Preparatory Study on

Eco-design of Boilers

Task 2 (FINAL)

Market Analysis

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INTRODUCTION

The scope of Task 2 of the preparatory Eco-design study on Central Heating Boilers is:

- To place the product group within the total of EU industry and trade policy (subtask 2.1).
- To provide market and cost inputs for the EU-wide environmental impact of the product group (subtask 2.2).
- To provide insight in the latest market trends so as to indicate the market-structures and ongoing trends in product design (subtask 2.3, also relevant for the impact analyses).
- And finally, to provide a practical dataset of prices and rates to be used in a Life Cycle Cost (LCC) calculation (Subtask 2.4).

Subtask 2.1 is reported in Chapter 2 and provides generic economic data on EU Production, Extra-EU Trade, Intra-EU Trade and Apparent EU-consumption[1] Data relate to the latest full year for which at least half of the Member States have reported., i.e. 2004. Production data could be provided in physical volume and in money units and split up per Member State. The information for this subtask was derived from official EU Eurostat statistics and coherent with official data used in EU industry and trade policy.

Market and stock data are reported in Chapter 3. The main source is work by BRG Consult, acting as a sub-contractor for VHK and author of a very recent comprehensive study on the EU boiler market for the European Commission. Sales and stock data are provided in physical units and concern 99% of the EU population (EU 25 except for Luxemburg, Malta and Cyprus).

The reference years are

- 1990 (Kyoto reference)
- 2004 (most recent real data),
- 2010 (forecast, end of Kyoto phase 1, relevant also for Stockholm, etc.),
- 2025 (forecast, year in which all new eco-designs of today will be absorbed by the market)

The following parameters were identified:

- Installed base (“stock”) and penetration rate,
- Annual sales growth rate (% or physical units)
- Total sales/ real EU-consumption[2] , (total market in €)
- Replacement sales
- New sales
- Average Product Life, differentiated in overall lifetime and time in service, (in years) and a rough indication of the spread (e.g. standard deviation)

[1] Calculated from production, imports and exports. .

[2] The objective is to define the actual consumption as reliably as possible for the categories defined in task 1.1, for the latest full year for which consistent data could be retrieved. Significant differences between the actual consumption and the apparent consumption in subtask 2.2 may occur.

BRG Consult has developed its own stock model, which was the basis for the 2010 and 2025 forecasts. The BRG Consult data and forecasts were checked against the VHK Market and Stock Model developed for the 2001 SAVE study. The forecasts give a segmentation (in physical units and efficiency) by:

- Country (EU, excl. Malta, Luxembourg and Cyprus);
- Fuel type (gas, oil, electric).

The sales data give a segmentation

- By capacity class (3 for wall-hung boilers, 4 for gas floorstanding, 6 classes for oil-fired jet burners),
- By efficiency class (2 classes, 'condensing' and 'non-condensing')
- By several combustion, ignition and control characteristics
- By hot water production (dual purpose products).

The forecasts for 2010 and 2025 will be accompanied by an overview of the relevant market trends, also in Chapter 3. This is actually the first part of Subtask 2.3 ('general trends in product-design and product-features'), but it makes sense to provide the trends behind the forecasts in the same chapter.

Apart from the market trends (Chapter 3), the other parts of subtask 2.3 are in chapter 5, identifying the major players in the market, the distribution structure, consumer association tests, etc.. Also the usual pace of product redesign in the sector is discussed. This is information that is very relevant for the Manufacturer Impact Analysis planned in Tasks 7/8.

Another part of Chapter 5 regards the financial side of the market structure: the average margins and a split up of the manufacturing costs. These data serve as a background for the cost calculations that will be the basis for the Design Options (Task 6) and of course they are part of the definition of the Base Case in Task 5.

Chapter 4 provides the basic ingredients for the Life Cycle Cost calculations that will be used in Tasks 5 (Base Case) and 6 (Design Options). It includes average product prices, installation costs, energy prices, other consumables, repair and maintenance costs, disposal costs, discount rates and the average product life.

1 GENERIC ECONOMIC DATA

1.1 Introduction

This section presents production, import and export data as extracted from the Eurostat COMEXT database, using PRODCOM categorisation ([3]).

The following PRODCOM categories were assessed:

- 28.22.12.00 Boilers for central heating other than those of HS 8402 ([4]);
- 28.22.12.03 Boilers for central heating using gas;
- 28.22.12.05 Boilers for central heating using fuel;
- 28.22.12.07 Boilers for central heating using other types of energy.

The extracted tables contain many blank cells and data for 2005 was not present at all. Large fields of data are confidential or estimated and are suppressed, especially fields regarding recent years. Furthermore, import and export data expressed in physical units and for other categories than the generic boiler category are lacking.

In the MEEUP Methodology Report (VHK 2005) reservations about the reliability of the PRODCOM data were already expressed. The main value of presenting these data here, is that they represent the official data that is currently used by the European Community.

1.2 EU25 Production

Table 2.1 provides PRODCOM data for the EU25 boiler production, category 28.11.12.00. Based upon these figures the production value of an "average" central heating boiler produced in the EU25 is 656 euro (2004).

For France, Germany and Italy more detailed production information on gas, oil and 'other fuel' boilers is available. This information is presented in table 2.2.

French data for 2000-2002 indicate a production value of 620-650 euro for a gas boiler and 1200-1250 euro for an oil boiler. The latter figure corresponds with the German oil boiler value of 1270 euro. The German gas boiler value appears somewhat higher than its French counterpart. Italian boiler production value appears lower than French and German boilers.

[3] Extracted from http://fd.comext.eurostat.cec.eu.int/xtweb/ during May 2006

[4] HS 8402 refers to steam generating boilers.

Table 1-1. Eurostat BOILER PRODUCTION

Production	Boilers for central heating (other than HS8402)											
	in 1000 units						in million Euro					
	1995	2000	2001	2002	2003	2004	1995	2000	2001	2002	2003	2004
Austria	55	53	50	53			99	96	103	94		
Belgium	141	100	51	49	53	53	80	50	28	29	29	31
Cyprus									7,5		5,9	
Czech Rep.			135		118	119			58	59	80	82
Denmark	13	16	16	11	14	12	24	31	37	21	26	31
Estonia			0,9			0,3			0,6		0,3	0,5
Finland			11	13	13	16	20	18	21	19	22	28
France	65	995	901	942	972	1034	63	728	680	710	728	762
Germany	787	664	684	641	705	834	996	774	817	807	839	870
Greece	17	17	19		13	35	10	8	9		6	14
Hungary			11	11	18	12		20				
Ireland		67	62			91		18	19		26	36
Italy	1031	2094	2310	2322	2864	2855	463	1027	1158	1169	1368	1455
Latvia			1,3	1,2	1,6	1,5			1,5	1,3	1,5	1,7
Lithuania		4,8	7,2	8,3	9,3	10,6		2,5	3,7	4	5,6	6,2
Luxemburg												
Malta												
Netherlands	256	432	441				233	380	394	381	385	401
Poland				113	315	315				50	119	119
Portugal	1,2		0,5		0,4	0,3	0,8		2,1		1,4	1,3
Slovakia		30										
Slovenia			6,4		5,8				7,3	6	8	8,1
Spain	54	124	105	103	78	87	41	102	84	73	51	61
Sweden		36	42	49			0,03	50	54	65		
UK	903	945	933	910	993	1058	439	644	642	530	549	625
EU15			5625						4048			
EU25					7387	7312					4604	4797

Table 1-2. Production value of boilers for FR, DE and IT

		1995			2000			2001			2002		
		gas	oil	other	gas	oil	other	gas	oil	other	gas	oil	other
France	1000 units	6	50	107	823	62	110	776	57	n.a.	776	69	97
	mln. €	14	49	130	510	78	140	491	70	n.a.	491	83	135
	(value/unit)	2285	972	1209	619	1251	1277	633	1234	n.a.	633	1203	1400
Germany	1000 units										335	234	72
	mln. €										358	298	151
	(value/unit)										1068	1271	2103
Italy	1000 units	850	176	5									
	mln. €	362	95	6									
	(value/unit)	426	537	1429									

1.3 EU25 Trade

The table below shows the Eurostat PRODCOM data on imports and exports of CH boilers in the EU 25. The most recent year for which data are available is 2004. Table 2.3 shows the intra- and extra-EU imports and exports per country and for the EU as a whole from the PRODCOM statistics. Data are only available in mln. € and not in physical units and relate to PRODCOM category 28.22.12.00, central heating boilers excluding HS 8402.

Table 1-3. Eurostat EU25 CH Boilers Eports and Imports (PRODCOM 28.22.12.00, central heating boilers excluding HS8402)

	EU25 CH BOILER EXPORTS						EU25 CH BOILER IMPORTS					
	in mln. €						in mln. €					
	1995	2000	2001	2002	2003	**2004**	1995	2000	2001	2002	2003	**2004**
Austria	32	49	73	70			49	63	49	48		
Belgium	60	41	27	26	23	**16**	64	70	69	78	95	**99**
Cyprus												
Czech Rep.			28	33	45	**53**			34	36	35	**39**
Denmark	13	16	16	19	20	**18**	7	16	19	23	30	**32**
Estonia			0,9		0,4	**0,3**			3,4		4,7	**3,4**
Finland	8	6	15	9	11	**7**	0,8	0,8	0,6	0,3	1,1	**1,2**
France	224	237	230	204	208	**234**	100	171	142	149	170	**185**
Germany	491	734	648	706	798	**837**	135	208	198	205	228	**282**
Greece	1	3	3		4	**3**	11	20	13		24	**29**
Hungary			8,4	13,6	15	**15,1**			44,1	43,5	52	**51**
Ireland		16	15		21	**23**		27	45		30	**32**
Italy	238	512	488	495	568	**583**	120	126	145	168	188	**201**
Latvia			2,8	2,6	2,7	**3,5**			7	6,7	8,7	**8,8**
Lithuania		0,5	0,7	0,8	1,1	**1,8**		4,6	5,7	6,8	7,9	**8,8**
Luxemburg												
Malta												
Netherlands	31	150	132	150	186	**207**	76	34	21	44	87	**88**
Poland				44	60	**62**				70	76	**94**
Portugal	0		29,2		43,4	**30**	8,3		33,6		32,9	**32,2**
Slovakia		17						9				
Slovenia			5,4		4,8				9,5		10,6	
Spain	9	42	38	44	44	**74**	111	165	137	156	167	**168**
Sweden	8,61	12	12	17			6,14	6	9	12		
UK	20	28	29	43	49	**54**	99	277	319	349	321	**348**
EU15			486						130			
EU25					761	**838**					285	**304**

Table 1.3 shows that total 2004 EU25-exports of boilers (excl. HS 8402) to third countries amounted to € 838 mln, which is approx. 17,5 % of the EU-production value of € 4,8 bln. identified in the previous paragraph. With respect of the previous year, exports rose by 10%. Imports amount to € 304 mln (6,3% of EU production value), rising 7% with respect of the previous year.

In terms of the total intra- and extra-EU trade, the largest exporter is Germany (€ 837 mln), followed by Italy (583). France (234) and the Netherlands (207). The largest

importer is the United Kingdom (€ 348 mln), followed by Germany (282), Italy (201) and France (185). Please note that more than half of this is intra-EU trade.

Table 1.4 shows just the extra-EU trade, not according to PRODCOM, but according to the Harmonised System (HS). The data relate to CH boilers of cast iron (category HS 84.03.10) and non-electric CH boilers (category HS 84.03.90). Table 1.4 also gives some indication of also the physical quantity (weight) involved.

According to the Harmonised System the exports of the same product category amounted to € 105,6 mln (cast-iron) plus € 476,7 mln (other boilers), totalling € 582,3 mln in 2004. This is 30% (€ 255,7 mln) less than the export data from PRODCOM.

For the import data there is even a larger discrepancy between the two statistics sources in 2004. PRODCOM imports are € 304 mln, whereas the Harmonised System identifies only € 154,3 mln.

If we include the boiler (spare) parts in the equation, the situation slightly improves, with total EU exports in the HS system now also is close to € 800 mln. VHK believes that the reliability of the value declarations in the Harmonised System (table 1.4) is more limited than that of PRODCOM. Nonetheless, the fact that a split-up is made between cast-iron and other boilers and physical units are specified gives some extra information.

Table 1-4. Eurostat EU25 Trade balance

reported by: EU25 trade partner: EU25 EXTRA	Central Heating Boilers of cast iron (excl. vapour generating boilers and superheated water boilers of heading 8402)					Central Heating Boilers, non-electric, materials other than cast iron (excluding boilers under heading 8402)				
	1995	2000	2003	2004	2005	1995	2000	2003	2004	2005
IMPORTS										
Quantity in 1000kg (excl. suppl.quantities)	2351	5835	5984	5847	7343	5395	9966	13743	16186	16132
mln. €	14,0	23,9	31,3	33,8	36,6	35,5	72,5	106,3	120,5	117,3
EXPORTS										
Quantity in 1000kg (excl. suppl.quantities)	23546	20817	34565	38771	41848	17233	35913	59647	75270	82050
mln. €	69,0	61,7	96,0	105,6	122,2	115,4	233,2	413,6	476,7	552,1
BALANCE (exports - imports)										
Quantity in 1000kg (excl. suppl.quantities)	21194	14982	28581	32923	34505	11838	25947	45904	59085	65917
mln. €	55,0	37,8	64,6	71,8	85,6	79,9	160,7	307,4	356,1	434,7

Tables 1.5 and 1.6 on the next page give a split up of the extra-EU imports and exports by country of provenence and destimation. As mentioned, the table also include the boiler parts, but these are just the parts clearly marked as boiler spare parts and should not be confused with semi-finished sub-assemblies from OEMs outside the European Union, which are virtually untraceable statistically.

Overall, the significance and reliability of the import- and export-data should not be overrated.

