



Association européenne pour la Biomasse

European Biomass Association

JOSSART Jean-Marc
Croix du Sud 2, Bte 11
1348 Louvain-la-Neuve
BELGIUM
Tél. and fax : + 32 10 47 34 55
Mobile : +32 478 77 36 09
jossart@aebiom.org
www.aebiom.org

Report to project Key Issues for Renewable Heat in Europe - K4RES-H

Targets for heat from biomass

Task 4.1. – corresponding to deliverables number 2 and 3 of the project

Content

1. Introduction.....	2
2. Technology specific targets.....	2
3. Setting the targets.....	3
3.1. Priority to Biomass Action Plan (BAP)	3
3.2. Repartition to the Member States (MS)	4
3.3. Method to calculate the target.....	5
3.4. Targets for 2020	6
4. Statistics	7
4.1. Items to consider	7
4.2. Calculation principles.....	7
4.2.1. Small scale systems	7
4.2.2. Cogeneration.....	8
5. First attempts for objectives for biomass for heat.....	9
5.1. Based on existing biomass for heat.....	9
5.2. Based on biomass as primary energy.....	10
5.3. Based on enquiries at national level.....	12

1. Introduction

Targets are powerful instruments to motivate people and organisations, to initiate actions and steering instruments and to get things done.

The more detailed and concrete they are the more powerful they will be. A very general target without numbers such as 'increase the share of renewables in the heating sector' is more or less worthless. While a specific target such as for example "In each member state X thousands of ton oil equivalent final heat from biomass should be produced by 2010 and 2020" is much more clear.

European and national targets within a directive are a successful method to promote renewables. The European experience of the past years confirms this fact for electricity and transportation biofuels.

Therefore also in the heating directive clear targets should be defined for each member state.

2. Technology specific targets

There are four renewable sources for heat :

- solar thermal
- geothermal
- ambient heat
- biomass

The potential for each of them is different from one member states to another depending on the availability of the resource, sunshine, biomass, etc. Biomass provided so far the most important renewable heat. The versatility of biomass should also be taken into account as it can also follow an electricity and transportation biofuels routes.

AEBIOM proposes a specific target for each technology and for each member state, for the following reasons :

a) **Support several industrial sectors** : Behind each RES-heat technology stands a specific industry: manufacturing plants, planners, plumbers etc. And it is advantageous for the economic, ecological and energetic development of the European Union to develop all these renewable industries. To realize these advantages specific targets for each technology are a must.

b) **Develop all technologies** : The potential of all RES technologies has to be developed to reduce the CO₂ emissions and being less dependent on energy imports. The long run goal of RES deployment must be to reduce the green house gas emission as much as possible by replacing fossil fuels.

Having this goal in mind, it would be a mistake to develop in one region only one specific RES heat technology and not the total existing potential. Yet, this would be the case if

there is only one target for renewable heat and no specific targets for solar thermal, biomass and geothermal.

c) **Complementarity** : Solar thermal and biomass boilers are complementary technologies: Solar thermal is suitable to produce hot water during summer time whereas the production of hot water in summer with a combustion system (biomass, oil, gas) is highly inefficient, because of the stop and go of the burner. Half of the energy is needed to heat up the burner before it starts producing hot water.

On the other hand biomass is best suited to produce heat and hot water in winter time, when the output of solar panels is limited. Solar thermal and biomass are supporting each other and combined technologies are sold, connected to the same water boiler. To promote these combinations of solar thermal and biomass specific targets for both technologies are needed.

3. Setting the targets

3.1. Priority to Biomass Action Plan (BAP)

The BAP can be considered as an excellent contribution for bioenergy development in Europe. About 30 concrete measures to overcome barriers have been identified and it is important to implement them.

The targets mentioned in this BAP have the nice advantage to exist (Tableau 1), which is already important (see above). In addition these targets should remain valid for 2010.

However these targets contains some problems like :

- Mixture of primary energy and final energy : It does not make sense to add biomass for electricity and liquid biofuels as it will lead to incomprehensive targets. For example, in the future wood might be used for second generation biofuels as well as for heat and electricity. So one can not add wood to the transportation fuels made of it.
- Bioheat into electricity target : cogeneration is included in the term biomass for electricity. It means that a part of the bioheat is included in the target for electricity.

