption that only 2/3 of the manure can be collected. The calculation of the reduced technical potential of Austrian grasslands for biomass usage considered the renewable grassland growth in one year per hectare and included only surface areas not used for livestock farming.

Results

The above mentioned conditions led to a reduced technical potential of 8,186 GWh of methane fuel energy from grassland and livestock farms.

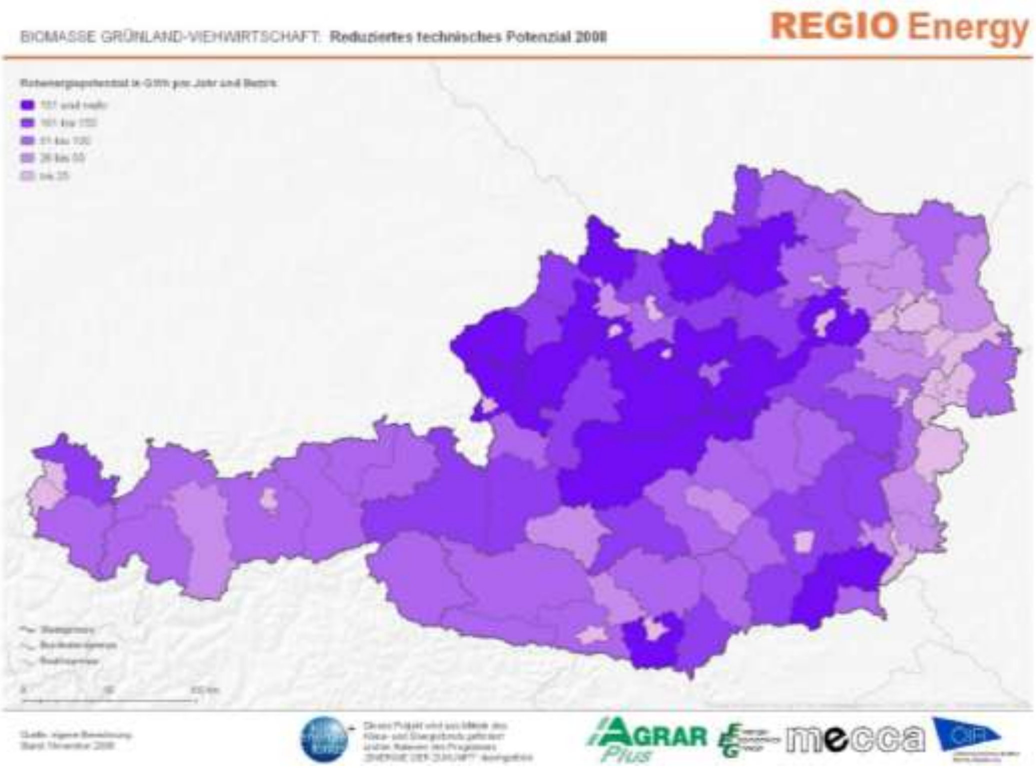

Illustration 3 – Austrian reduced technical potential – livestock farms biomass, source: REGIO Energy, explanation: darker purple = higher potential in GWh per year and district

The districts with the highest grassland and livestock potential are: Amstetten (271 GWh/a), St. Pölten (227 GWh/a), Feldbach (223 GWh/a), Rohrbach (203 GWh/a) and Kirchdorf an der Krems (200 GWh/a)

2.2 Biomass demand potential

(cf. REGIO Energy)

2.2.1 Heat demand

The data basis for the regional heat demand are energy balances from the Statistik Austria (from 2008), not including the process heat demand. In the Illustration below, the heat demand for every Austrian region is displayed in GWh per year for 2008.