Table 1-5. Extra EU25 Boiler Imports 2004-2005 in mln. Euro (Eurostat 2006)

HS	84031090		84031010		84039090 84039010		TOTAL	
	not cast-iron boilers		cast-iron boilers		boiler parts			
From	2005	2004	2005	2004	2005	2004	2005	2004
Turkey	62,6	76,3	11,3	5,0	7,4	10,2	81,4	91,5
Switzerland	11,1	10,4	21,8	24,9	14,4	8,8	47,3	44,0
Lichtenstein	15,2	12,7	2,2	2,4	2,5	1,5	19,9	16,5
Romania	7,3	2,7	*	*	1,3	1,8	8,6	4,5
Norway	7,5	7,5	*	*	*	*	7,5	7,5
Korea(South)	7,4	6,8	*	*	*	*	7,4	6,8
Slovenia	1,8	1,4	*	*	*	*	1,8	1,4
other	4,4	2,9	1,3	1,6	17,4	13,8	23,1	18,3
EU25_EXTRA	117,4	120,5	36,6	33,8	43,0	36,1	197,0	190,4

* =< 1 mln.

Table 1-6. Extra EU25 Boiler Exports 2004-2005 in mln. Euro (Eurostat 2006)

HS	84031090		84031010		84039090 84039010		TOTAL	
	not cast-iron boilers		cast-iron boilers		boiler parts			
To	2005	2004	2005	2004	2005	2004	2005	2004
Turkey	133,8	106,1	4,2	2,8	25,7	36,6	163,8	145,5
Russia	77,9	56,4	21,9	13,9	11,4	6,9	111,2	77,3
Romania	87,2	79,9	14,0	12,1	7,7	7,4	108,9	99,3
Switzerland	43,1	37,0	17,0	15,5	16,6	17,0	76,7	69,5
Ukraine	37,9	24,4	10,3	8,5	11,0	9,2	59,2	42,1
USA	19,7	11,1	14,6	15,6	17,3	13,5	51,6	40,2
China	24,5	25,7	5,8	6,6	2,8	7,2	33,1	39,6
Croatia	21,7	20,9	4,0	3,4	3,9	*	29,6	24,4
Canada	16,1	11,9	*	*	2,0	1,5	18,0	13,4
Slovenia	9,3	8,2	4,9	4,2	2,5	2,2	16,7	14,7
Bulgaria	5,1	3,6	5,5	4,9	1,3	1,2	12,0	9,7
Japan	9,8	6,0	*	*	1,4	1,3	11,2	7,3
Serbia	7,0	9,3	1,5	2,2	*	*	8,5	11,5
Iran	6,0	28,0	*	*	1,2	*	7,2	28,0
Norway	4,2	7,4	*	*	2,4	2,3	6,6	9,7
Lichtenstein	4,2	1,7	*	*	1,3	1,1	5,5	2,7
Moldova	5,2	5,0	*	*	*	*	5,2	5,0
Bosnia & Herz.	3,2	3,0	1,6	1,1	*	*	4,7	4,1
Tunesia	3,7	3,8	*	*	1,0	19,8	4,6	23,6
Korea(South)	3,0	6,5	*	*	1,5	2,5	4,6	9,0
Argentina	3,1	1,6	0,9	1,0	*	*	4,0	2,6
Chile	3,8	3,4	*	*	*	*	3,8	3,4
Kazakhstan	3,2	1,4	*	*	*	*	3,2	1,4
Belarus	3,0	2,6	*	*	*	*	3,0	2,6
other (< 3 mln.)	16,5	11,8	15,9	13,7	12,3	17,9	44,7	43,4
EU25_EXTRA	552,1	476,7	122,2	105,6	123,3	147,6	752,8	686,5

* =< 3 mln.

1.4 EU25 Apparent Consumption

The apparent consumption (defined as production plus imports minus exports) can only be calculated in monetary terms.

Table 1.7. Eurostat BOILERS APPARENT CONSUMPTION

	Boilers for central heating other than HS8402					
	1995	**2000**	**2001**	**2002**	**2003**	**2004**
Austria	116	110	79	73		
Belgium	85	79	70	81	102	114
Cyprus						
Czech Rep.			63	62	70	68
Denmark	19	31	40	26	36	44
Estonia			3		5	4
Finland	13	13	7	11	12	23
France	-60	661	591	655	690	713
Germany	639	248	367	305	268	315
Greece	20	25	19		27	39
Hungary			43	36	45	44
Ireland		28	49		35	46
Italy	344	641	815	842	987	1073
Latvia			6	5	8	7
Lithuania		7	9	10	12	13
Luxemburg			2			
Malta						
Netherlands	278	265	284	274	286	282
Poland				76	135	151
Portugal	9		6		-9	4
Slovakia		12				
Slovenia			12		12	
Spain	143	225	184	185	174	155
Sweden	-2	44	50	60		
UK	518	893	932	836	821	919
EU15			3692			
EU25					4128	4263

Table 1.7 shows the apparent consumption as can be calculated from the official Eurostat data and as required by contract. At the same time table 1.5 implicitly also shows the **very limited reliability of these data**, as some values are highly unlikely or just plain wrong (e.g. data on Germany). In the remainder of the study we will not use the above dataset, but instead refer to the sales data in the next chapter.

2 MARKET AND STOCK DATA

2.1 Introduction

Data on market and stock ("park") were supplied by BRG Consult ('BRGC'), acting as a subcontractor to VHK in the underlying study. An important source for the data was the wider market study that BRGC performed for the European Commission in the context of the revision of the Directive 92/42/EEC (Boiler Efficiency Directive - BED).[5] This comprehensive study addressed the complete heating system market, including several items that are not relevant for the underlying study, such as solid fuel boilers, district heating, local heating systems, etc.. We may include these issues here, if they are deemed relevant to position the gas/oil/electric boilers within complete picture, but in general we will restrict ourselves to gas/oil/electric central heating boilers.

BRGC is the leading market research consultant in the European boiler sector and has made available sales data and time series from a 20 year research experience. Much of the data is presented 'as is' with a reference to the above mentioned wider study. However, in some instances VHK may also expand to data from earlier studies, such as the 2001 SAVE study for the EU-15[6], to point out differences. The tables from the VHK stock model that was constructed in 2001 can be found in Annex A.

Especially in the field of collective systems and commercial boilers, a discussion of the consistency with ECCP data can be relevant. In the case of individual 'wet systems', the BRGC data cover around 99% of the market. Please note that whenever data and totals are discussed Malta, Cyprus and Luxembourg were not included, as BRGC did not have data for these countries. However, given these countries constitute less than 1% of the total and the use of central heating boilers in Cyprus and Malta is very low, the amount of error is deemed acceptable.

The stock data refers to types of boilers / heating systems in dwellings[7], the market data refers to unit sales only. BRGC data refer mainly to 1990 and 2004.

2.2 EU Boiler stock

2.2.1 Residential sector

On the basis of its time-series of sales data 1990-2004 BRGC has built a stock model. The stock model serves to produce a consistent overview of the central heating boilers installed in the reference years as required by contract. Furthermore, BRGC uses the stock model for the forecasts up to 2020.

From this stock model, BRGC reports a total EU-stock of dwellings –including primary secondary and vacant dwellings—of 207,7 mln. units in 2004. This is +16% higher than in 1990. The total stock of dwellings equipped with some form of central heating grew by +36%, from 119,7 mln. (1990) to 163,1 mln. (2004). The penetration of Central Heating rose from 67% (1990) to 79% (2004) of all heating systems. The fastest growth

[5] BRG Consult, The Boiler and Heating System Market in the European Union, Final Draft for the European Commission, Canterbury, June 2006.

[6] BRE, Heating Systems, SAVE study 2001. VHK was subcontractor for the technical analysis and the stock model. Note that amongst others also BRG Consult collaborated in some of the data for this stock model, but of course the sales data were available only for a period up to 1999-2000.

[7] Dwellings includes primary, secundary and vacant dwellings. Excludes commercial/tertiary sector premises

has come from individual wet central heating systems (+52% over 1990-2004), from 53% of dwellings with central heating in 1990 to 72% in 2004.

Within the individual central heating sector, most of the growth has come from gas-fired systems whose share increased from 57% in 1990 to 79% in 2004. Of these gas-fired systems, 75% was wall-hung in 2004. Of the 70 mln. individual gas boilers in use in 2004, only 6,8 mln. (<10%) were condensing models (including floor standing).

Apart from individual wet systems, some 10% of the dwelling stock is connected to district heating, 15% is on collective heating and 7% is on dry electric or gas heaters (local heating).

Table 2-1. EU Domestic Heating STOCK, in '000 dwellings (source: BRG Consult 2006)

STOCK	1990			2004		
	'000	%	%	'000	%	%
Individual wet system						
GAS Wall Hung non-condens.	21780	34%		46198	47%	
GAS Wall Hung condensing	346	1%		6519	7%	
GAS Floor Standing	12943	20%		14971	15%	
GAS Jet Burner	1614	3%		2651	3%	
OIL Jet Burner	17510	27%		19361	20%	
ELECTRIC CH boilers	937	1%		1115	1%	
HEAT PUMP CH boilers	129	0%		928	1%	
SOLID fuel boilers	8864	14%		6202	6%	
Individual wet systems (total)	64123	100%	36%	97945	100%	47%
District	18571		10%	21003		10%
Collective	25704		14%	30425		15%
Ind. dry gas/electric	11300		6%	13715		7%
No CH (local heating + no heating)	60100		33%	44640		21%
total dwellings	179798		100%	207728		100%
Of which total 'wet' (ind.+DH+coll.)	108398		60%	149373		72%

Comparing the BRGC data with the 2001 SAVE study is not easy, because

- the SAVE study starts from the number of households (not dwellings). The number of EU-25 households in 2004 is around 185 mln. and the number of dwellings 207 mln., meaning that there are around 20 mln. secondary and vacation homes (10% difference) not taken into account in the SAVE study. Commercially it makes more sense to follow the BRGC approach, whereas energetically (SAVE study) it makes sense to look only at the primary homes that will be used during the heating season.
- the SAVE study relates to the EU15 (not EU25). The number of EU15-households in 2004 is around 155 mln. and in the EU25 it is around 185 mln (20% more).
- It uses other reference years (1995, 2005 instead of 1990, 2004). The number of households in 1990 is around 140 mln. versus 145 mln. in 1995.

As a consequence, e.g. the share of 'no central heating' in the BRGC study is somewhat higher, because BRGC includes holiday homes and the new EU member states with a relatively higher share of no heating or only local heaters. The SAVE study finds 9% of fossil-fuel fired local heating (4% gas, 2% oil, 3% solid fuel) and 0-2% no heating in 2004, totalling 11% vs. 21% in the BRGC study.

The higher share of district heating in the BRGC data (10% vs. SAVE 7%) is a consequence of the accession of the Eastern European new Member States.

Table 2-2. Residential Space Heating EU-15, Stock of Heat Generators according to SAVE 2002 study

Assessment on the basis of households (1995: 145 mln.; 2005: 155 mln. In EU-15)

	local heaters		CH individual		CH collective		Total	
	1995	2005	1995	2005	1995	2005	1995	2005
gas	6%	4%	28%	40%	10%	15%	44%	59%
oil	2%	2%	12%	12%	8%	6%	22%	20%
solid-fuel	6%	3%	2%	2%	0%	0%	8%	5%
electric							14%	8%
district heat							7%	7%
misc.							2%	1%
none							3%	1%
Total	**14%**	**9%**	**42%**	**54%**	**18%**	**21%**	**100%**	**100%**

The stock 1995 was assessed by VHK on the basis of misc. sources (amongst others BRGC data);
The 2005 stock data were a forecast by VHK in 2001 on the basis of a VHK linear stock model.

Another difference is a higher share of collective heating systems in the SAVE study: 15% with BRGC and 21% (7 mln. units) with SAVE. Here, the SAVE study may have underestimated the number of apartment buildings with individual wet systems, resulting in a higher figure. The share of centrally controlled dry electric heating systems (fixed electric convectors, radiation panels, underfloor heating, etc.) is similar in the BRGC and SAVE study, estimating a 7% share.

In short, especially for wet systems, there seems to be a fair amount of consistency. BRGC found a total of 97 mln. installed individual central heating systems for the EU25, whereas the SAVE study made a forecast of 78 mln. for EU15. Considering that with the new accession countries the EU population expanded by around 20%, this makes the figure of 97 mln. individual 'wet' CH systems in the EU25 fairly robust (incl. solid fuel CH boilers). Also the split-up by fuel type for this category is consistent, with 72-74% gas, 18-20% oil and 5-6% solid fuel. Without the solid fuel CH boilers, which are outside our scope, around **90 mln. individual gas- and oil-fired CH boilers** are installed. As will be shown in the next paragraph, the average capacity per individual boiler is around 24 kW.

For **residential collective 'wet' CH systems** —correcting the SAVE data with the lower BRGC estimate— some **5-6 mln. units** can be estimated. According to the SAVE study one collective boiler will have been dimensioned to serve almost 5 apartments and therefore will have a capacity of on average close to 100 kW. Most of these will be floor standing models and –more recently— wall hung cascade configurations.

2.2.2 Non-residential sector

Assessment of the number of non-residential boilers is extremely difficult. Both the BRGC and the SAVE data are reported to relate to the residential sector, but at the same time BRGC admits that 8% (0,5 mln.) of its 'residential' boiler sales may actually be sales to the non-residential sector (see paragraph on sales. The non-residential sector (tertiary and industry) is highly heterogeneous and it is almost impossible to make an assessment at the point-of-sales whether a customer is residential or non-residential. So for sure we believe that a fraction of the residential sales data may be 'contaminated' with non-residential sales, e.g. to small offices, shops, bars, etc.. To make matters worse, many of these smaller enterprises are sharing the heating boiler, not only with each other (e.g. in an office building) but also with residential customers (e.g. shop or bar in the ground floor of an apartment building). Finally, EU-wide surveys of the

sector including heating system were not found. In the rest of this paragraph we will give the information that has led to a first rough estimate

Space heating energy

In the 2003 ECCP report a baseline scenario of 214 Mt CO_2 emissions was given for the tertiary sector in 2010. This estimate was based on anecdotal evidence from some countries. An important source was ECN, who published a survey on the heating use in the Dutch tertiary sector. This survey gives some background as to the subdivision of this energy use (see table below).