Tableau 1 : Biomass Action Plan targets for EU25 ¹

	2003 results	2010 targets	Bioenergy increase 2002-2010
Bioelectricity (TWh)	48	174	126
Biomass for electricity (Mtoe)	20,6	56*	35,4**
Biomass for heat (Mtoe)	48,2	74,8*	26,6**
Liquid biofuels (Mtoe)	0,5	18,6	18,1
TOTAL (Mtoe)	69,3	149,4	80,1

* biomass for electricity and heat : 56 + 74,8 = 130,8 Mtoe

¹ COM(2005)628, Biomass Action Plan

* biomass for electricity and heat : $35,4 + 26,6 = 62$ Mtoe

Therefore it is proposed to :

- Keep BAP targets but couple biomass for heat and biomass for electricity together. It means 130,8 Mtoe by 2010.
- Improve the situation of target setting through the national biomass action plan.

It is proposed to express the targets as follows :

Biomass for heat	→	Bioheat
Biomass for cogeneration	→	Bioheat and bioelectricity
Biomass for electricity	→	Bioelectricity
Biomass for transportation biofuels	→	Transportation biofuels

Only the bioheat that is really used should ideally be considered. Alternatively the useful heat could be taken into account (the heat that can potentially be used). Indeed, if heat is wasted in cogeneration units for example it should not be considered, as it does not replace any fossil alternative and do not contribute to greenhouse gas reduction.

3.2. Repartition to the Member States (MS)

Several methods can be used to distribute the overall EU goal down to the MS level. The following features might be taken into account :

- **South Europe** : MS in south Europe have a lower demand for heat and could have lower objectives.
- **Existing bioenergy** : On one hand MS that have already developed bioenergy to a large extend have an existing infrastructure and industry and they can easier go ahead. However they might already have exploited a significant part of the biomass resource and/ or covered a large share of the market (% of households heated by wood, % of district heating using biomass, etc.) and therefore the increase of bioenergy calculated as a percentage might be low. On the other hand MS with a small share of bioenergy could increase much more in terms of percentage.
- **Efficiency** : A goal in terms of primary energy is not sufficient and the final energy has to be considered, or in other words the efficiency of the conversion. For example the efficiency of biomass combustion to produce heat in modern installation reaches 90%, as compared to 25% -30% efficiency of biomass cofiring in power plants for electricity only. Therefore **the new directive on heat should draw the attention on this efficiency** and maybe state a minimum overall efficiency for biomass conversion, for example 75%.
- **Potential of the resource** : Targets should also take the potential of biomass into account, taking care of the other kinds of use of the wood (paper and pulp, sawn goods, board manufacture). If it appears that the potential does not fit the target measures should be taken to increase the resource (better techniques for collection of forest residues, agricultural crops for solid biofuels,etc.). Imports might also be considered from another MS or from outside the Union but for this latter option provisions should be stated to maintain sustainability.

Whatever the method used it will be necessary to consult the MS because it is extremely important to get their commitment for bioenergy development. This can be done through the Biomass Action Plans. So **the Commission should propose some indicative targets, to be evaluated by each MS.**

As the same biomass can be used for heat, electricity or liquid biofuels, the impact of biomass for each of these routes should be evaluated. Criteria like CO₂ mitigation, efficiency – energy independence, employment will help MS to allocate biomass where it is the most efficient. The situation might be different in each MS as well as the implementation possibilities (district heating network are sometimes absent, etc.).

The targets should be expressed in energy terms (toe and TWh) so that it is comparable among MS and with Eurostat data. In the national action plans the goals might be detailed in terms of scenarios of number of units and investments as it gives another approach for decision makers.

3.3. Method to calculate the target

For countries with a small amount of bioheat an objective could be calculated as an increased percentage of the existing bioenergy, that can take into account the past evolution. For countries having already a high bioenergy/ bioheat market penetration, objectives cannot be higher than the market potential (number of heat installations in households, etc.).