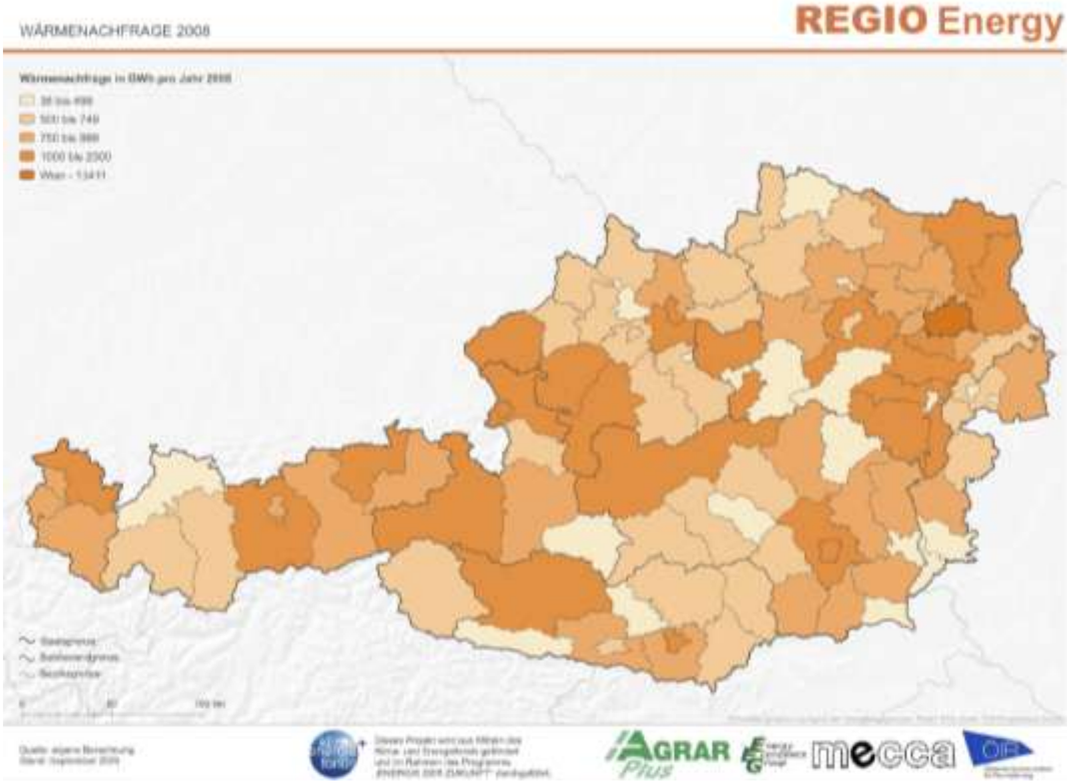

Illustration 4 – Austrian heat demand in GWh per district in the year 2008, source: REGIO Energy, explanation: darker orange = higher demand in GWh per district for the year 2008

2.2.2 Regional self supply of heat energy

The possible regional self supply with heat from renewable energy sources for 2020 is shown in the map below. It can be seen that due to the high heat demand and the low resource potentials, urban areas have a lower level of possible self coverage than rural areas.

The green parts of the circles represent the percentage of possible regional biomass supply to the heat demand. It can be seen, that (according to the research results of the REGIO Energy project) a complete heat self supply in Austria would need further implementation of energy efficient measures in order to reduce the overall heat demand.