The heating energy is not representative of the number of boilers installed, but the table at least gives an overview of the sectors involved. The industry (ECCP 2010 baseline 75 Mt CO_2) is not included in this overview.

Table 2-3. Split up fossil-fuel based space heating energy tertiary sector (% of total energy (source ECN 1999 for NL)

Retail & Repair	11,5%	Hospitals	6,9%
Trade and repair cars	4,5%	Homes for disabled	1,7%
Wholesale	10,9%	Homes for elderly	3,9%
Hotels, Restaurants, cafés	11,0%	Other health care	4,7%
Transport, storage, communication	6,3%	Cultural buildings	1,5%
Financial institutions	1,6%	Sports and recreation	4,0%
Rentals and business services	7,8%	Other services	5,7%
Public administration	8,5%		
Education	9,3%	Total tertiary sector NL	100%

Source:Energieverbruik van gebouwgebonden energiefuncties in woningen en utiliteitsgebouwen, ECN, Nov. 1999. Data relate to fossil fuel for heating

Number of enterprises

Another angle is the number of enterprises. In the EU-15 there are around 19 mln. enterprises (see table below). According to EIM the new EU-10 countries, which have a much higher density of especially retail outlets than the EU-15, will add another 5,8 mln. enterprises, bringing the EU-total to over 25 mln..

Table 2-4. Number of enterprises x 1000 by country and type EU15, 2000 (source: EIM, 2002)

	ex-traction	manu-facturing	con-struction	whole-sale trade	retail distri-bution	transport, commu-nication	producer services	personal services	Total EU-15	EU-25	Total EU-25
Austria	1	26	17	19	42	12	37	72	226		
Belgium	0	47	71	65	133	19	103	104	543		
Denmark	4	22	25	21	40	10	36	22	179		
Finland	2	26	27	18	34	26	42	36	212		
France	5	230	315	142	465	103	608	622	2489		
Germany	11	311	342	250	612	148	903	971	3548		
Greece	2	31	113	84	395	39	51	83	798		
Ireland	1	8	17	5	20	5	19	18	93		
Italy	7	599	487	382	885	187	856	721	4125		
Luxembourg	0	1	2	3	3	1	6	5	22		
Netherlands	0	45	50	53	104	33	137	132	553		
Portugal	3	91	106	62	225	23	69	104	683		
Spain	6	261	293	207	655	256	503	517	2698		
Sweden	1	28	26	31	44	17	97	25	271		
UK	6	330	771	147	424	219	879	713	3490		
EU-15	49	2 055	2 663	1 488	4 082	1 099	4 347	4 145	19 928	5 800	25 729
of which											
micro	39	1676	2470	1359	3929	1022	4141	3933	18 569	5 540	24 109
small	8	302	176	113	139	65	167	190	1 160	205	1 365
medium	2	61	16	14	11	10	29	18	161	45	206
large	1	16	2	2	3	2	10	3	39	10	49

source: http://www.eim.nl/observatory_7_and_8/en/stats.html (EIM, Business & Policy research, Observatory of European SMEs)

Around 8% of the EU-15 (2,1 mln.) can be qualified as 'industry' (75 Mt CO_2 emissions, at around 65-70 kg CO_2/GJ this is equivalent to 70 mln. TJ). For the 2,47 mln. 'micro' construction enterprises the space heating requirement will be limited. Furthermore, many of the retail shops and personal services (8 mln. total) will have their heating boiler shared with the residential sector. If this share is 50% than this would amount to 4 mln., thus leaving a total of 11 mln. enterprises (not establishments and certainly not buildings) in the EU-15 that own or share a non-residential heating boiler (14 mln. in the EU-25).

The amount of boiler-sharing is of course difficult to assess. In 1999 the US DoE has made an energy survey of commercial buildings, showing that on average an office building occupied 2,6 establishments.[8] If we use this factor for the data above, this would mean that the 14 mln. EU-25 enterprise occupied around 5-6 mln. buildings with a strictly commercial use. Usually there will be 1 or 2 boilers per building, meaning that 5 to 10 mln. boilers are installed.

It is useful to check whether this would make sense in terms of energy use and boiler capacity.

[8] http://www.eia.doe.gov/emeu/cbecs/pba99/office/officebasictables.html

The average size of the building was around 450 m² At an average space heating requirement of 700-1000 MJ/m² this would amount to 300 -400 GJ/building. At around 70 kg CO_2/GJ [9] this is 21-28 t CO_2 per building. With the CO_2-emissions of 214 Mt this results in 9-13-mln. buildings. The 300-400 GJ amounts to 83 – 11 MWh. With a heating season of 5000 hours this is 17-22 kW on average. Given that the boiler is sized for a utilisation rate of 15-20% this leads to an average boiler capacity of 80-130 kW. This is not inconsistent with the average boiler capacity found in the RT 2000 database (see table below) or the commercial boiler data presented in the next paragraph.

Table 2-5. Distribution of boilers by power class in RT2000 database (source: VHK 2006)

gas wall hung		gas floorstanding		oil-fired	
kW class	%	kW class	%	kW class	%
8-16	2,4%				
17-25	67,2%				
26-32	17,9%	<30	40,0%	<35	52,1%
33-70	10,1%	31-70	30,1%	35-50	14,9%
				51-70	4,3%
71-400	1,7%	71-400	23,3%	71-120	2,7%
				121-400	10,2%
>400	0,7%	>400	6,6%	401-2000	11,5%
				>2000	4,3%
avg kW	32 kW	avg kW	106 kW	avg kW	274 kW
avg kW >32	96 kW	avg. kW>30	161 kW	avg. kW>35	547 kW

source: VHK analysis of rt2000 database France, 2006. Population wall hung n=296, gas floorstanding n=425, oil-fired n=698

averages calculated with ca. 24 kW for lowest class and class limit for highest class

From the above we can make a **rough estimate** that –excluding the boilers shared with the residential sector— the number of installed **non-residential boilers** in the EU25 will amount to around **8 million units** (incl. 1 mln. boilers in the industrial industrial) with an average capacity of around 100 kW. The accuracy of these figures is believed to be no higher than ± 20%.

2.3 EU Boiler Market

2.3.1 Total EU

The table below shows BRGC sales data for 1990 and 2004. The total size of the market calculated by BRGC corresponds closely to what could be calculated on basis of Eurostat figure: Eurostat market EU25 2004: 6.6 million boilers, BRGC market EU22 2004: almost 7 million boilers. The 2002 SAVE study made a forecast of 6 mln. boilers sold in the EU-15 in 2005. BRGC estimates the total boiler market to be worth around € 5,8 mln. in manufacturer selling prices.

[9] value from VHK, MEEUP Methodology Report, 2005

Table 2-6. EU Domestic Heating SALES ('000 units)

SALES	1990		2004	
	'000	%	'000	%
Individual wet system				
GAS Wall Hung non-condens.	2275	47.7%	3731	53.4%
GAS Wall Hung cast iron	227	4.8%	255	3.6%
GAS Wall Hung condensing	67	1.4%	1296	18.5%
GAS Floor Standing	949	19.9%	434	6.2%
GAS/OIL Jet Burner	900	18.9%	880	12.6%
ELECTRIC CH boilers	36	0.8%	39	0.6%
HEAT PUMP CH boilers	23	0.5%	119	1.7%
SOLID fuel boilers	288	6%	237	3.4%
Individual wet systems (total)	4765	100%	6989	100%

The boiler market is mainly a replacement market. According to BRGC replacement sales is accounting for around 60% and new housing accounting for only 22%. First time installations (14,3%) refer to situations where the owner previously had a different heating system (e.g. local heaters or no heating). Sales to non-residential customers are estimated at around 260 000 units (3,8%).

Table 2-7a. Sales by end-use segment, EU year 2004 (source: BRGC)

Product	Total sales	New housing	First time install.	Replacement	Non housing	Total	New housing	First time install.	Replacement	Non housing
	'000	'000	'000	'000	'000	%	%	%	%	%
Wall Hung Gas Non Cond	3985	924,1	580,0	2428,7	52,0	*100,0%*	*23,2%*	*14,6%*	*60,9%*	*1,3%*
Wall Hung Gas Cond	1296	327,7	177,9	739,6	50,9	*100,0%*	*25,3%*	*13,7%*	*57,1%*	*3,9%*
Gas Floor Standing (excl. JB)	424	54,3	47,1	279,9	42,4	*100,0%*	*12,8%*	*11,1%*	*66,1%*	*10,0%*
Jet Burner Boilers	890	139,3	111,2	546,6	93,3	*100,0%*	*15,6%*	*12,5%*	*61,4%*	*10,5%*
Solid Fuel	237	43,1	30,5	147,0	16,1	*100,0%*	*18,2%*	*12,9%*	*62,1%*	*6,8%*
Electric	39	4,1	7,6	26,5	0,4	*100,0%*	*10,6%*	*19,6%*	*68,7%*	*1,1%*
Heat Pumps	118	44,4	48,4	18,0	7,3	*100,0%*	*37,6%*	*41,0%*	*15,2%*	*6,2%*
Total	6989	1537	1003	4186	262	*100,0%*	*22,0%*	*14,3%*	*59,9%*	*3,8%*

In the long run, manufacturer MTS estimates the share of replacement sales to increase even further up to a level close to 80% (with new housing 15% and first-time installation 5%) Tables below were composed by MTS from elaborations of BRGC and Euroconstruct data.

Table 2-7b . MTS estimate of market sales split 2004-2006 (elaboration of BRGC data)

Year	Total Sales	New Housing	%	1st Time Installation	%	Replacement and Non Housing	%
2004	6.949.300	1.511.600	22%	995.700	14%	4.442.000	64%
2005	6.993.800	1.527.800	22%	861.000	12%	4.605.000	66%
2006	7.315.000	1.599.000	22%	766.000	10%	4.950.000	68%

Table 2-7c . MTS estimate of housing trends 2004-2009, based on Euroconstruct 2006 data

Country	2004	2005	2006	2007	2008	2009	CAGR 06-09
EU Residential Stocks of dwellings	202.103	204.120	206.216	208.442	210.702	212.893	1%

Residential New start of dwellings	2.009	2.138	2.288	2.229	2.096	2.079	-3%
Residential New completions of dwellings	2.243	2.328	2.497	2.583	2.493	2.419	-1%

The table below gives the technical segmentation by main boiler characteristics.

Table 2-8. EU BOILER MARKET: TECHNICAL SEGMENTATION 2004 (source: BRGC 2006)

Product characteristics		WALL HUNG GAS			FLOOR STANDING GAS *			JET BURNER	
		'000 pieces	%		'000 pieces	%		'000 pieces	%
Total		5 281	100,0%		423	100,0%		891	100,0%
Condensing	No	3 985	75,5%		371	87,6%		857	96,2%
	Yes	1 296	24,5%		53	12,4%		34	3,8%
	Non-combis / Heating only:								
Hot water production	- with built-in cylinder				66	15,6%		239	26,8%
	- with external cylinder	801	15,2%		136	32,1%		363	40,7%
	- without cylinder	295	5,6%		171	40,5%		276	31,0%
	Mounted on fs cylinder	65	1,2%						
	Combis:				44	10,4%			
	- conventional/pre-heat	3 612	68,4%						
	- storage	507	9,6%						
Heat exchanger	copper	3 159	59,8%		22	5,1%		-	-
	steel***	884	16,7%		97	23,0%		495	55,6%
	aluminium	951	18,0%		15	3,5%		-	-
	cast iron	270	5,1%		283	67,0%		383	43,0%
Output (kW)	8-15	564	10,7%	<30	224	53,0%	<35	422	47,3%
	16-25	3 810	71,9%	30-<70	138	32,7%	35-<50	281	31,5%
	26+	904	17,1%	70+	55	12,9%	50-<70	108	12,2%
							70-<120	33	3,8%
							120+	34	3,8%
Burner type	conventional	3 668	69,5%		253	59,8%			
	fan assisted premix	1 353	25,6%		59	14,0%			
	other low NO_x	243	4,6%		105	24,8%			
Flue type	open	1 232	23,3%		305	72,1%		627	70,4%
	room sealed	4 033	76,4%		112	26,5%		251	28,2%
Ignition type	pilot	293	5,5%		100	23,6%			
	electronic	4 972	94,2%		317	75,0%			
Fuel type	natural gas	5 047	95,6%		403	95,2%	oil/gas**	251	28,1%
	LPG	218	4,1%		14	3,3%	oil	518	58,1%
							gas	110	12,3%

* Excluding Jet Burner Boilers

**=inc.bifuel

***= for jet burners 'steel/mixed'

NB: segmentation does not always cover 100% of sales, as data is not always available for a number of countries (Estonia, Latvia, Lithuania, Greece, Hungary, Slovakia, Slovenia)

BRGC estimates that for gas-fired wall hung boilers 10,7% have outputs <15 kW. Sales are concentrated in the 16-25 kW range (average 22 kW). Some 24,5% of sales are condensing units. The overwhelming majority of wall hung boilers (>94%) are sold as dual purpose appliances (space heating and hot water) with 79% being 'combis' and some 15% with external cylinders. Of the 5,6% that are neither combis nor sold with a

hot water cylinder, it is likely that some will be replacement boilers that will be fitted to existing indirect cylinders. Copper heat exchangers account for the majority of sales, typically associated with non-condensing models sold in Italy, UK, France and Spain. Most condensing models have (stainless) steel or aluminium heat exchangers. Fanned room-sealed systems (Type C) account for 73% of sales. However, in Germany (50%) and France (43%) open flues –typically associated with dedicated boiler rooms- retain a substantial share. In Italy and Spain the share is 22-23%. Pilot flame ignition has almost disappeared (94% are electric). BRGC estimates a 4% market share for LPG-fired boilers, with non gasified areas in Italy, Spain, France, UK and Portugal accounting for 90% of demand.

Floor standing gas boilers can be found both in the residential and the non residential market. 54% of sales are <30 kW, 30% are in the 30-70 kW range and finally 13% have outputs above 70 kW. The condensing penetration stays much lower than for wall-hung. For 2004 BRGC reports the sales of 55000 condensing models representing 12,7% of the market. By 2006, mainly due to legislation in the UK, this should have risen to 82000 (26%). The BRGC analysis shows that around 60% of floor standing gas boilers were sold with a sanitary hot water facility. Around 10% were 'combis' (BRGC definition) and 48% were sold with a cylinder: 16% with a built-in cylinder (including tank-in-tank and bain marie models) and 32% with an external cylinder.