For example in Sweden the following approach was used :

Scenario for 2010

- Industry: 50% from 22 TWh oil converted to solid biofuels → 10 TWh biofuels
 - District heating: All oil (5 TWh) exchanged for biofuels and + 7 TWh additional biofuel for district heat
 - Direct heating: All oil (11 TWh) and 2,5 TWh el. heating will be converted until 2015.
 - Oil => 50% to bio, 50% to heat pumps & district heating
- ⇒ Biofuel for heat 94 TWh 2003 => 122 TWh 2010

+ 4 TWh/ year biofuel for heat
+ 1 TWh/ year biofuel for power
+ 1 TWh/ year biofuel for transports
= 6 TWh/ year total biofuels until 2010

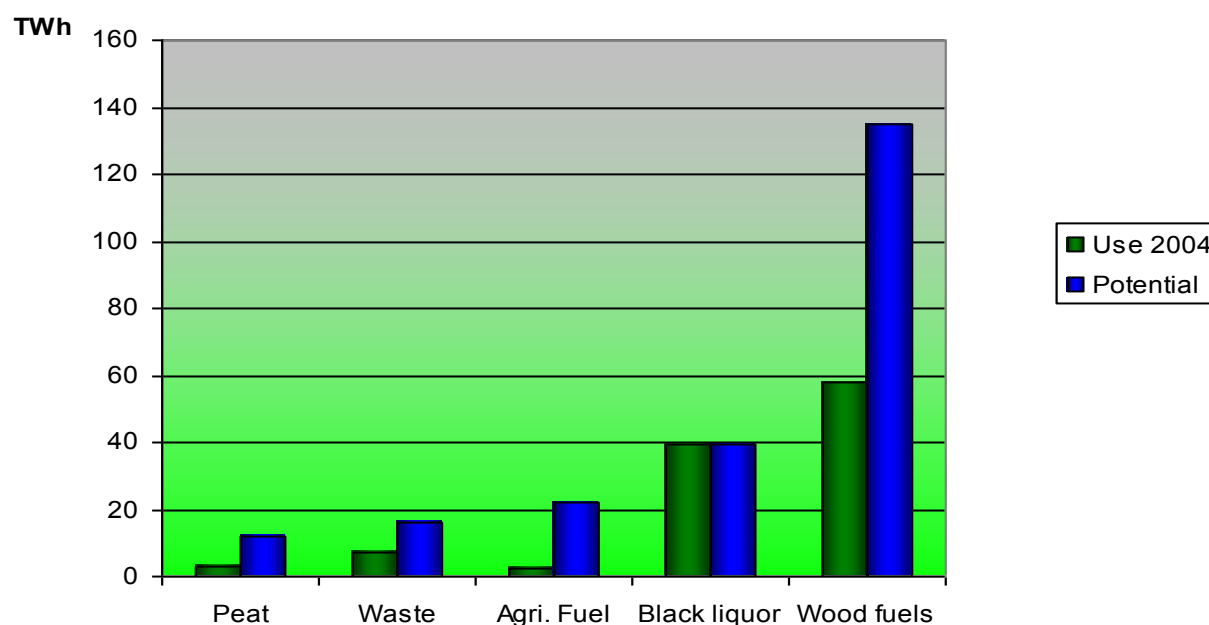
Scenario for 2020

- Increase at same level as today: +5,5 TWh/ year (total bio)
 - Almost full utilisation of biofuel potential (200/ 220)
 - Increasing competition between biofuel for heat, power and transports
- ⇒ Biofuel for heat 122 TWh 2010 => 150 TWh 2020

+ 3 TWh/ year biofuel for heat
+ 2 TWh/ year biofuel for power

+ 0,5 TWh/ year biofuel for transports
 = 5,5 TWh/ year total biofuel increase during 2010-2020

Figure 1 : Comparison between use and potential in Sweden



3.4. Targets for 2020

As explained above for the period from now to 2010 the targets of the BAP should be used. But it is also necessary to develop targets for a longer time horizon to give clear signals for the economy and the consumers. These indicative targets could be revised every five years based on the experience gained. The targets for biomass should also be related to the demand for final energy and to basic principles of biomass deployment such as high conversion efficiency and a competitive cost structure.

We should keep in mind that roughly 50% of the final energy consumption goes to the heat market (table below). Therefore balanced targets for heat, electricity and transportation biofuels should be envisaged. In addition due to thermodynamic laws (efficiency for cogeneration) the objective for electricity should be much lower than for heat.