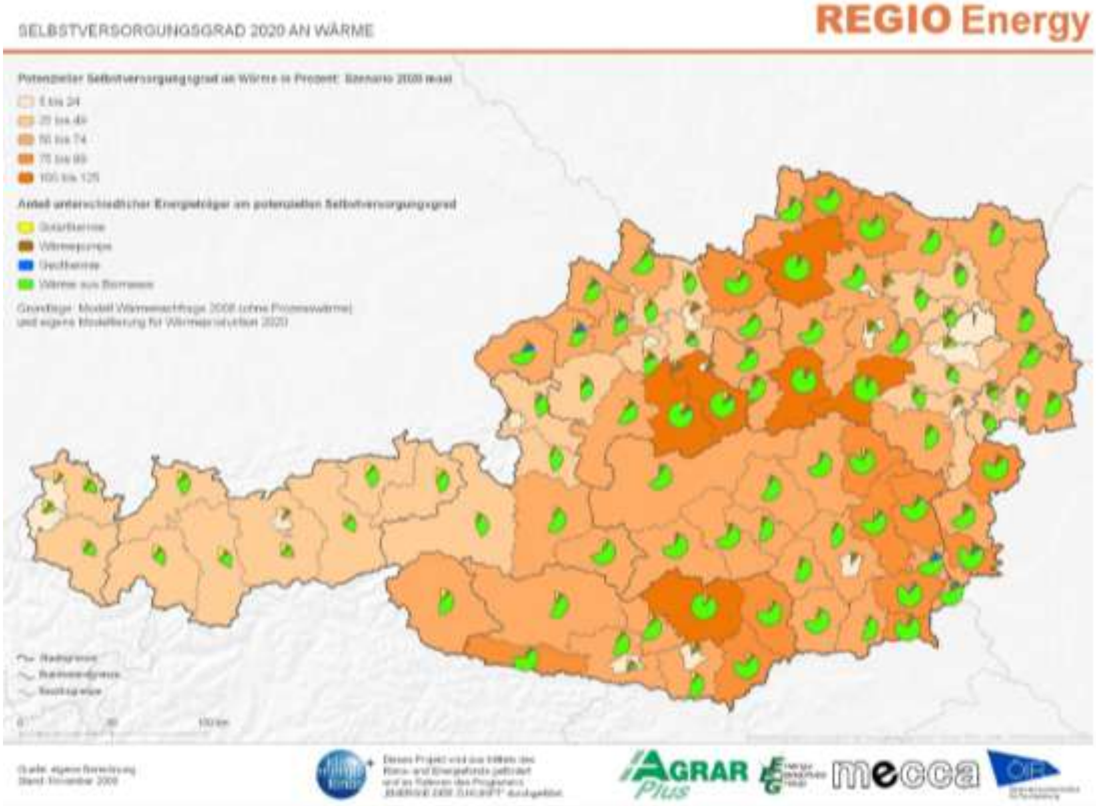

Illustration 5 – Austrian head demand potential 2020 and possible energy self supply , source: REGIO Energy, explanation: darker orange = higher possibility in percent to produce heat locally and self sufficient, green parts in circles – possible biomass portion of heat supply

3 Current situation biomass usage

3.1 Solid biomass

According to the REGIO Energy analysis 85% of available forest biomass is already used for heating purposes. According to Austria Statistik the national production of solid biomass (firewood, pellets/wood briquettes and wood waste) amounted to 36,258 GWh in 2009, as can be seen in the chart below. Unfortunately the comparability of the results of the REGIO Energy potential and the Austria Statistik data for wooden biomass is not possible, due to the uncertainty of the amount of imported wooden products becoming wood waste.

		2009	
		in TJ	**in GWh**
Domestic production of raw energy	Firewood[1]	56,692	15,748
	Pellets & wood briquettes[1]	7,761	2,156
	Wood waste (including waste imports)[1]	66,076	18,354
	Total Austrian production of raw energy[1]	130,529	36,258
Potential	**Reduced technical Potential[2]** (excl imports)		40,482

Chart 1 – Domestic production of wooden energy (Statistik Austria– Energy balances 1970-2009) and reduced technical potential (REGIO Energy report 2010)

3.2 Liquid Biomass and Biogas

According to the REGIO Energy report in Austria liquid biomass and biogas have a higher unused potential than solid biomass. In the following a short summary of the current Austrian situation of liquid biomass and biogas is given.

Biodiesel and Bioethanol

The map below illustrates liquid biomass for biodiesel and bioethanol plants in Austria in 2008. Main source for the data is the report “Biofuels in the transport sector 2010” written by Winter and Bach in 2010 on behalf of the Austrian Federal Ministry for Agriculture, Forestry, Environment and Water Management.

According to ARGE Biokraft, the Austrian association of liquid biofuel producers, there were 14 biodiesel plants operating in Austria in 2009, with a total capacity of approximately 650,000 tonnes. With this capacity 323,147 tonnes of biodiesel were actually produced. The first bioethanol production plant (Pischelsdorf, Lower Austria) was completed in autumn 2007. According to ARGE Biokraft's data, 138,073 tonnes of ethanol were produced in 2010 in this plant.