Jet burner boilers (mostly oil-fired) are usually sited in dwellings or buildings which have a cellar or other area not frequented by occupants. Thus they are generally associated with larger properties. Just under half fall within the "normal" range for individual central heating (<35 kW), and a substantial proportion (44%) are in the intermediate range of 35-70 kW. 3,8 % are over 70 kW. In contrast to the gas boilers there is a substantial business in replacement burners. For 2004 BRGC reported sales of 0,64 mln. burners, of which 0,25 mln. for new boilers and 0,39 mln. for replacement. According to BRGC the majority of jet burners use open combustion systems (type B) but with a fan (e.g. type B23). Penetration of condensing technology in this segment is estimated to be low (2,4%): some 21000 units of which 20000 in Germany. Some 70% of jet burner boilers are sold with a cylinder (26,5% built-in and 41% external). As with the other boiler categories, many of the boilers sold without a cylinder may be fitted with to an existing cylinder.

2.3.2 Non-residential boilers

The sales figures presented include boilers that are applied in collective or commercial settings. Separating these **collective residential boilers** and **non-residential boilers** from boilers applied in individual dwellings is difficult, and made more so by the variety of definitions and thresholds adopted by different countries. BRGC estimates that less than **0.5 million boilers** at least overlap with commercial/collective categories.

In terms of consistency with the stock data presented in the previous paragraph, this figures makes sense. At a product life of 30 years the 6 mln. stock of collective residential boilers would result in replacement sales of around 200 000 units. The 8 mln boilers in the non-residential sector would result in replacement sales of around 260 000 units.

Table 2-9. EU Collective & Commercial Boiler Market 2004 - SEGMENTATION BY OUTPUT in '000 units (source BRGC 2006)

	Floor Standing Atmospheric Gas Boilers				Jet Burner Boilers			Total
Austria	31-60 kW	61-350 kW	>350 kW		31-60 kW	61-350 kW	>350 kW	
	1,0	0,3	0,1		3,4	0,5	0,3	5,6
Belgium	35-70 kW	>70-150 kW	>150-500 kW	>500 kW	35-60 kW	>60 kW		
	7,0	1,3	1,1	0,0	15,0	4,5		28,9
CzechRep.	30-49 kW	50-60 kW			31-60 kW	61-350 kW	>350 kW	
	2,4	1,2			0,1	0,6	0,3	4,6
Denmark	30-<70 kW				35-70 kW	>70 kW		
	0,4				0,5	0,4		1,3
Estonia								
Finland								
France	31-70 kW	>70-<180 kW	180+ kW		31-70 kW	>70-<180 kW	180+ kW	
	11,8	3,1	0,8		23,5	5,9	5,7	50,8
Germany	26-50 kW	>50 kW			26-50 kW	>50-120 kW	>120 kW	
	18,9	15,6			57,5	11,2	15,9	119,1
Greece					31-70 kW	>70-180 kW	>180 kW	
					23,1	11,8	5,2	40,1
Hungary	26+ kW				26-49 kW	50-<120 kW	120+ kW	
	7,9				7,9	8,3	1,1	25,2
Ireland	>24 kW				>27 kW			
	0,1				11,8			
Italy	>35-50 kW	>50 kW			>35-50 kW	>50-110 kW	>110 kW	
	2,4	3,6			6,0	8,1	11,5	31,6
Latvia								
Lithuania								
Netherlands	>30-60 kW	>60-120 kW	>120-250 kW	>250 kW	>60-120 kW	>120-250 kW	>250 kW	
	1,2	0,9	1,5	2,5	0,3	0,4	0,1	6,9
Poland	35->150 kW	>150 kW			<50 kW	50-200 kW	>200 kW	
	5,3	0,3			13,6	2,6	0,8	22,6
Portugal	30-70 kW	>70 kW			30-70 kW	>70-180 kW	>180 kW	
	0,5	0,5			10,8	1,0	0,3	13,1
Slovakia	>30-60 kW	>60-350 kW	>350 kW					
	3,6	1,6	0,2					
Slovenia								
Spain	>25-<50 kW	50+ kW			>25-50 kW	>50-120 kW	>120 kW	
	3,8	3,0			69,6	4,0	2,1	82,5
Sweden	>50 kW				30-50 kW	>50 kW		
	0,5				1,7	1,0		3,2
UK	>44 kW				>44 kW			
	9,0				13,0			22,0
TOTAL EU*								457,5

NB: does not include Cyprus, Luxembourg and Malta

The Table 2-10 below is an attempt to harmonised the capacity classes in the previous table in order to arrive at a very rough estimate of EU averages. The weighted average power output for collective and commercial boilers is found to be close to 100 kW.

Table 2-10. EU Collective & Commercial Boiler Market 2004 - SEGMENTATION BY OUTPUT in '000 units WITH HARMONISED CAPACITY CLASSES (VHK assessment on basis of BRGC, 2006)

	Floor Standing Gas Boilers				Total fs	Jet Burner Boilers			Total jet	Total
output class in kW	30-70	70-120	120-350	>350		30-60	60-120	120+		
Austria	1,0	0,2	0,15	0,1	1,4	3,4	0,4	0,4	4,2	5,6
Belgium	7,0	1,1	1,3	0,2	9,6	15,0	2,5	2,0	19,5	29,1
Czech Rep.	3,6				3,6	0,1	0,5	0,5	1,0	4,6
Denmark	0,3	0,1			0,4	0,5	0,2	0,2	0,9	1,3
Estonia									0,0	0,0
Finland									0,0	0,0
France	11,8	2,0	1,0	1,0	15,7	23,5	5,0	6,6	35,1	50,8
Germany	18,9	5,6	5,0	5,0	34,5	57,5	11,2	15,9	84,6	119,1
Greece					0,0	23,1	11,8	5,2	40,1	40,1
Hungary	7,9	2,6	1,1	0,2	11,8					11,8
Ireland	0,1	0,0	0,0	0,0	0,1	7,9	2,6	1,3	11,8	11,9
Italy	2,4	1,2	1,2	1,2	6,0	6,0	8,1	11,5	25,6	31,6
Latvia									0,0	0,0
Lithuania									0,0	0,0
Netherlands	1,2	0,9	1,5	2,5	6,1		0,4	0,6	0,9	7,0
Poland	5,3	1,4	1,5	1,5	9,7	6,8	2,6	0,8	10,2	19,9
Portugal	0,5	0,1	0,2	0,2	1,0	10,8	0,8	0,5	12,1	13,1
Slovakia	3,6	0,8	0,8	0,2	5,4				0,0	5,4
Slovenia									0,0	0,0
Spain	3,8	1,0	1,0	1,0	6,8	69,6	4,0	2,1	75,7	82,5
Sweden	0,1	0,3	0,1	0,1	0,6	1,7	0,7	0,3	2,7	3,3
UK (>44 kW)	6,9	1,2	1,0	0,0	9,1	7,8	4,0	2,2	14,0	23,1
TOTAL EU*	67,5	17,3	14,8	13,1	112,7	233,7	54,7	50,0	338,4	460
avg. kW	50	85	235	400	120	45	90	320	93	98
mln. kW	3,4	1,5	3,5	5,3	13,6	10,5	4,9	16,0	31,4	45

* = NB: does not include Cyprus, Luxembourg and Malta

Table 2-11 then gives a 45/55 split up between collective and non-residential boilers and adds the individual residential market (single homes) to complete the overview. Please note that the accuracy of these assessments should not be overrated (± 20%), as it is the first time in a policy study that enough background information is available to attempt to make such a detailed segmentation at all.

Table 2-11. EU 2004 Boiler Market, segmented by sector, application, boiler type and capacity (VHK assessment on the basis of BRGC data 2006)

SECTOR	RESIDENTIAL (incl. boilers shared with small non-residential)											NON-RESIDENTIAL			TOTAL
APPLICATION	INDIVIDUAL							COLLECTIVE			TOTAL			TOTAL	
TYPE	gas wh				gas fs	oil jet	total Indiv.	gas fs	oil jet	total Coll.		gas fs	oil jet		
Output in kW	8-15	16-25	26+	tot wh	< 35	< 30		> 35	> 30			> 35	>.30		
Austria	*4*	*23*	*17*	44	4	9	57	1	2	3	59	1	2	8	67
Belgium	*8*	*61*	*36*	105	17	22	144	4	9	13	157	5	11	13	170
Czech Rep.	*12*	*12*	*61*	85	8	0	93	2	0	2	95	2	1	1	96
Denmark	*17*	*2*	*2*	21	0	5	25	0	0	1	26	0	0	0	26
Estonia	–	–	–	2	0	1	3	0	0	0	3	0	0	0	3
Finalnd	–	–	–			12	12	0	0	0	12	0	0	9	21
France	–	*430*	*107*	537	64	153	754	7	16	23	777	9	19	38	815
Germany	*72*	*359*	*64*	495	46	117	658	16	38	54	711	19	47	47	758
Greece	*0*	*8*	*3*	12	1	27	39	0	18	18	57	0	22	29	86
Hungary	*9*	*69*	*8*	86	8	1	95	5	0	5	101	6	0	0	101
Ireland	*20*	*35*	*3*	58	2	35	96	0	5	5	101	0	6	10	111
Italy	*1*	*1084*	*145*	1230	59	21	1310	3	12	14	1324	3	14	14	1338
Latvia	–	–	–	6	1	1	7	0	0	0	7	0	0	0	7
Lithuania	–	–	–	8	3	1	12	0	0	0	12	0	0	3	15
Netherlands	*210*	*153*	*44*	408	2	0	410	3	0	3	413	3	0	6	419
Poland	*2*	*114*	*11*	126	8	7	141	4	5	9	150	5	6	6	157
Portugal	–	*30*	*3*	33	0	4	37	0	5	6	43	1	7	10	53
Slovakia	*2*	*6*	*18*	26	13	0	39	2	0	2	42	3	0	0	42
Slovenia	*1*	*6*	*1*	8	1	10	18	0	0	0	18	0	0	4	22
Spain	*3*	*371*	*64*	438	1	24	463	3	34	37	500	4	42	42	542
Sweden	*0*	*1*	–	1	0	0	1	0	1	1	3	0	1	6	9
UK (>44 kW)	*203*	*1044*	*318*	1565	59	92	1715	4	6	10	1726	5	8	75	1801
EU	*564*	*3810*	*904*	5295	296	541	6132	51	152	203	6335	67	186	253	6588
avg. kW	*12*	*22*	*29*	22,1	22	22	22,1	120	93	100	25	120	93	100	27
mln. kW	*6,8*	*83,8*	*26,2*	116,8	6,5	11,9	135,2	6,1	14,2	20,2	155	8,0	17,3	25,3	181

2.3.3 Country tables

The tables in Annex A give the sales and technical segmentation for the whole of the EU per country. BRGC identifies the UK as the largest EU-market in 2004, with 1,7 mln. unit sales (25%), followed by Italy (1,36 mln. units; 19,5 %), France (0,83 mln.; 11,9%) and Germany (0,81 mln.; 11,6%). The boiler sales are thus not in line with population. BRGC sees the main reason in the different shares of individual, collective, district heating and local (room) heating per country. Also specific local circumstances, such as the dramatic situation in the German construction industry in 2004 will have their effect (see further paragraph on market trends).

Table 2-12. Boiler Sales EU per country, 1990 and 2004 (BRGC 2006)

	1990 '000	2004 '000
Austria	97	84
Belgium	107	175
Czech R.	63	148
Denmark	17	34
Estonia	1	5
Finland	12	19
France	541	834
Germany	828	810
Greece	62	80
Hungary	127	111
Ireland	46	113
Italy	1114	1360
Latvia	3	13
Lithuania	5	22
Netherlands	292	420
Poland	137	237
Portugal	5	50
Slovakia	27	60
Slovenia	20	27
Spain	260	546
Sweden	68	81
UK	935	1762
Total EU	4765	6989

2.4 Forecasts and Market Trends

2.4.1 Forecasts

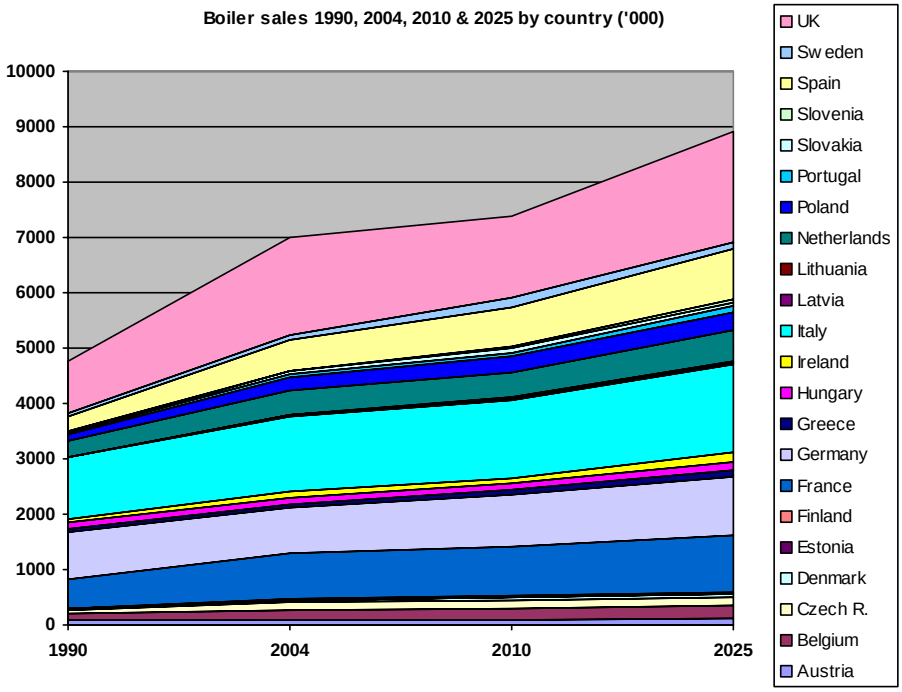
Based on its stock model incorporating time series of sales data from 1990 onwards, BRG Consult has made a forecast of the sales for the years 2010 and 2025. The table and figure below show the unit sales for the reference years 1990, 2004, 2010 and 2025.