Tableau 2 : Final energy consumption by energy form in 2003

	Mtoe	%
Heat	561	49,7
Electricity	225	19,9
Transport fuels	343	30,4
Total	1129	100

4. Statistics

4.1. Items to consider

Fixing objectives is a key point but bioenergy and bioheat in particular should also be measurable so that a monitoring can be undertaken. Solutions have to be found because :

- Renewable heat does not appear in Eurostat
- Biomass and waste are sometimes mixed together in a single number
- Traditional biomass used as wood logs in stove is still representing a significant part of the bioheat with calculation procedure rather than measurement

The statistics should take into account the guidelines that will be given to the MS for their national biomass action plans. If we take the example above the following items should appear :

Biomass for heat	→	Bioheat
Biomass for cogeneration	→	Bioheat and bioelectricity
Biomass for electricity	→	Bioelectricity
Biomass for transportation biofuels	→	Transportation biofuels

However for "biomass for heat only applications" a large variation of efficiency exists between technologies starting from open fires (round 10 % efficiency), stoves (40-50%) and automatic boilers (80-90%). Therefore it is proposed to further categorize biomass for heat for example in two items : small scale units for individual households and medium - and large scale units.

4.2. Calculation principles

Whenever possible statistics have to be based on measurements. Such data are generally available when heat is sold and for large scale. But the biomass for heat and the bioheat are not measured, especially in the case of small scale applications. In this case a calculation methodology is needed. The following equations are proposed for discussion.

4.2.1. Small scale systems

Small scale systems are stoves and boilers (automatic or not) that can use several types of biofuels (logs, chips, pellets).

Two approaches can be used and compared :

a. Based on fuel

amount of biomass for heat (kg) x lower heating value - LHV (kWh/kg) x conversion efficiency (%) = bioheat (kWh)

This approach will be particularly efficient for certain types of biofuels like pellets for which the quantity of biomass is measurable because it is sold (production capacity of pellets production units, import/ exports, etc.).

LHV and conversion efficiency can be approximate on the base of studies and test in laboratories. However it should be noted that figures representing real life conditions should be used and not optimal efficiency of the boilers for example. It would also be possible to launch test in real conditions on a significant number of families (100 for example) that will monitor and measure precisely the amount of wood they are using during a winter season. The results will than be used to extrapolate the results to a certain region.

b. Based on use

number of units (n) x installed capacity (kW) x hours (h) x load factor (%) = biomass for heat (kWh)

biomass for heat (kWh) x conversion efficiency (%) = bioheat (kWh)

In this approach we need to know the number of units. This should be done through survey and energy questionnaires. However such questionnaire cannot be too detailed and some factors of the equation have to be evaluated like capacity, hours and load factor. This latter factor takes into account the fact that a system does not work always at full capacity. Another approach is to take theoretic hours of full capacity operations. These factors are also depending on regions, climate and year

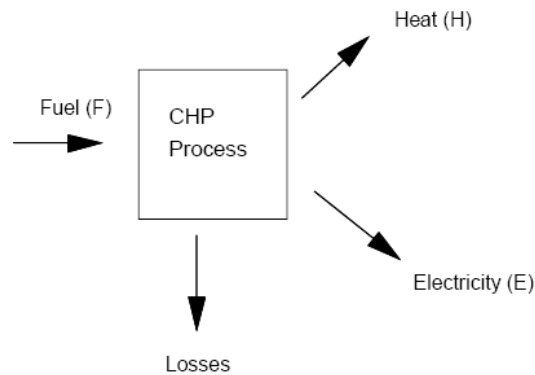
In addition technologies have to be classified and the calculation carried out for each class. Traditional stoves as additional heating systems have totally different running hours and efficiencies as compared to automatic pellets boilers.

4.2.2. Cogeneration

If the targets do not foresee a specific objective for biomass for cogeneration but only biomass for heat and biomass for electricity, then a special calculation method has to be used to allocate a certain amount of the biomass for heat and for electricity. The EUROSTAT methodology foresees to share the fuel for cogeneration applications according to the proportion of heat and electricity according to a simple principle (see Figure 2) using the formula : Fuel for heat = $F * (H / (H+E))$

Figure 2 : Methodology for apportioning fuel input in a CHP plant²

² EUROSTAT, definition of renewable and waste for the annual questionnaire 2001 and 2002, <http://europa.eu.int/estatref/info/sdds/fr/sirene/reneng.pdf>



For cogeneration units waste heat should ideally be taken into account. When cogeneration units are dimensioned there might be surplus heat during summer time that cannot be used.