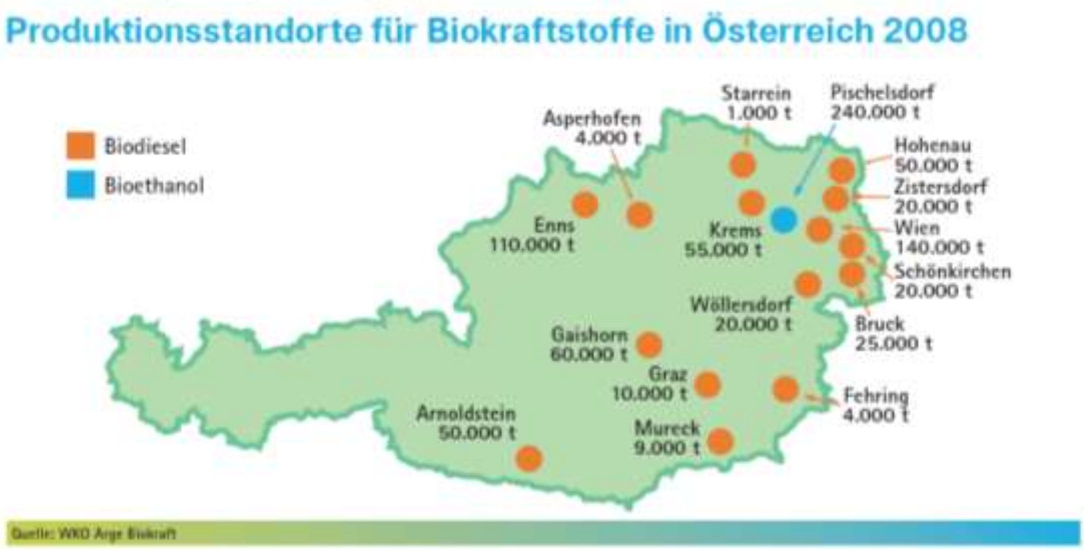

Illustration 6 – Austrian Biodiesel and Bioethanol production plants in 2008, source: Austrian association of liquid biofuel producers

Biogas

At the end of 2010, 289 biogas plants with a total power of 79.1 MWel had an official contract with OeMAG, the Austrian Settlement Center for Eco-Electricity. These plants produced 539,5 GWh of electricity in 2010 which corresponds to approximately 0.92% of the Austrian gross electricity consumption. The map below from Raumberg-Gumpenstein shows the Austrian biogas plant sites.

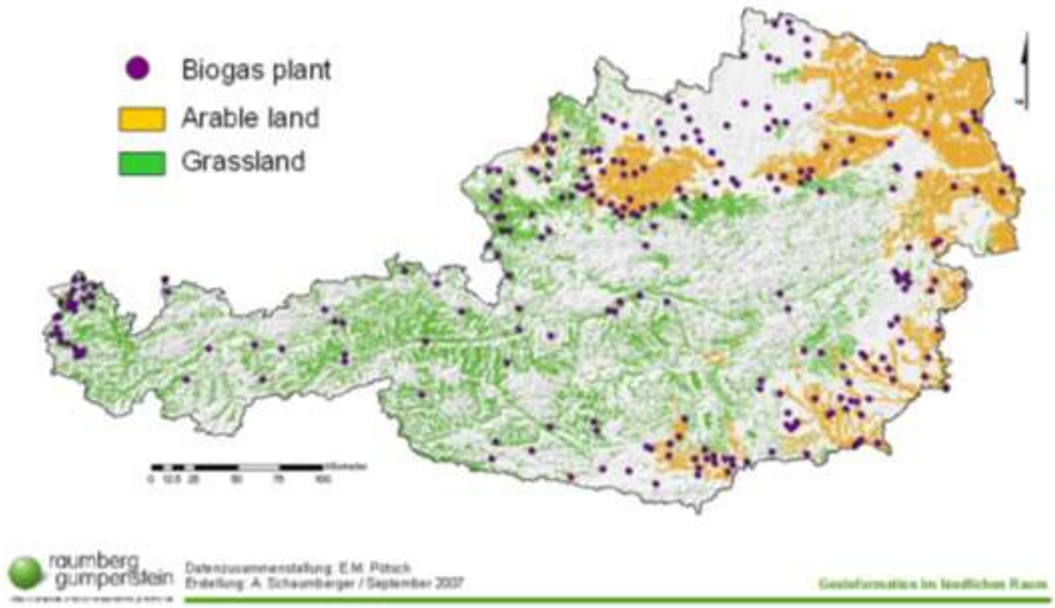

Illustration 7 - Austrian biogas plants 2007, source Raumberg-Gumpenstein - A. Schaumberger

3.3 Heat

In the map below a overview of installed biomass heating and CHP plants in Austria for 2008 is given. The source for the map is the Chamber of Agriculture of Lower Austria and the Austrian Energy Agency