Between 2004 and 2010 BRGC expects a modest sales growth of 5,5% (1% annual sales growth rate), with total sales of 7,37 mln. in 2010. For the period 2010-2025 a growth of 20% is expected, which amounts to an annual increase of 1,2 %.

Table 2-13. Sales outlook 1990-2005-2010-2025

	1990 '000	2004/'05 '000	2010 '000	2025 '000
Austria	97	84	98	110
Belgium	107	175	199	230
Czech R.	63	148	158	160
Denmark	17	34	46	55
Estonia	1	5	11	13
Finland	12	19	23	25
France	541	834	882	1020
Germany	828	810	929	1050
Greece	62	80	104	133
Hungary	127	111	95	150
Ireland	46	113	110	160
Italy	1114	1360	1403	1600
Latvia	3	13	18	25
Lithuania	5	22	28	30
Netherlands	292	420	457	550
Poland	137	237	301	350
Portugal	5	50	59	100
Slovakia	27	60	67	70
Slovenia	20	27	31	40
Spain	260	546	723	930
Sweden	68	81	182	100
UK	935	1762	1450	2000
Total EU	4765	6989	7374	8900

Figure 2-1. Sales forecast 2005-2010-2025



With new construction projected to be stable at an average long term level, and the potential for first time installations necessarily declining, as penetration of central heating approaches saturation, this growth is expected to come mostly from an increasing demand for replacement. This can be seen as resulting from several factors:

- Considerable growth in most EU boiler markets in the last 10-20 years, largely driven by first time installation, or displacement of central heating by individual installation. This section of the park is now gradually coming up for replacement;
- The trend towards wall hung boilers and away from floor standing (or from old cast iron models in the UK/Ireland) in several European markets, means that a growing proportion of the park has a shorter average life, thus requiring replacing more frequently. It is also generally considered that more technologically advanced boilers now on the market may have a shorter life than simpler models;
- Improvement in the living conditions in new accession member states from Eastern Europe, where still a considerable stock of old solid fuel or oil boilers will eventually need replacing.

Negative impacts on growth can be expected from:

- Approach of central heating saturation and a slowing of first time installation demand;
- A continuing expansion of district heating;
- A worsening of economic performance of EU member states;
- Any eventual appearance of heating systems with longer life, which will need replacing less often.

As regards the product mix, under "a business as usual" scenario:

- The trend towards wall hung boilers is expected to continue in the long term, and within that a marked shift towards condensing boilers, even without the introduction of additional legislation;
- The share of floor standing boilers (including and jet burner) is expected to fall, and a similar trend towards condensing is likely to continue;
- Solid fuel boilers have experienced a "revival" over the last few years, and all else equal it is reasonable to expect that this growth will continue to some extent, although a "natural ceiling" to the penetration of this type of boilers is posed by the cumbersome requirements in terms of storage and fuel supply;
- Electric boilers are expected to maintain their marginal position, and their future is particularly related to overall energy policy decisions;
- Sales of heat pumps are expected to grow, although the pace of this growth is very difficult to evaluate. It is possible that the forecast presented could be rather conservative.

In its report BRGC gives also an overview of the market trends in 2005 per country. A summary of these trends per country is given in the table below.

Table 2-14. The market in 2005

Country	Market trends 2005	Explained
Austria	- 0.8%	Wall hung gas growth, floor standing gas + oil decline
Belgium	+ 6.5%	All growth from wall hung gas
Czech R.	- 1%	Decline for all categories except solid fuel
Denmark	+ 12%	Most of growth in solid fuel (pellet) boilers
Estonia	++ 27%	Mostly wall hung gas boilers and solid fuel boilers
Finland	+ 3.6%	Growth almost entirely heat pumps
France	-/+	Strong growth in wall hung gas, strong decline in oil boilers, growth for solid, heat pumps and dry electric.
Germany	- 10%	Decline in all categories except heat pumps and solid fuel
Greece	+ 4.4%	Growth entirely in wall hung gas
Hungary	- 8%	Decline in all sectors except solid fuel
Ireland	+ 4.9%	For both wall hung gas and oil boilers
Italy	+ 2.5%	Growth mostly from wall hung gas
Latvia	+ 7%	Growth mostly from wall hung gas
Lithuania	+ 9%	Growth in wall hung as and solid fuel
Netherlands	+ 5.3%	Mainly replacement of wall hung gas
Poland	+ 1%	Growth in solid fuel, decline in gas/oil (even wall hung gas)
Portugal	+ 3%	Mainly jet burner boilers in non-gasified areas
Slovakia	+ 2.3%	Growth in wall hung gas and solid fuel (pellet) boilers
Slovenia	+ 2%	Mainly wall hung gas and some solid fuel
Spain	+ 8.3%	Mainly wall hung gas in new housing
Sweden	+ 20%	Mainly electric heat pumps, electric immersion and solid fuel boilers
UK	- 4%	Decline in cast iron, floor standing and back boilers

Market and product trends

In its report to the European Commission BRG Consult gives an overview of the market and product trends from a commercial perspective. Below we will give a summary of their findings

Overall EU market trends in sales (BRGC)

In terms of market shares by boiler category, the key trends to note are:

- The growth in the share of wall hung boilers up to 2004/05. BRG CONSULT's forecasts have this share steady up to 2010 (as biomass and heat pumps will take most of the growth), then increase again.
- The growth in the share of condensing boilers, especially wall hung. With the revision of the Building Regulation Part L in the UK in 2005 (plus natural trends in other markets) the condensing share of wall hung has risen from 14% in 2004 to 37.6% in 2005 (with the UK accounting for 52% of all EU wall hung condensing sales). By 2010 without any major new official initiative (eg from Legge 192 or RT 2005), but also assuming that existing initiatives will stay in place or run their course, the condensing share is forecast to be 54% in 2010. By that time Italy, France and Spain are expected to account for 75% of all non-condensing wall hung boiler sales.
- The decline in the share of gas and oil floor standing boilers, which looks set to continue. The condensing share of floor standing boilers has developed more slowly than for wall hung gas. It stood at some 6.3% in 2004, rising to 8% in 2005 and is forecast to increase to 28% by 2010.
- The recent surge in sales of solid fuel (mainly biomass pellet) boilers. This is a relatively recent phenomenon, after a long period of declining solid fuel sales. Indeed, the surge accelerated in 2005 when sales grew by nearly 30% (notably in Austria, Czech Republic, Denmark, Finland, France, Poland and Sweden). There is a great deal of optimism about the prospects in these countries, backed by a certain amount of official encouragement. BRG CONSULT's forecasts show the share of solid fuel rising from 3.4% in 2004 to 5.9% in 2010. However, we believe some caution is justified. Only a limited proportion of homes can handle solid fuel (it is difficult to imagine many urban gas connected dwellings converting), so saturation could be reached at some stage in the not too distant future, followed by a sharp and sudden fall.
- A similar surge of interest in heat pumps. In fact several countries had toyed with heat pumps in the early 1980s, but with a withdrawal of subsidies and some product problems, the movement fizzled out. Sweden has been the pioneer of the recent revival, and in 2004 accounted for 50% of sales of hydronic heat pumps used for space heating. In 2005 the market grew by some 20%. Sweden followed this trend, and there were sharp increases in France, Germany and to a lesser extent Austria and Finland. Given the high initial costs, heat pump sales are sensitive to subsidies and incentives and like biomass boilers they are not suited to all homes. However it is likely that the growth will be more sustainable than biomass boilers (and the ecological benefits greater, especially with regards to emissions). It could be that BRG CONSULT's forecasts turn out to be conservative.
- As already stated, BRG CONSULT models do suggest that over the next 20 years replacement growth will more than compensate for the decline in first time installations. The growth patterns will neither be consistent between countries nor follow a smooth progression. To give two examples:
  - the UK market, which has seen strong growth over the ten year up to 2004, looks set for a downturn in 2005-2010, followed by a significant upturn to 2025. Although the revisions to Part L may have had some short term impact in 2005/06, it could be dangerous to attribute to this measure any sustained dip in sales up to 2010. It was probably due to happen anyway.
  - Conversely, BRG CONSULT believes that the long term suppressed German market is due for a revival in replacement demand over the next five years.

Movements Towards Improving Heating Efficiency

SHIFTS IN ATTITUDE

Public (and even official) awareness of the environmental impact of heating systems has developed slowly and unevenly in Europe. At one stage (looking across the whole of Europe) BRG CONSULT used to recognise three groups of countries:

- the environmentally aware Western European countries (the Nordic Countries, the Netherlands, Germany, Austria and Switzerland);
- the less aware Western European countries (UK, Ireland, Belgium, France, Italy, Spain, Portugal and Greece);
- Eastern Europe, emerging from a regime where the impact of pollution on health was of greater concern to the public than climate change or the depletion of fossil fuel reserves.

If these differences have not disappeared, there has been considerable progress, especially over the past 2-3 years. Apart from cleaning up the air in most of Eastern Europe, perhaps the biggest change has come in the UK, which needed to make a step jump in boiler efficiency just to meet the 1992 Boiler Efficiency Directive provisions, and then made another large change to move almost entirely to condensing boilers.

Product Trends: Established Technologies

It is widely acknowledged that even non condensing boilers have shown improvements in efficiency and reductions of harmful emissions since the 1992 Boiler Efficiency Directive (even if the labelling scheme associated with that directive may not have had a notable impact at the consumer level).

The product developments that have gone beyond that basic improvement have mostly been covered in the preceding sections. Probably the most significant have been:

- the growing share of condensing boilers and
- the recent, if still small scale, increases in sales of:
  - biomass boilers
  - heat pumps

BRG CONSULT believes that, even without any additional official measures, the share of such products within the total boiler market will grow from about 23% of the market to over 50% by 2010.

Product Trends: New, Emerging and Alternative Technologies

There is a great deal of speculation about the likely future impact of newer technologies on the boiler market and on the environmental performance of the heating sector. Of the various alternatives identified:

- Modern district heating schemes of the type developed in Denmark probably require too much infrastructural work for them to be developed on a large scale in countries where systems are not already in place.
- Biomass boilers are obviously enjoying an upsurge at the present time and this could last for some years. However, as already mentioned, BRG CONSULT believes that saturation will at some point put this growth into reverse rather suddenly. It is also not clear which side of the environmental argument biomass boilers will fall: while they use renewable energy they are still responsible for significant polluting emissions.
- Heat pumps do look like an attractive energy efficient alternative, and there following the lead of Sweden there are now signs that the technology is starting to move into the mainstream of the heating market. However, the high initial

investment is likely to mean that this solution needs the support of subsidies and incentives on a long term basis.While gas (or oil-) engine heat pumps and gas adsorption heat pumps are still in the development stage, and it is not clear how soon the key technical constraints outlined in this report will be overcome, larger Gas Absorption Heat Pumps (>35 kW output) have completed their development phase and are already available for light commercial and residential heating applications with distinctive advantages over the electric compression heat pumps (see Task 4 – 10.6.2).

- Solar thermal is also at the forefront of discussion at the moment, not least because of the initiatives in Spain. However, the downside is that solar thermal works best under circumstances when space heating is least needed, so this technology is likely to remain primarily associated with water heating, together with a supplementary role for space heating.
- Micro CHP gas motor systems are already on the market more are likely to appear commercially in 2007, based on Stirling engines. In particular, launch plans are well advanced in the UK. It is only at this stage that it will be possible to form a judgement on the extent to which (and the circumstances under which) such systems will gain acceptance. Hydrogen fuel cells for space heat are still in the prototype stage.

Reversible air conditioning might be seen more as an environmental threat than an opportunity. The heat wave of 2003 combined with cheap products arriving from China demonstrated how suddenly demand can soar for such products. They may constrain part of the further penetration of boiler ownership in the still unequipped stock of dwellings in the Mediterranean countries. However in general BRG CONSULT views domestic air conditioning as a supplementary discretionary technology which probably in most cases is not used throughout the whole dwelling. Of course in the commercial sector air conditioning has already taken share on a large scale from wet system space heating.

Official Initiatives

From back in the 1980s numerous attempts have been made to improve the ecological performance of central heating products by official initiatives. Many were either on too small a scale or too short lived to have any profound lasting effect. Examples include:

- the programme in France to subsidise condensing boilers in the late 1980s;
- early incentivisation of heat pumps in a number of countries (including Sweden, Germany, France, Austria).

There were however some initiatives which had a grater impact, notably the Blauer Engel in Germany, which provided a focal point for German environmental awareness, as well as imposing specific requirements for boilers to conform

- the subsidisation of condensing boilers in the Netherlands, which can claim to have given birth to the whole condensing boiler movement in Europe;
- the Swiss LRV '92, which is significant in that it was taken up later by Austria;
- the German §82a of the EstDV, which had a dramatic if brief impact in stimulating boiler replacements just before it expired at the end of 1991. After that from the point of view of the boiler market the impact of the two rounds of BimSchV has been much less striking.

The lessons from these early initiatives would seem to be that they work most effectively as part of a package of measures (the subsidy scheme in the Netherlands was supported by building regulations and a labelling scheme) and they need to be sustained over a long period.