Calculation approaches are similar as above :

a. Based on fuel

amount of biomass for cogeneration (kg) x LHV (kWh/kg) x conversion efficiency for heat (%) = gross bioheat (kWh)

then percentage of net bioheat should be estimated

amount of biomass for cogen (kg) x bioheat (kWh) / (bioheat + bioelectricity (kWh)) = amount of biomass for heat (kg)

b. Based on use

number of units (n) x installed electric capacity (kWe) x hours (h) x load factor (%) / electric efficiency (%) = biomass for cogen (kWh)

then same calculation as a.

5. First attempts for objectives for biomass for heat and bioheat

5.1. Based on existing biomass for heat

The total biomass used for heat in 2001 is given by the Commission³, as well as the target of 74 800 ktoe for EU25 countries in 2010. As the countries have various development of the heat market from biomass, it would not be realistic to increase biomass for heat uniformly. For example one can't consider an equal increase in Finland where biomass represents about 1/3 of the total heat market and The Netherlands where biomass represents roughly 1% of the heat market. As a tentative approach of national targets for

³ SEC(2004) 547, European Commission, " The share of renewable energy in the EU. Country Profiles. Overview of Renewable Energy Sources in the Enlarged European Union", as support to COM(2004)366

biomass for heat we multiplied the national percentage of biomass for heat using the following formula :

$$\text{Percentage in 2010} = \text{percentage in 2001} \times 1,25 + 3,35$$

This formula gives a linear increase of the biomass for heat; the smallest the percentage in 2001, the highest proportional increase. Using such calculation Belgium has to increase biomass for heat by a factor 2,95 (from 2 to 5,9%) while Sweden has to increase by a factor 1,34 (from 38,4 to 51,3%). When multiplied by the market for heat in 2010 we can calculate the needed biomass for heat in 2010 (Tableau 3).

The same calculation method can be used for 2020 (Percentage in 2010 = percentage in 2001 x 1,5 + 12,3). The total value of 130 000 ktoe for EU25 is an AEBIOM objective.

Tableau 3 : Biomass for heat : AEBIOM calculated national objectives (ktoe)

	Reference in 2001 ³	AEBIOM calculation for 2010	AEBIOM calculation for 2020
Austria	2373	3.347	4.963
Belgium	384	1.124	2.946
Cyprus	3	17	56
Czech Republic	432	945	2.141
Denmark	891	1.337	2.159
Estonia	398	537	742
Finland	4818	6.510	9.021
France	9567	13.702	20.768
Germany	5480	10.116	20.245
Greece	962	1.449	2.351
Hungary	302	710	1.677
Ireland	145	332	773
Italy	5613	8.955	15.558
Latvia	592	822	1.191
Lithuania	574	757	1.008
Luxembourg	25	74	197
Malta	0	0	1
Netherlands	324	1.340	3.927
Poland	2539	4.285	7.901
Portugal	1885	2.600	3.725
Slovak Republic	103	349	965
Slovenia	383	544	814
Spain	3383	5.218	8.718
Sweden	4995	6.680	9.097
United Kingdom	700	3.050	9.058
EU25	46.870	74.800	130 000

5.2. Based on biomass as primary energy

Eurostat gives figures for biomass as part of the Gross Inland Consumption (GIC). In these figures liquid biofuels can be considered as negligible and therefore biomass covers biomass for heat and biomass for electricity (and also some waste for some countries).

The target for 2010 has been defined in the BAP (see *Tableau 1*). National objectives have been defined simply by multiplying the 2004 biomass contribution of each country by the same factor 1,82.

For 2020 the AEBIOM objective is 195 000 ktoe for EU25 (biomass for heat, cogeneration and electricity, without transportation biofuels). It can be reached by multiplying the 2004 figures by a factor 2,71.

This is obviously a simplistic way to calculate the national contributions that does not take into account the potential of the biomass resource and its current use (a country that would already exploit a significant part of the biomass potential cannot increase it by 270 %).

Tableau 4 : Biomass as Primary Energy : Eurostat statistics from 1999 to 2004, target for 2010 and 2020 by AEBIOM (biomass for heat, cogeneration and electricity, without transportation biofuels, in ktoe).