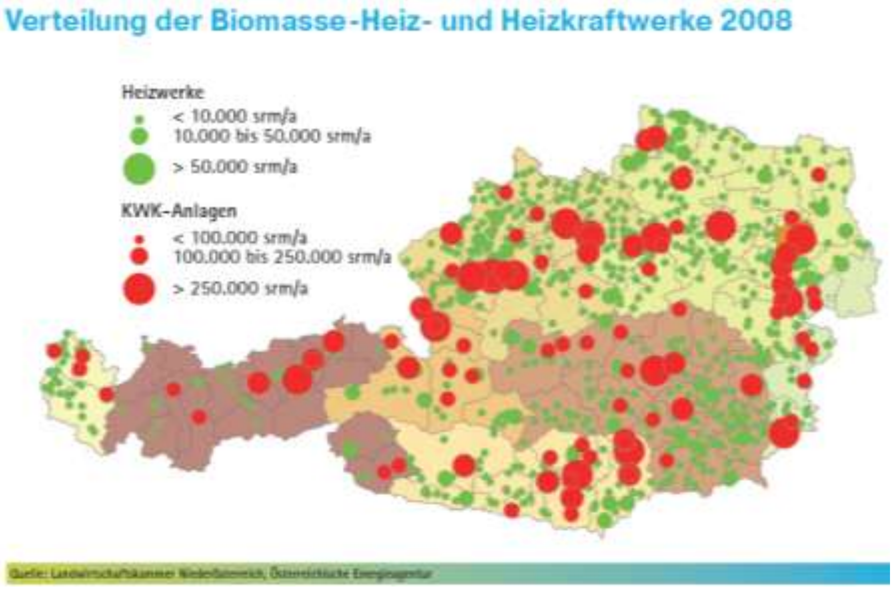

Illustration 8 – Austrian biomass heating and CHP plants location and capacity 2008 (in cubic meter per year), source: Chamber of Agriculture Lower Austria, Austrian Energy Agency red circles: CHP plants, green circles: heat-only plants

In Chart 2 the amount of energy used by small biomass boilers and produced by biomass district heating systems (solid biomass, liquid biomass as well as biogas) can be seen. The data for the fuel energy usage by small biomass boilers for heat generation is an extrapolation of the Austrian Energy Agency with basic data from the Chamber of Agriculture of Lower Austria. The source for the transformation output (= **not** the fuel energy) for biomass district heating are the Austrian energy balances 1970 – 2009 from Austria Statistik

2008	Small biomass boiler	biomass district heating
	fuel energy	transformation output
	GWh	GWh
Burgenland	1.287,5	
Lower Austria	5.226,1	
Upper Austria	4.219,8	
Carinthia	1.873,3	
Salzburg	1.261,7	
Styria	3.850,2	
Tyrol	1.565,4	
Vorarlberg	776,6	
Vienna	245,7	
Austria	**20.306,5**	**6.260,9**

Chart 2 – Austrian Biomass Heating in GWh for 2008, source: district heating data - Statistik Austria, Biomass boiler - Chamber of Agriculture of Lower Austria 2008

3.4 Electricity

The chart below shows the official data concerning biomass electricity from OeMAG, the Austrian Settlement Center for Eco-Electricity. It contains data for the year 2009 for the four biomass main usages: solid biomass and waste, biogas, liquid biomass and sewage treatment plants. For each type the total number and the total capacity (MW) of the installed plants is shown. Additionally the amount of electricity feed into the grid (only plants with a contract with OeMAG) is displayed.