In recent years the number of measures has proliferated, as witnessed by the long inventory provided in the BRG Consult report:

- Easily the most dramatic example has been the revision of Part L of the UK Building Regulations, which from April 2005 requires all boilers sold in England and Wales, with very few exemptions, to be condensing models conforming to SEDBUK A or B. This coercive move followed a number of measures intended to boost condensing sales, such as HEES Programme.
- Denmark has now adopted much the same position, although the quantities of boilers involved are obviously far smaller.
- Across the EU there are numerous national and local schemes which seem to be lifting the share of condensing boilers, as well as heat pumps and biomass boilers (including France, Belgium, Austria, Sweden).
- Also worth mentioning are the requirements in certain regions of Spain to install solar panels in new build and major renovations. However solar thermal technology still looks more suited to water heating than to space heating.
- Coming on top of these measures, is a whole raft of recent or impending national legislation necessary for the implementation of the Energy Performance of Buildings Directive (notably the RT2005 in France and Legge 192 in Italy). Although directed overtly to the whole building rather than specifically to heating systems, its impact on the boiler market is expected to be considerable.
- There is ongoing speculation that Legge 192 in particular will ultimately lead to the market going largely over to condensing boilers, but neither the specifics of such requirements nor the timing are yet clear. For the time being BRG CONSULT forecasts do not assume any such compulsion regarding condensing boilers, but we believe that if this does happen in Italy, it could have a knock-on effect throughout Europe.

With the possible exception of condensing boilers in the Netherlands and heat pumps in Sweden, the evidence would appear to suggest that subsidies and incentives on their own have a very limited lasting effect on sales. Apart from anything else they are too easy to remove. §82a in Germany showed that incentives aimed at the park can be effective, although to have a single long anticipated expiry date leads to a short term distortion on the market that is difficult for the manufacturers to handle.

Coercive legislation such as building regulation are likely to have a longer lasting impact. Long term incentivisation to bring forward replacements on a discretionary basis within the existing park have yet to be tried, although they are being talked about. They would probably need to target those specific segments of the park that are generating the most energy consumption and CO_2 emissions.

[Note: See also the Task 1 report for a discussion of boiler-related legislation]

Implications of the Findings

It is now generally accepted that space (and water) heating needs to be given priority status along with transport and electricity generation in the search for ways of reducing carbon emissions and conserving fossil fuels. Unlike transport, heating is an area where improvements can be made without asking people to change important aspects of their life styles.

From a European perspective heating has a special position. It is an area in which Europe is the global technological leader, and in which European manufacturers have so far held on to almost the whole of their market. Obviously there is no room for complacency on this score, and any process by which the European industry can prolong its technological leadership while at the same time contributing to environmental objectives is surely to be encouraged.

The BRG CONSULT market study highlights certain areas that need to be encompassed by any such recommendations.

It is necessary to keep in the forefront of the mind those parts of the boiler market that are less likely to make a move without further official initiatives. For example (barring any yet unannounced new requirements from Legge 192 or RT 2005) BRG CONSULT predicts that by 2010 some 75% of all non condensing wall hung boilers will be sold in Italy, Spain and France. It should also be borne in mind that the great majority of such product are and will be combis, so that:

- the dual function of the products needs to be taken into account;
- space is a consideration for most users of such products.

This said, there is still a substantial volume of boilers to target. Based on the various assumptions set out, BRG CONSULT forecasts that without further intervention some 45 million "standard efficiency" (i.e. non-condensing boilers) would be sold between 2011 and 2025.

In order to be worth doing, any future product specific initiatives would need to be combined with initiatives aimed at the whole system (configuration, controls etc.) and at the thermal properties of the building itself. The EPBD is obviously timely in this respect, but it is the existing dwelling and heating system stock that in many countries is most in need of attention.

With over 90% of central heating boilers also generating sanitary hot water, and more than two thirds of EU dwellings use their space heating generator to provide sanitary hot water as well. Therefore in making recommendations space heating and water heating cannot be divorced from one another.

As far as the categorisation of boilers for labelling are concerned (which does form part of the remit of the present study: see Section 7.3), the recommendations of BRG CONSULT and its partner VHK are based on two main principles:

- that any categorisation should in principle be based on function and performance (i.e. on what the product actually does rather than on its physical and technical properties);
- the labelling must encompass both the space heating and the water heating functions.

It must be stressed that –especially the implications of the findings by BRG Consult— are solely based on the market perspective and formulated by BRG Consult. The Eco-design study has a wider perspective and –although representing a valuable angle— other considerations might come into play that would change some of the BRG Consult findings quoted above. Furthermore, regarding the technical product trends the reports on Task 4 (technical analysis) and 6 (design options) will expand.

2.5 Average age and product life

The average product life is the essential parameter in a stock model, linking sales and park data. In a sense this average product life is a reflection of the history of all the boilers installed in the past and this 'historical' product life should not be confused with the product life that is used in a Life Cycle Cost calculation, which is directed towards the future (see paragraph 4.8).

BRGC has estimated that on average of the 100 mln. boilers are in stock and that the rplacements sales are 60% (4,2 mln. units) of the 7 mln. boilers sold annually. This means an average product life of 23 years. With an equal age distribution this means that the age of the average installed boiler should be around 11,5 years.

Annex C contains a discussion paper by VHK concerning the spread, average age and thereby the product life from several surveys on this subject over recent years.

The SAVE Heating System study and the 1999 Gas/oil boiler replacement study, both for the European Commission, found considerable average age differences, not so much per country but especially per fuel type. Gas-fired boilers had an average age of 12 to 14

years, whereas oil-fired boilers showed an age of between 15 and 25 years. A Belgian study by VITO on boiler replacement in Belgium showed an average boiler age of 12,4 years for gas-fired boilers and 12-7 to 15 years for oil-fired types. In Germany, BBT presented a breakdown of the boiler age classes, resulting in an average of around 13-14 years.

Both Belgium and Germany have a high share of oil-fired (jet) burners, which are virtually indestructible. In contrast, the UK is mainly a country with gas-fired boilers, which presents a different picture. In a 2005 study for the DTI an average age of 'heating only' gas boilers of 8,4 years was found.

The above is of course only anecdotal, but it seems to suggest that the product life of 23 years (age 11-13 years, depending on distribution) is a reliable estimate.

3 PRICES AND RATES

3.1 Introduction

Ingredients of the LCC calculation are:

- Product price;
- Installation costs;

- Energy (gas, oil & electricity) prices;
- Service, maintenance & repair costs;
- Prices of other consumables;
- Disposal tariffs;

- Discount rate (interest minus inflation)
- Average product life expectation.

Annex II of the EuP-Directive provides some guidance regarding the definition of Life Cycle Costs (LCC). The LCC analysis method '*uses a real discount rate on the basis of data provided from the European Central Bank and a realistic lifetime for the EuP; it is based on the sum of the variation in purchase price (resulting from variations in industrial costs) and in operating expenses, which result from the different levels of technical improvement options, discounted over the lifetime of the representative EuP. The operating expenses cover primarily energy consumption an additional expenses in other resources (such as water or detergent).*'

The relevant equation is

$$LCC = PP + PWF * OE$$

where LCC is Life Cycle Costs, PP is the purchase price (incl. installation costs) and OE is the operating expense.

The PWF (Present Worth Factor) is defined as

$$PWF = N * 1/(1+r)^{N}$$

in which N is the product life and r is the discount (interest-inflation) rate.

3.2 Consumer prices

The aim is to establish the average EU consumer price including taxes for the Life cycle Cost (LCC) calculation (Task 5).

To this end VHK has collected data from various sources. BRG Consult was the most comprehensive source for gas- and oil-fired boiler list prices[10]. This information was checked against additional sources such as consumer test associations (e.g. see previous paragraph), public manufacturer list prices, wholesale prices and street prices offered by internet suppliers.

BRGG prices followed the typology of their Boiler Market Study and we chose the consumer (street) price of the most common type, the "Gas-fired non-condensing solo wall hung" type (including both room-sealed and open systems) as a start-value. This value, including 19% VAT, is 15% below the BRG Consult list prices at € 1014 per boiler and represents what the average EU25 consumer pays for a fossil-fuel fired boiler (excl. solid fuel boilers). The prices for the other types –combi, condensing, floorstanding, oil-fired, etc.—were derived from this start value through multipliers. For instance, for a combi boiler (with hot water production, instead of a solo), a factor 1,2 applies, which means that on average combis are 20% more expensive than otherwise identical solo-boilers. The resulting price is therefore 1,2 * 1014= € 1216. For a condensing boiler a factor 1,4 applies. A boiler that is both condensing and a combi, all factors apply, which means that e.g. a gas-fired wall-hung condensing combi will cost 1,2 * 1,4 * 1014 = € 1704. This so-called multiplier approach was chosen because it is compact and allows – together with BRGC's data on the market shares of each typology—to make a good estimate of the average EU consumer price for a boiler. This is shown in the table below.

Table 3-1. Fossil-fuel fired boilers. Average consumer (street) price incl. VAT, EU-2004

non-condensing, wall-hung, gas-fired (start value)					
list price incl. 19% VAT	1178				
consumer (street) price incl. 19% VAT	1014	86%			
	factor	add	share	agg.factor	agg.add
combi	1,2		57,7%	1,115	
condensing	1,4		25,0%	1,100	
floorstanding	1,45		18,2%	1,082	
oil-fired condensing [11]	1	+3600	1,2%	1,000	+43
oil-fired other	1,5		11,2%	1,056	
aggregated factor and addition				1,4	+43

avg. consumer (street) price incl. VAT Eur. 1014 * 1,4 + Eur 43 = Eur 1462= ca. Eur. 1500

LEGEND

factor= multiplier if the boiler has this characteristic, if boiler has two characteristics then both factors need to be applied, e.g. If the boiler is both a combi and condensing the factor is 1,2 * 1,4 = 1,68

add = only in case of a condensing oil boiler there is no multiplier but a fixed amount has to be added

share = market share of the characteristic, according to BRG consult data

agg.factor = aggregrated = factor * share

[10] BRG consult pers. comm.. 2006

[11] Pers. Comm.. Danish DTI and Eurofuel think the price increase for condensing oil-fired boilers vs. non-condensing in the table is too high. They point out that there are more different designs on the market and the price gap between traditional and condensing oil-fired boilers has narrowed the recent years as they start to get market share.

agg. add = aggregated = add * share

The average price of the boiler, rounded to € 1500, will not change significantly if we also include electrical resistance CH boiler (1% market share, prices € 1000) and heat pumps (1% market share, prices for ground source types € 10 000 in the largest market Sweden). Therefore, the 6,75 million **individual** wet systems (excl. those with solid fuel boilers) installed annually in the EU 25 (see paragraph 2.2.2) represent a consumer expenditure of over € 10 billion.

If we include also the collective wet systems and commercial boilers (e.g. > 40 kW), which BRG Consult estimates to constitute ca. 30% of the individual residential boiler market, the total EU-expenditure amounts to around € 13-14 billion/year.

The accuracy of the above data is believed to be in the order of magnitude of ± 5%. Please note, that the prices per type are not necessarily a 100% reflection of costs per type, but are merely an inventory of the commercial prices currently on the market

In the interest of the sensitivity analysis (Tasks 7/8) the consumer prices, including taxes, were established for various (clusters of) countries through 'country multipliers' for the street price:

- High (SV, DK, AT): 2,6 - 2,2 - 2
- Higher than avg. (DE, FIN): 1,65 – 1,55
- Average (FR, UK/BE/SL, NL/IT): 1,1 – 0,9 – 0,85
- Lower than avg. (IRL/ES/GR/SK/ES/LT/LV, PO): 0,7 – 0,65
- Low (PL/CZ/HU): 0,5

3.2.1 Installation costs

In Task 3 detailled costs for replacement installation and the costs of various chimney renewal options are given. These costs could only be retrieved for a limited number of countries in the Middle of Europe, but on the basis of this limited data-set we can conclude that the above mentioned country multipliers apply and that therefore the multiplier approach also can be used to establish installation costs. Two cases are distinguished: The first case is a simple boiler replacement (multiplier) and the second case is a new or replacement installation where also the chimney has to be renewed:

Installation cost multipliers:

- Replacement (excl. Chimney renew): boiler street price* 0,6
- New/Replacement incl. chimney renew attic: boiler street price * 0,9
- New/Replacement chimney lateral: boiler street price * 1
- New/Replacement chimney inner liner: boiler street price * 1,2

For the average EU boiler **replacement** without chimney renewal, the installation costs are therefore 0,6 * € 1500 = **€ 900,-/ boiler incl. VAT**. This will apply to most of the 60% housing boiler replacement market and 3,8% of the non-housing market identified by BRG Consult (see par. 2.2.2). Please note that these installation costs apply to individual wet systems; information from GFCC and other sources indicate that chimney renewal for collective systems are slightly lower.

BRG Consult estimates that around 22% of boilers are placed in new housing and 14% are first time installations, in which case also chimney costs have to be taken into account. Furthermore, a part of the around 60% 'replacements' will require chimney renewal when switching from conventional to condensing boilers. If we all take this into account, we estimate that 40% of the market will face chimney costs in the order of magnitude of 1 * € 1500. The choice for the multiplier of '1' is an estimate also based on the fact that for collective chimney systems in apartment buildings are slightly lower than in individual houses.

Aggregating the above for the EU25, we estimate that the average consumer expenditure on installation, including chimney renewal is 0,6*900 + 0,4*1500 = € 1140,- .

The above figure relates to installation costs of most gas- and oil-fired boilers, but there are some extra installation costs:

For all boilers installed in new housing (22% of sales) and a large part of the first time installations (14,3%), also an **electrician** is needed to install a dedicated socket and fuse. The extra costs are between € 50,- (gas-fired boiler, new house) and € 200,- (existing house, electric boiler with extra fuse, etc.), say around € 100,- on average[12]. If this applies to ca. 35% of sales, it will raise the average EU installation costs by € 35,-. Heat pump boilers require a more thorough revision of the electrical installation and there the costs are estimated at € 700 - € 800 (source: Intec 2 / 2003). However, because of the low market share (<2%) this does not significantly change the EU average.

For oil-fired boilers in new housing and first time installations, also the materials and labour costs of the **oil tank and piping** has to be taken into account. According to BRGC figures (par. 2.2.2) oil boilers account for 18,2 % of 2004 sales and around 28% of these are placed in new houses (15,6%) or are first time installations (12,5%). Therefore with around 5% of annually installed boilers there are also the costs of installing the oil tank, piping, etc.. An average oil storage tank costs around € 2500 [13]. For piping and installation another € 1700 is estimated[14], bringing the total cost for the house owner to around € 4200 [15]. When applied to 5% of the sales, this raises the average EU installation expenditure by € 210,-.