	1999	2000	2001	2002	2003	2004	2010	2020
EU 25	56.229	58.246	60.501	62.724	68.060	71.898	130.800	195.000
BE	597	596	673	627	864	913	1.661	2.476
CZ	589	444	510	637	1.036	1.324	2.409	3.591
DK	1.633	1.668	1.789	1.872	2.073	2.154	3.919	5.842
DE	6.384	6.830	7.300	7.929	8.643	9.367	17.041	25.405
EE	509	500	550	542	608	685	1.246	1.858
EL	913	946	970	996	945	953	1.734	2.585
ES	3.894	4.049	4.149	4.328	5.018	4.853	8.829	13.162
FR	11.232	11.579	11.802	11.134	11.739	12.007	21.844	32.565
IE	167	164	180	176	170	214	389	580
IT	1.624	1.572	1.653	1.637	2.012	3.145	5.722	8.530
CY	9	9	9	10	6	5	9	14
LV	1.456	1.284	1.411	1.584	1.776	1.866	3.395	5.061
LT	621	627	630	666	677	706	1.284	1.915
LU	36	44	46	44	51	59	107	160
HU	384	415	387	784	818	860	1.565	2.332
MT								
NL	1.476	1.529	1.519	1.642	1.940	2.175	3.957	5.899
AT	2.910	2.819	3.140	3.204	3.411	3.452	6.280	9.362
PL	3.572	3.625	3.874	3.933	3.996	4.126	7.506	11.190
PT	1.933	2.053	2.583	2.838	2.842	2.877	5.234	7.803
SI	233	458	450	465	460	470	855	1.275
SK	73	100	328	260	331	385	700	1.044
FI	6.158	6.536	6.433	6.915	7.112	7.556	13.746	20.493

SE	7.929	8.330	7.967	8.174	8.773	8.883	16.160	24.092
UK	1.897	2.069	2.148	2.327	2.759	2.863	5.208	7.765

A similar calculation could be done using the Gross Inland Consumption (GIC). In this case member states would have to reach a certain percentage of the GIC through biomass for energy.

5.3. Based on enquiries at national level

The best method to establish targets for bioenergy would be based on national enquiries. The sectors of heat – small scale and medium to large scale, cogeneration, electricity and second generation liquid biofuels should all be addressed in the same study. Targets should be expressed as primary and final energy as described in 3.1. Objectives should also be compared with the potential of biomass at national, European and world levels.

The tables below are giving a first attempt for such objectives. Starting from a reference in 2004, goals are defined for 2010 and 2020. Some AEBIOM members have defined these targets and conversion efficiencies. For the others we have used a factor that multiplies the 2004 figures to reach 74 800 ktoe in 2010 (BAP target) and 162 500 ktoe for 2020 (AEBIOM target for biomass for heat and cogeneration, 195 000 ktoe for biomass for heat, cogeneration and electricity). Conversion efficiencies are roughly estimated and increased for 2010 and 2020 based on technology improvements.

Defining such targets is obviously more complicated than the above mentioned example. However studies at national level with detailed objectives would be excellent instruments to highlight the need to address the different sectors separately and to increase the efficiency especially for the small scale individual systems.

State of Bioheat in 2004

Preliminary definitions

all figures below in **ktoe** (1000 ton oil equivalent = 41868 GJ
= 11630 MWh)

Small scale individual heating systems are systems for households (but if you would like another definitions, like systems below 100 kW, please indicate)

Medium and Large scale boiler : for industries and district heating, for all types of fuel (wood, straw, biodegradable part of waste)

CHP : cogeneration, including for all types of fuel (biogas, wood, straw, biodegradable part of waste)

Efficiency : ratio between energy content of biofuel and energy content of final energy after conversion under real life conditions (not laboratory numbers)