<table>
<tr><th>2009</th><th colspan="3">Solid biomass and waste with high biogenic fraction</th><th colspan="3">Biogas</th></tr>
<tr><td>Federal land</td><td>Number¹</td><td>MW¹</td><td>GWh²</td><td>Number¹</td><td>MW¹</td><td>GWh²</td></tr>
<tr><td>Lower Austria</td><td>51</td><td>107,4</td><td>634,6</td><td>100</td><td>37,1</td><td>219,4</td></tr>
<tr><td>Carinthia</td><td>27</td><td>69,7</td><td>289,4</td><td>34</td><td>5,7</td><td>35,8</td></tr>
<tr><td>Styria</td><td>48</td><td>61,2</td><td>126,4</td><td>47</td><td>18,0</td><td>108,7</td></tr>
<tr><td>Tyrol</td><td>12</td><td>28,3</td><td>179,4</td><td>18</td><td>3,0</td><td>11,3</td></tr>
<tr><td>Salzburg</td><td>14</td><td>27,6</td><td>116,6</td><td>11</td><td>2,2</td><td>7,7</td></tr>
<tr><td>Vorarlberg</td><td rowspan="2">6</td><td rowspan="2">27,8</td><td rowspan="2">146,3</td><td>33</td><td>3,5</td><td>16,7</td></tr>
<tr><td>Vienna</td><td>0</td><td>0,0</td><td>0,0</td></tr>
<tr><td>Burgenland</td><td>11</td><td>36,0</td><td>243,6</td><td>19</td><td>9,2</td><td>34,6</td></tr>
<tr><td>Upper Austria</td><td>17</td><td>56,1</td><td>221,6</td><td>79</td><td>15,8</td><td>90,4</td></tr>
<tr><td>Total</td><td>186</td><td>413,9</td><td>1957,9</td><td>341</td><td>94,5</td><td>524,5</td></tr>
</table>

<table>
<tr><th>2009</th><th colspan="3">Liquid biomass</th><th colspan="3">Sewage treatment plants</th></tr>
<tr><td>Federal land</td><td>Number¹</td><td>MW¹</td><td>GWh²</td><td>Number¹</td><td>MW¹</td><td>GWh²</td></tr>
<tr><td>Lower Austria</td><td>27</td><td>3,9</td><td>0,8</td><td>11</td><td>7,3</td><td>4,3</td></tr>
<tr><td>Carinthia</td><td>13</td><td>3,4</td><td>0,6</td><td>6</td><td>2,7</td><td>5,0</td></tr>
<tr><td>Styria</td><td>20</td><td>1,6</td><td>0,1</td><td>10</td><td>3,3</td><td>5,6</td></tr>
<tr><td>Tyrol</td><td>6</td><td>1,9</td><td>6,9</td><td>13</td><td>5,0</td><td>10,6</td></tr>
<tr><td>Vorarlberg</td><td>10</td><td>13,0</td><td>30,1</td><td>9</td><td>2,5</td><td>9,6</td></tr>
<tr><td>Salzburg</td><td>12</td><td>1,1</td><td>0,0</td><td rowspan="3">7</td><td rowspan="3">2,3</td><td rowspan="3">7,4</td></tr>
<tr><td>Vienna</td><td rowspan="3">4</td><td rowspan="3">0,4</td><td rowspan="3">0,4</td></tr>
<tr><td>Burgenland</td></tr>
<tr><td>Upper Austria</td><td>9</td><td>6,1</td><td>1,2</td></tr>
<tr><td>Total</td><td>92</td><td>25,3</td><td>38,9</td><td>65</td><td>29,1</td><td>43,7</td></tr>
</table>

¹ all accredited plants

² only for plants with a feed in contract with OeMAG

Chart 3 - Austrian biomass for electricity 2009, source: E-Control

4 Obstacles

A variety of obstacles stand against the diffusion of biomass-technologies on the market. They can be differentiated in economic, technological, administrative, and societal.

1. Economic obstacles result from the fact that biomass-technologies are usually more expensive – at least concerning the investment – than those of the competing fossil fuels like natural gas or heating oil. Although biomass-technologies for heating and for power production, both small scale and big, receive public support in the form of investment subsidies (heat-technologies) and feed-in-tariffs (electricity-production), this is often not sufficient to compete successfully with fossil competitors. Moreover, the oil industry has started to financially support oil heating systems to keep their customers in their market and to compensate for the public support of biomass-technologies. The fuel biomass itself – pellets, woodchips, logwood – is usually cheaper than their fossil competitors (with the exception of coal, but this fuel is not any longer important in the Austrian heat market).

2. Technological obstacles are comprised of hard- and software-elements. Concerning hardware, biomass-equipment is still more massive and bulky than, for example, heating systems based on oil or natural gas, and consequently more expensive. This is attributed to the fuel biomass and an inevitable feature of the technology itself, which has to be perceived being an obstacle for market-penetration. The operation and handling of biomass based plants, although pellet-plants as to that are close to oil heating plants, is still more complex and time-consuming than that of oil- and gas-systems.