For gas- and oil-fired boilers with an open combustion system (type B) the **ventilation requirements for the boiler room**, following more stringent legislation on air tightness of new and renovated houses, have become or will become more explicit and stringent. In some EU-countries, like Germany, such requirements are already in place and will lead to extra costs for installation provisions. No exact data is available; we will assume a default of € 200,- for ventilation provisions.

BRGC gives no exact figures on the amount of type B boilers in the market, but it is estimated that especially for new and renovated houses not more than 5-10% of boilers will have open systems. Hence, this means that only around € 20,- should be added to the EU average.

For electric heat pump boilers the costs of **making the heat source available** have to be added. The costs e.g. of drilling a hole for a vertical ground source heat pump vary widely depending on the type of soil, between e.g. € 500,- and € 2000,-. If we assume the latter and a market share of heat pumps of around 1,7%, then the contribution to the EU average is around € 17,-.

For replacements and installations in new housing the costs of connection to the gas- and electricity grid do not play a role. For “first time installations” (e.g. switch from oil to gas) the connection costs to the gas-grid play a role. These depend very much on the area, the utility (how much is subsidized) and country. In Belgium urban areas a tariff of € 200,- is fairly standard (www.iveg.be), but the actual costs area close to € 700,-. In the Netherlands a new connection is not subsidized by the utility and the tariff reflects the costs: ca. € 700,-/dwelling (www.essent.nl) . In Germany, tariffs between € 1000,- and € 3000 are reported (www.energieverbraucher.de), whereby the lower tariff is applicable to urban areas. On top of that various German gas utilities give subsidies of

[12] German sources mention around € 150,-.

[13] source: www.heizungsvergleich.de

[14] also source: www.heizungsvergleich.de

[15] Pers. Comm.. Danish DTI and Eurofuel think the indicated material costs plus installation costs are too high.

on average € 500,- for thos switching towards gas. In Italy a gas grid connection tariffs are found of € 100,- (Italimpianti) to € 300,- (Energas). The Danish DTI reports a cost of around € 1000,- per connection. Finally, it can be mentioned that several gas utilities in several countries offer the possibility to discount the connection costs in the energy rate.

The table below summarizes the calculation of the average EU installation costs for gas/oil/electric CH boilers in the EU.

Table 3-2. Average EU installation costs per CH boiler (excl. Solid fuel), 2004

	€	share of boiler sales
Boiler replacement	900	100%
Add extra:		
Chimney new & renewal (new housing, 1st installation, etc.)	240	40%
Electrician (new housing & part of 1st installation)	35	35%
Oil storage tank (new housing & 1st installation, oil-fired, 60% material+ 40% labour)	210	5%
Ventilation provisions for open combustion boilers	20	10%
Heat pump, infrastructure heat source	17	1%
Total average installation costs per boiler, incl. VAT	1.422	

The € 1422 found in the table above is considerably higher than the € 924 used in the MEEUP Case Study, because we have added more detail regarding the extra costs.

For 6,75 million boilers per year, the total expenditure is thus also between € 9 and 10 billion for individual wet systems. For commercial and collective systems also some 30% can be added, resulting in a total expenditure of € 13 billion.

3.3 Energy prices

Eurostat is the source for the energy prices presented in the tables in this paragraph. The discrepancy between the lower Eurostat prices versus prices identified by most consumer's associations has been discussed in the MEEUP Methodology Report (VHK 2005), but for the moment it is not possible to make a comprehensive correction Eurostat data for the whole of the EU-25. For that reason we will have to use the Eurostat prices, rounded to the highest near whole number. We will restrict ourselves to energy prices for households, as they are the most relevant for CH boilers.

3.3.1 Electricity

According to the Eurostat July 2006 news release, electricity prices for EU25-households rose by 4,6 % in the year 2005, leading to an average price of € 14,16 per 100 kWh per Jan. 2006. For the Life Cycle Cost calculations (Tasks 5 and 6) a rounded figure of € 0,15/kWh will be used. Over a

longer time period, household and industrial electricity prices in the EU15 rose in total by 9% between January 2000 and January 2006. This amounts to a longer-term average annual price increase of 1,5%, to be taken into account in the Life Cycle Cost calculations.

Price changes between January 2005 and January 2006 varied significantly between Member States. For households, the largest price rises were observed in Cyprus (+31,4%), Malta (+23,3%) and the United Kingdom (+14,2%), while prices remained stable in Latvia and Lithuania and fell in Belgium (-2,6%) and Austria (-5,2%).

In absolute values, household electricity prices were highest in January 2006 in Denmark (€23,62 per 100 kWh), followed by Italy (€21,08), the Netherlands (€20,87) and Germany (€18,32). The lowest prices were observed in Greece (€7,01), Lithuania (€7,18), Estonia (€7,31) and Latvia (€8,29).

When adjusted for purchasing power, household electricity prices in Greece (8,01 PPS3 per 100 kWh) remained the cheapest, followed by the United Kingdom (9.05), Finland (9,38) and France (10,92), while the highest prices were recorded in Slovakia (24,48), Italy (20,23), Poland (20,05) and the Netherlands (19,15).

The share of taxation in household electricity prices varied greatly between Member States, ranging from around 5% in Malta, the United Kingdom and Portugal to more than 40% in Denmark (58%) and the Netherlands (42%).

Electricity prices in the table below refer a household with 3500 kWh, of which 1300 kWh overnight, living in a 90 m² dwelling.

Table 4.3. Electricity prices Jan. 2006 in Euro/100 kWh, incl. all taxes, standard household consumer 3500 kWh, of which 1300 kWh/a overnight (Eurostat ref., 90 m² dwelling)

	Jan 2006 (nat. Currency per 100 kWh)	% increase Jan 2006/ Jan 2005	Jan 2006 (euro/ 100 kWh)	Jan 2006 (PPS)*	% taxes
EU25	14,16	4,6	**14,16**		
Belgium	14,42	-2,6	14,42	13,33	22,1
Czech Republic	283,00	7,6	9,85	15,81	15,8
Denmark	176,25	4,0	23,62	17,17	57,8
Germany [16]	18,32	2,6	18,32	16,65	25,0
Estonia	114,40	7,8	7,31	11,78	15,2
Greece	7,01	1,9	7,01	8,01	8,3
Spain	11,47	4,6	11,47	11,95	18,0
France	12,05	0,9	12,05	10,92	24,9
Ireland	14,90	3,8	14,90	11,95	13,8
Italy	21,08	7,0	21,08	20,23	26,6
Cyprus	8,21	31,4	14,31	15,01	14,4
Latvia	5,77	0,0	8,29	15,37	15,3
Lithuania	24,80	0,0	7,18	13,77	15,2
Luxembourg	16,03	8,5	16,03	13,97	13,3
Hungary	26,95	2,7	10,75	17,14	16,7
Malta	4,07	23,3	9,49	13,26	4,7
Netherlands	20,87	7,3	20,87	19,15	42,2
Austria	13,40	-5,2	13,40	12,47	33,3
Poland	45,45	4,7	11,90	20,05	22,4
Portugal	14,10	2,1	14,10	16,30	5,0
Slovenia	2512,00	1,4	10,49	13,71	16,7
Slovakia	543,00	5,2	14,48	24,48	16,0
Finland	10,78	2,0	10,78	9,38	25,0
Sweden	133,59	5,7	14,35	12,06	39,0
United Kingdom	7,00	14,2	10,20	9,05	4,8

*=PPS is weighted with purchasing power indicator

[16] UBA reports that in Germany most suppliers provide tariffs especially for use in heat pumps that are about 1/3 cheaper than common household electricity. Electricity prices for electric heating systems are even lower.

Source: Eurostat, Electricity prices in the EU in January 2006 "Household elektricity prices rose by 5% in 2005, industrial prices up by 16%", news release, July 2006

When using the variations in prices for the sensitivity analysis (Task 7/8), the electricity prices has to be considered in conjunction with the boiler prices (see country multipliers). In some parts of the EU25 like Eastern Europe and the UK, both the absolute electricity prices and the boiler prices are low. In countries like Sweden the boiler prices are high and the electricity prices are low. In the Netherlands and Italy, electricity tariffs are high, whilst boiler prices are moderate, etc..

3.3.2 Natural gas

Gas prices (all taxes included) for households in the EU25 rose by 16% on average between January 2005 and January 2006. Over a longer time period, household and industrial gas prices in the EU15 rose in total by 34% between January 2000 and January 2006. They followed the same pattern: a strong increase in 2000, four years of relatively stable prices and a further sharp increase in 2005. Over the same period, crude oil prices doubled.

All Member States are largely dependent on imported gas, except for Denmark and the Netherlands, which are self-sufficient, and the United Kingdom, which imports around 7% of the gas it uses.

Price changes between January 2005 and January 2006 varied significantly between Member States. For households, prices rose by more than 25% in Slovakia (+30%), Luxembourg and the Czech Republic (both +27%), Slovenia (+26%) and Ireland (+25%), while prices remained nearly stable in Estonia and increased by less than 10% in Denmark (+5%) and Italy (+8%).

In absolute values, household gas prices were highest in January 2006 in Denmark (€29,82 per GJ), followed by Sweden (€25,95), the Netherlands (€16,92) and Italy (€16,50). The lowest prices were observed in the three Baltic Member States, Estonia (€4,63), Latvia (€5,34) and Lithuania (€6,24).

However, when adjusted for purchasing power, gas prices in the United Kingdom (7,30 PPS4 per GJ) were the cheapest, followed by Estonia (7,47) and Luxembourg (9,00), while the highest prices were recorded in Sweden (21,81), Denmark (21,68), Slovakia (18,40) and Slovenia (16,97). The share of taxation in gas prices varied greatly between Member States, ranging from around 5% in Portugal, the United Kingdom and Luxembourg to more than 40% in Denmark (56%) and Sweden (43%).

For the Life Cycle Cost calculation (Tasks 5 and 6) we will use a value of € 13,- per GJ, which is roughly equivalent to € 0,46/m³. Furthermore, we will assume the annual price increase of 5,6% to stretch also into the future.

Regarding the variations in gas price to be taken into account in the sensitivity analysis (Task 7/8), also here we have to consider the context with e.g. boiler prices in the specific countries.

Table 3-4. Gas prices Jan. 2006 per GJ, incl. all taxes, standard household consumer 83.7 GJ/year

	January 2006 (nat. currency)	% increase January 2006/2005	January 2006 (euro)	January 2006 (PPS)*	% taxes Jan. 2006
EU25 (weighted avg.)	13,02	15,6	13,02		
Belgium	13,5	21	13,5	12,48	20,4
Czech Republic	287,97	26,8	10,03	16,09	16
Denmark	222,5	5,2	29,82	21,68	55,8
Germany	15,98	17,8	15,98	14,53	23,3
Estonia	72,52	0,1	4,63	7,47	15,1
Spain	13,63	14,5	13,63	14,2	13,8
France	12,72	20,3	12,72	11,53	15
Ireland	12,51	25,3	12,51	10,03	11,9
Italy	16,5	7,6	16,5	15,83	36,8
Latvia	3,72	17,7	5,34	9,91	15
Lithuania	21,54	15,3	6,24	11,96	15,2
Luxembourg	10,33	26,9	10,33	9	5,7
Hungary	1856,25	21,6	7,4	11,8	13
Netherlands	16,92	11,5	16,92	15,53	34,5
Austria	15,65	17,1	15,65	14,56	31,5
Poland	36,15	17,3	9,46	15,95	18
Portugal	14,52	17,7	14,52	16,79	4,8
Slovenia	3110	25,6	12,99	16,97	22,8
Slovakia	408	29,9	10,88	18,4	16,2
Sweden	241,6	20,4	25,95	21,81	43
United Kingdom	5,65	11,4	8,24	7,3	4,8

Greece, Cyprus and Malta do not have a significant gas market and therefore did not report gas prices. Finland does not have a significant gas market for household consumers and therefore does not report prices for household consumers.
*= PPS is weighted with purchasing power indicator

Source: Eurostat, Gas prices in the EU in January 2006 "Household gas prices rose by 16% in 2005, industrial prices up by 33%", news release, July 2006

3.3.3 Heating Oil

For heating oil Eurostat has not yet released an overview of developments and the data in the table below were retrieved and analyzed by VHK from various Oil Bulletins 2006, 2005, 2003 published by the European Commission.

The table shows heating oil prices (all taxes included) for households in the EU25 rose by as much as 32% (!) on average between January 2005 and January 2006. The EU25 average for Jan. 2006 was ca. € 645,-/1000 litres, which we will take as an anchorpoint for life cycle costs calculation. This is the price for gas heating oil delivered at a quantity of between 2000 and 5000 litres, free at home.

Over a longer time period, it was found that heating oil prices rose by a total of 11% between Jan. 2003 and 2005. For the period 2000-2002 there was no consistent data set available, but assuming that the price rise was similar to 2003-2005 it was concluded that the long-term average price rise is around 8,2% per year (see table below). This 8,2% is taken to calculate the oil-specific PWF (Present Worth Factor) in

our life cycle cost calculations, starting from the "anchorpoint"of € 645,-/1000 litres mentioned above [17].

Price changes between January 2005 and January 2006 varied significantly between Member States. For households, prices rose by more than 40% in Malta (+51%), Belgium (+50%), Poland (+48%), United Kingdom (+45%), Finland (+44%) and Luxembourg (42%). (+26%), while price rises in Hungary (+5%), Cyprus (+14%), Italy (+17%), Sweden (+17%) and Slovenia (+18%) remained below the 20%-mark.

In absolute values, household heating oil prices were highest in January 2006 in Italy (€1108 euro/1000 l.), followed by Hungary (€1012), Denmark (€1004) and Sweden (€998). At the lower end prices of around €520-650 can be found, with he UK, Belgium and many new Member States being the cheapest. The middle segment is represented by the Netherlands (€889) and the Czech Republic (€712), whereas most of the rest of the EU Member States are in a relatively narrow price range €530 to €630, with Luxemburg (€524) being the cheapest.

Table 4.5. Heating oil prices Jan. 2006 in Euro/100 litres incl. all taxes, consumer prices for deliveries between 2000 and 5000 litres free at home.