ktoe	Small scale individual heating systems for households			Medium and Large scale boiler			CHP					Total		
	biomass for heat	Efficiency	bioheat	biomass for heat	Efficiency	bioheat	biomass for CHP	Efficiency for heat	Efficiency for electricity	bioheat	bioelectricity	biomass for heat and CHP	overall efficiency	bioheat
Austria	1420	69%	980	655	80%	524	835	55%	25%	459	209	2.910	67%	1.963
Belgium	188	50%	94	191	80%	153						379		247
Cyprus	0		0			0						0		0
Czech Republic	466	50%	233	13	80%	10	125	40%	25%	50	31	604	49%	293
Denmark	485	50%	243	478	80%	382	844	40%	25%	338	211	2.030	47%	963
Estonia	337	50%	169	88	80%	70	26	40%	25%	10	7	573	0%	
Finland	1.120	70%	784	450	85%	383	5190	60%	30%	3.114	1.557	6.760	63%	4.281
France	7325	40%	2.930	1422	80%	1.138	1276	40%	25%	510	319	10.023	46%	4.578
Germany	4.130	63%	2.602	740	78%	577	2140	22%	27%	471	578	7.010	52%	3.650
Greece	702	50%	351		80%	0	8	40%	25%	3	2	710	50%	354
Hungary	496	50%	248	3	80%	2	22	40%	25%	9	6	521	50%	259
Ireland	43	50%	22		80%	0		40%	25%			43		22
Italy	3.235	40%	1.294	1.536	85%	1.306	297	78%	20%	232	59	5.068	56%	2.832
Latvia	696	50%	348	278	80%	222	3	40%	25%	1	1	977	59%	572
Lithuania	432	70%	302	95	85%	81	9	50%	30%	5	3	536	72%	388
Luxembourg	15	50%	8		80%	0		40%	25%			15		8
Malta		50%	0		80%	0		40%	25%			0		0

Netherlands	223	50%	112		80%	0	177	40%	25%	71	44	400	46%	182
Poland	2469	50%	1.235	25	80%	20		40%	25%			2.494		1.255
Portugal	1158	50%	579		80%	0	922	40%	25%	369	231	2.080	46%	948
Slovakia	31	50%	16	7	80%	6	186	40%	25%	74	47	224	43%	96
Slovenia	324	50%	162	9	80%	7	84	40%	25%	34	21	417	49%	203
Spain	2019	50%	1.010		80%	0	780	40%	25%	312	195	2.799	47%	1.322
Sweden	1.101	65%	716	6.552	85%	5.569	360	50%	30%	180	108	8.013	81%	6.465
United Kingdom	226	50%	113	59	80%	47	176	40%	25%	70	44	461	50%	231
EU25	28.641	51%	14.547	12.601	83%	10.498	13.460	47%	27%	6.313	3.671	55.047	57%	31.108
Biomass for heat only	41.242													

Bioheat objectives for 2010

ktoe	Small scale individual heating systems for households			Medium and Large scale boiler			CHP					Total		
	biomass for heat	Efficiency	bioheat	biomass for heat	Efficiency	bioheat	biomass for CHP	Efficiency for heat	Efficiency for electricity	bioheat	bioelectricity	biomass for heat and CHP	overall efficiency	bioheat
Austria	1.420	80%	1.136	1.587	80%	1.270	2.152	57%	23%	1.218	503	5.159	70%	3.624
Belgium	621	60%	373	631	85%	537		45%	27,5%			1.253		909
Cyprus	0	60%	0	0	85%	0		45%	27,5%			0		0
Czech Republic	1.540	60%	924	43	85%	37	186	45%	27,5%	84	51	1.769	59%	1.044
Denmark	1.603	60%	962	1.580	85%	1.343	1.254	45%	27,5%	564	345	4.437	65%	2.869
Estonia	1.114	60%	668	291	85%	247	39	45%	27,5%	17	11	1.443	65%	933
Finland	1.720	60%	1.032	1.050	85%	893	5.500	45%	27,5%	2.475	1.513	8.270	53%	4.400
France	8.100	60%	4.860	1.600	85%	1.360	1.800	45%	27,5%	810	495	11.500	61%	7.030
Germany	4.920	65%	3.198	890	80%	712	2.840	25%	28%	710	795	8.650	53%	4.620
Greece	2.320	60%	1.392	0	85%	0	12	45%	27,5%	5	3	2.332	60%	1.397
Hungary	1.639	60%	984	10	85%	8	33	45%	27,5%	15	9	1.682	60%	1.007
Ireland	142	60%	85	0	85%	0		45%	27,5%			142		85
Italy	7.700	50%	3.850	2.020	85%	1.717	720	80%	22%	576	158	10.440	59%	6.143
Latvia	2.300	60%	1.380	919	85%	781	4	45%	27,5%	2	1	3.224	67%	2.163