About 500,000 tiled Stoves can be found in Austrian households. Due to a long tradition dating back to the 17th century, Austrians are very familiar with this technology. They are installed by professional stove-builders, costs of installation, however, are relatively high (amounting to several 1,000 up to 10,000 Euros and more). Despite of the costs, a generally positive stance of Austrians helps to overcome this obstacle. Logwood-boilers are preferred by users with own wood-resources, intensive handling for feeding of the boilers with the logs, however, is an obstacle for many potential users. Woodchip-boilers are used for big houses and district-heating-grids, their operation requires professional mechanical skills, which restricts their deployment to certain target groups. Pellet-boilers take this hurdle with a similar convenience as an oil-heating system, applicable also for users without own wood-resources. Their installation, however, requires professional installers; their absence comprised a significant barrier for market diffusion until about 2001. This has in the meantime been overcome by training courses for installers. About one third of Austrian installers are “bioheat-installers”, which sufficiently covers market-demands. Additionally, a quality-system implemented for biomass district heating systems, “QM Heizwerke”, reduces obstacles like bad planning or operation of such plants.

Constant supply of high quality standardized biomass-fuel is, due to standardization of biomass-pellets, not any longer a big obstacle. However, due to increased need for imports, it can become a problem in the future, as had to be experienced in 2007, when an export-driven peak in costs for pellets one year before resulted in deep distrust in the technology and in sharply reduced new installations of biomass-boilers.

3. Administrative obstacles affected the market especially for biomass-CHP due to unstable conditions of feed-in-tariffs, their timely restrictions and the resulting need to quickly develop investment projects. Concerning the heat-market, administrative hurdles appear to be of limited importance, despite certain barriers against biomass-heating systems in big cities like Vienna, which is argued for with fine particle emissions.

4. Societal problems can be overcome by simplicity of the wanted behavior, and by a motivating environment. The NIMB-syndrom (“not in my backyard”) has prevented especially district heating plants

from realization, however, the same thinking with somehow adverse sign ("especially in my backyard") has also strongly supported the development of other district heating plants. In Austria, bioenergy has a by and large positive image, the implementation of the respective technologies can trust in a supportive stance of the population, besides some limited examples.

Generally, the good biomass availability (47% of national area is forest) and a long tradition in energy wood usage, complemented by a positive political commitment, a wide portfolio of proven technologies, a positive image and strong information- and promotion activities support the use of bioenergy in Austria. Stable and predictable financial incentives, especially in the small-scale heating sector, less in CHP, have supported the heating market. Installers-trainings were a central element to overcome the technological barrier.

The most important lesson learned is: Policies make a difference – Comprehensive long term approaches and continuity are crucial!

5 Need for Demo Projects

There is a steady progress in the performance of bioenergy-technologies in Austria. One frontier of improvement, for example, concerns emissions of small particles (fine dust) from the combustion of wood. New combustion-technologies are in a first step being tested at the testing-site of the producers. In a second step, before entering the market, a handful of pilot-plants would be tested as demo-projects in the “field”.

A special need for certain demo-projects, however, cannot be observed according to that approach. With respect to the relatively small size of the country, the long tradition of pioneering bioenergy development since about the second oil-crisis, in addition to a well established and successfully networking scientific community, a network of experts in the administrations of the nine federal provinces, and among practitioners like plumbers and planners, practically each interested consumer and investor has the possibility of contacting each type of relevant biomass-plant in the near vicinity of his or her home. District-heating-plants, small-scale-heating plants and biomass-CHP are spread relatively even throughout the country. Biogas-plants and biodiesel-plants are concentrated in the agricultural areas of the country, but it would not be sensible to establish them far from the resources they process.

What would be needed more urgently than new demo-projects are more stable, enduring and persisting framework-conditions for the implementation of biomass-technologies. Especially in the electricity-market, the relatively quick changes of feed-in-tariffs as the main financing element have led to projects being developed too quickly with little respect to the optimal utilization of the resource biomass and the selection of the best site for their deployment. Small-scale heating technologies are being supported by regimes designed by the federal provinces. They differ from one province to the other which makes it difficult for producers and traders to offer stable sale-conditions to the customers.

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