Lithuania	420	75%	315	120	85%	102	106	50%	30%	53	32	646	73%	470
Luxembourg	50	60%	30	0	85%	0		45%	27,5%			50		30
Malta	0	60%	0	0	85%	0		45%	27,5%			0		0
Netherlands	737	60%	442	0	85%	0	263	45%	27,5%	118	72	1.000	56%	561
Poland	8.160	60%	4.896	83	85%	70		45%	27,5%			8.243		4.966
Portugal	3.827	60%	2.296	0	85%	0	1.370	45%	27,5%	617	377	5.197	56%	2.913
Slovakia	102	60%	61	23	85%	20	276	45%	27,5%	124	76	402	51%	206
Slovenia	1.071	60%	642	30	85%	25	125	45%	27,5%	56	34	1.225	59%	724
Spain	6.673	60%	4.004	0	85%	0	1.159	45%	27,5%	522	319	7.832	58%	4.525
Sweden	1.617	75%	1.213	5.185	85%	4.407	4.299	60%	30%	2.579	1.290	11.101	74%	8.199
United Kingdom	747	60%	448	195	85%	166	262	45%	27,5%	118	72	1.203	61%	732
EU25	58.544	60%	35.192	16.256	84%	13.694	22.400	48%	27%	10.664	6.156	97.200	61%	59.549
Biomass for heat only	74.800													

Bioheat objectives for 2020

ktoe	Small scale individual heating systems for households			Medium and Large scale boiler			CHP					Total		
	biomass for heat	Efficiency	bioheat	biomass for heat	Efficiency	bioheat	biomass for CHP	Efficiency for heat	Efficiency for electricity	bioheat	bioelectricity	biomass for heat and CHP	overall efficiency	bioheat
Austria	6.089	85%	5.176	2.809	90%	2.528	2.757	50%	30%	1.379	827	11.655	78%	9.082
Belgium	806	70%	564	819	90%	737		50%	30%			1.625		1.301
Cyprus	0	70%	0	0	90%	0		50%	30%			0		0
Czech Republic	1.998	70%	1.399	56	90%	50	413	50%	30%	206	124	2.467	67%	1.655
Denmark	2.080	70%	1.456	2.050	90%	1.845	2.787	50%	30%	1.393	836	6.916	68%	4.694
Estonia	1.445	70%	1.012	377	90%	340	86	50%	30%	43	26	1.908	73%	1.394
Finland	1.820	75%	1.365	1460	90%	1.314	6400	50%	30%	3.200	1.920	9.680	61%	5.879
France	31.410	70%	21.987	6.098	90%	5.488	4.213	50%	30%	2.107	1.264	41.720	71%	29.581
Germany	5.820	70%	4.074	1.068	83%	886	4.260	30%	29%	1.278	1.235	11.148	56%	6.238
Greece	3.010	70%	2.107	0	90%	0	26	50%	30%	13	8	3.037	70%	2.120
Hungary	2.127	70%	1.489	13	90%	12	73	50%	30%	36	22	2.212	69%	1.537

Ireland	184	70%	129	0	90%	0		50%	30%			184		129
Italy	15.000	60%	9.000	4.000	90%	3.600	1.500	90%	30%	1.350	450	20.500	68%	13.950
Latvia	2.984	70%	2.089	1.192	90%	1.073	10	50%	30%	5	3	4.186	76%	3.167
Lithuania	400	80%	320	200	85%	170	200	50%	30%	100	60	800	74%	590
Luxembourg	64	70%	45	0	90%	0		50%	30%			64		45
Malta	0	70%	0	0	90%	0		50%	30%			0		0
Netherlands	956	70%	669	0	90%	0	584	50%	30%	292	175	1.541	62%	962
Poland	10.587	70%	7.411	107	90%	96		50%	30%			10.694		7.507
Portugal	4.965	70%	3.476	0	90%	0	3.044	50%	30%	1.522	913	8.010	62%	4.998
Slovakia	133	70%	93	30	90%	27	614	50%	30%	307	184	777	55%	427
Slovenia	1.389	70%	973	39	90%	35	277	50%	30%	139	83	1.705	67%	1.146
Spain	8.657	70%	6.060	0	90%	0	2.576	50%	30%	1.288	773	11.233	65%	7.348
Sweden	2.064	80%	1.651	4.471	90%	4.024	8.598	60%	30%	5.159	2.579	15.133	72%	10.834
United Kingdom	969	70%	678	253	90%	228	581	50%	30%	291	174	1.803	66%	1.197
EU25	104.959	70%	73.222	25.041	90%	22.452	39.000	52%	30%	20.108	11.657	169.000	69%	115.782
Biomass for heat only	130.000													