	Jan 2006 (nat. Currency per1000 l.)	% increase Jan 2006/ Jan 2005	% increase Jan 2005/ Jan 2003	% estimated avg. annual increase 2000-2006	Jan 2006 (euro/ 1000 l.)	% taxes Jan. 2006
EU25 (weighted avg.)	644,17	32,4	.		644	
EU15 (weighted avg.)	645	32,0	10,6	8,3	645	
Belgique	566	50	9	11	566	21
Cyprus (CYP)	408	14	.		712	15
Czech Republic (CZK)	18162	26	.		630	19
Danmark (DKK)	7489	20	13	7	1004	25
Deutschland	595	37	9	9	595	16
Ellas	581	37	20	12	581	18
Espana	582	20	19	8	582	16
Estonia (EEK)	8450	24	.		540	18
France	631	33	14	9	631	19,6
Hungary (HUF)	252613	5	.		1012	20
Ireland	672	29	12	8	672	13,5
Italia	1108	17	8	5	1108	20
Latvia (LVL)	418	27	.		601	18
Lithuania (LTL)	1821	37	.		527	18
Luxembourg	524	42	14	11	524	12
Malta (MTL)	239	51	.		557	0
Nederland	889	32	6	7	889	19
Österreich	656	32	15	10	656	20
Poland (PLN)	2277	48	.		606	22
Portugal	644	23	12	7	644	12
Slovakia (SKK)	21875	37	.		585	19
Slovenia (SIT)	139800	18	.		584	20
Suomi	609	44	5	9	609	22
Sverige (SEK)	9320	17	21	9	998	25
United Kingdom (GBP)	366	45	18	12	536	5

[17] Pers. Comm. Eurofuel reports that official DG TREN and Eurostat prices mentioned in the tables for gas and oil are different from prices and rates published by their national members like IWO (http://www.iwo.de/sites/iwo_website/standard.jsp?nodeId=44900&open=x&pagen

ame=TECH_HEL_PREIS), Informazout and Chaleur Fioul.

Source: European Commission, DG TREN, Oil Bulletin, 9 Jan. 2006/3 Jan. 2005 /6 Jan. 2003 (gas heating oil data)

Please note that prices mentioned above apply to light fuel oil or 'gas heating oil', which is the heating oil used in residential boilers. Specific weight is 0,85 kg/l. and the Gross Calorific Value is approx. 38 GJ per 1000 litres (42,5 MJ/kg). Therefore, a price of € 645/1000 litres is equivalent to € 17,-/GJ. This is around 30% higher than the current natural gas price (€ 13,-/GJ).

3.3.4 Other petroleum products: HFO and LPG

Heavy Fuel Oil (HFO)

Apart from gas heating oil, there is also an official price quote from the European Commission's Oil Bulletin for **'heavy fuel oil'** (HFO). HFO is a low-grade fuel primarily used in industrial boilers and other direct source heating applications (i.e., blast furnaces). It is also used as a principal fuel in marine applications in large diesel engines. Given its high boiling point and tar-like consistency, HFO typically requires heating before it can be moved through pipes or dispensed into a boiler or other heating vessel to be burned.

HFO is the least expensive of the refined oil fuels and can only be used by facilities that have preheating capabilities. HFO is typically high in sulphur and other impurities that are released into the air when the fuel is burned. The Oil Bulletin gives price quotes for HFO with sulphur content <= 1% (ca. € 380,-/1000 liters, July 2006) and HFO with sulphur content > 1% (ca. € 300,-/1000 litres, July 2006). [18]

Liquified Petroleum Gas (LPG)

LPG is a mixture of third family gases (propane 70-80 vol. %, butane 20-30%)[19] that comes from petroleum distillation or from natural gas fields as a by-product. In Europe it is most known for its use in cars. However, it is also used in residential CH boilers. The LPG storage tank is filled before/during the heating season by a delivery truck, similarly to the current practice with oil-fired boilers. LPG has a negligible sulphur content and low emissions.

Density is around 0,52 kg/litre and it has a GCV of around to 50 MJ/kg. [20] Per litre the GCV is thus around 25 MJ. LPG Prices from the European Commission's Oil Bulletin, Jan. 2006, are given below. The (straight) average price is estimated at € 570 per 1000 litres. An additional analysis shows that per litre the prices are on average some 16% lower than those of gas heating oil. However, per GJ the LPG is around 23% higher on average (€ 23/GJ).

Pricing strategy varies widely between Member States. For instance, in Hungary (7%), Italy (10%) and the Netherlands (0,3%) LPG prices also per GJ are cheaper than those for gas heating fuel oil.

[18] To calculate prices per GJ for HFO: The density of HFO is higher than that of gas heating oil (0,94 kg/dm3) and the Gross Calorific Value of HFO per weight unit is lower than that of (approx. 40 MJ/kg), therefore also here –as with gas heating oil—there is a conversion of 38 GJ (GCV) per 1000 litres.

[19] This also known as 'LPG Mix'. As bottled gas it is also often referred to as 'propane'. Pure or almost pure propane also exists ('LPG Propane') but for industrial use there is also 'LPG propane' and 'LPG Butane' which contains also

[20] http://www.lpga.co.uk/TypicalPropofCommercialLPG.htm

Table 3-6. LPG prices Jan. 2006 in Euro/100 litres incl. all taxes, consumer prices for deliveries between 2000 and 5000 litres free at home.

	Jan 2006 (euro/1000 l.)	price compared to gas heating oil per litre	price compared to gas heating oil per GJ
EU 25 (straight avg.)	568	-16%	+23%
Belgique	534	-6%	+30%
Cyprus (CYP)	.		
Czech Republic (CZK)	535	-18%	+23%
Danmark (DKK)	.		
Deutschland	562	-6%	+30%
Ellas	.		
Espana	590	+1%	+35%
Estonia (EEK)	499	-8%	+29%
France	692	+9%	+40%
Hungary (HUF)	621	-63%	-7%
Ireland	.		
Italia	664	-67%	-10%
Latvia (LVL)	487	-23%	+19%
Lithuania (LTL)	485	-9%	+28%
Luxembourg	513	-2%	+33%
Malta (MTL)	.		
Nederland	583	-52%	-0%
Österreich	.		
Poland (PLN)	568	-7%	+30%
Portugal	593	-9%	+29%
Slovakia (SKK)	607	+4%	+37%
Slovenia (SIT)	552	-6%	+30%
Suomi	.		
Sverige (SEK)	.		
United Kingdom (GBP)	.		

Source: European Commission, DG TREN, Oil Bulletin, 9 Jan. 2006; comparative analysis by VHK 2006

When recalculated to 1 GJ of energy the average EU25 energy prices for these energy sources compare as follows:

Table 3-7. Energy prices per GJ

Energy type	euro/GJ	calculated:
electric (grid)	41,60	1 kWh = 3.6 MJ
gas (GCV)	13	(given)
oil (GCV)	17	@ 0.85kg/ltr @ 42,5 GJ NCV/1000kg @ NCV/GCV = 0.95 = 38GJ GCV

3.4 Other consumables

Operators of condensing oil boilers using standard oil (with standard sulphur content) are (at least in Germany) required to neutralise the condensate. This is achieved by leading the condensate through a box which contains a neutralisation salt, usually composed of magnesium hydroxide and magnesium oxide (in Germany *Arbeitsblatt A 251* applies to the neutralisation facility and DIN 2000 to the salt). The box can be integrated in the appliance casing, or be added to the system as an external component.

The neutralisation salt needs to be replenished once in a while, following the instructions provided by the salt and/or the maintenance requirements of the boiler manufacturer.

According to a supplier[21] three kg of neutralisation salt suffices for two years of operation of a 25 kW condensing boiler. The salt is offered for 28 euro/3kg = 9,33 euro/kg, which recalculates to 4,50 euro per year (rounded).

On the whole the contribution of this type of consumable to the running costs of the average EU boiler is at most marginal and shall therefore be neglected in further calculations (tasks 7/8).

3.5 Servicing, maintenance & repair

From various sources anecdotal data was gathered on costs associated with operation of central heating boilers. The table below presents an overview of prices found for annual servicing & maintenance contracts applicable to households.

Table 3-8. Costs for servicing & maintenance of boilers

Country	Boiler type	Costs (euro/year)	Source
DE	Gas boiler	140	Alphainno Tec Wärmepumpencenter 2003
	Gas Condensing 15kW/18kW	120	www.heizungsvergleich.de
	Gas - condensing	62	Gastechnik Live C.3.4.4. adapted from BGW
	Oil - LT	200	Gastechnik Live C.3.4.4. adapted from BGW
	Oil boiler	190	Alphainno Tec Wärmepumpencenter 2003
	Oil regular 15kW/18kW	160	www.heizungsvergleich.de
	Heat pump	136	Gastechnik Live C.3.4.4. adapted from BGW
	Electric heat pump	50	Alphainno Tec Wärmepumpencenter 2003
	District (Heat Exchanger unit)	41	Gastechnik Live C.3.4.4. adapted from BGW
	Pellets	386	Gastechnik Live C.3.4.4. adapted from BGW
FR	Gas boiler 23kW, wh, combi	99-110	www.proxitherm.com
NL	Gas combi <40kW	87,5	www.altijdgeholpen.nl
	Gas combi	83-87	NUON-Feenstra
	Misc.	75-114	www.mampaey.nl
BE	Oil Boiler (UBIC)	145 (excl. VAT)	http://www.g-v.be > "Is mazout goedkoop"
	Oil Boiler (NACEBO)	100 (excl. VAT)	http://www.g-v.be > "Is mazout goedkoop"
UK	Boiler + controls Homecare 100	210,24	British Gas
	Boiler + heating system Homecare 200	280,32	British Gas
	Central heating efficiency test: £25	36,25	(http://www.taps-uk.co.uk/)
	Callout: £60 (includes one hour labour)	87	(http://www.taps-uk.co.uk/)
ES	Yearly maintenance	90	(BRGConsult - draft boiler cost comparison.xls, created 23 Feb 2006)

Most often safety inspections are included in the service tariffs quoted above.

[21] http://stores.ebay.de/1A-Heizungsshop

For Germany the annual inspection by the chimney-sweeper (*Kaminfeger/Schornsteingefer*) should be added. For oil boilers in Germany costs for insurance against surface water pollution may be added ("*Gewässerschadensversicherung*"). In Belgium regular inspections of oil storage tanks are required. Although these costs are not required for the whole of the EU they are incorporated in the overall cost assessment for safe keeping and to account for increased importance of inspections due to the EPBD regulations.

Table 3-9. Kaminkehrer costs etc., Germany 2003

Kaminkehrer	Costs	Source
Oil boiler	40 euro/yr	www.heizungsvergleich.nl
Oil Boiler	51.13 euro/yr	Intec 2/2003
Gas boiler	51.13 euro/yr	Intec 2/2003
Gewässerschadensversicherung		
Oil boiler	76.69	Intec 2/2003

Table 3-10. Belgium oil storage inspection costs

Underground storage tank	75-85 euro per check (excl. VAT) - higher price is inclusive leakage test. Checks do not have to be annual
Above ground storage tank	65 euro per check (excl. VAT). Checks do not have to be annual
Average	Considering an inspection period interval of 5-6 years the annual average lies at approximately 12,5 euro/yr.

source: http://www.g-v.be > "Is mazout goedkoop"

Costs for repair are no regular reoccurring costs for the consumer (hopefully), but do form part of the operational costs. No data was found which could be used to provide a coherent picture. In the environmental analysis of the MEEUP study 'repairs' were accounted for as 1% of the boiler weight. This default value will be used for the costs of repair, in the form of 1% of purchase price.

Table 3-11. Servicing, maintenance & repair

(euro / yr)	Gas	Oil	Heat Pump	
Service + maintenance	115	155	95	averages of values presented in previous tables
Tank inspection	-	12.50	-	average of values presented in previous tables
Chimney inspection/sweep	45		-	average of values presented in previous tables
Repairs	15			default 1% of purchase (1500 euro)
Annual costs	175	227.5	110	Costs are calculated as sum of averages
Stock share	76.7%	21.1%	1%	
	134	48	1	
total for average EU boiler	180 (rounded)			

3.6 Disposal tariffs

Central heating equipment is not subject to community legislation regarding "waste electrical and electronic equipment (WEEE)" (Directive 2002/96/EC, 27 January 2003) and therefore the take-back of such equipment is primarily organised at Member State level with general legislation on household waste applying to its disposal.

Recognising the scrap metal value of old boilers it is usually the installer who takes back the old boiler when replacing it for a new one. The consumer normally does not have to pay (nor gets reimbursed) for this service. In cases where consumers discard of the

product by themselves this will be regulated on basis of local community waste regulation. If the old boiler is collected on the curb-side by the community services then the consumer will have paid for this service through the applicable local waste taxes. The actual costs that can be allocated to this service are negligible (Example: boiler weight 60 kg, lifetime 17 years = 3,5 kg/year, average household size 2,3, thus boiler waste is app. 1.5 kg/pp/yr, compared to average household waste of 400 kg/year per capita[22]).

Therefore for the purpose of this study these disposal costs are fixed at zero.

Another issue is the removal of an old (underground) oil storage tank, possible in combination with re-sanitation of the contamination of the soil. As yet we have no reliable data on the frequency and the costs of this item, which –for now— will be treated as 'p.m.' (pro memoriam).

3.7 Interest & inflation rates

Interest rates are taken as average rates on bank deposits. Based upon publications by the European Central Bank[23] the interest rate for consumer savings accounts varies generally between 2 and 4% and for the purpose of this study will be fixed at 4%.

The Eurostat Euroindicator Newsletter[24] shows that annual inflation for the EU25 area is stable at 2,4%. Although this rate obviously is subject to change throughout the course and intended time scope of the study, it is fixed at 2.4% for the purpose of the study.

As a discount rate (interest-inflation) in the LCC calculation we will take a rate of 2%.

3.8 Product Life

The product life is an important parameter in the LCC-calculation. This product life is not the same as the average product life that links the stock and the sales data (see previous chapter). The latter reflects the history of the products already installed and was set at 23 years, taking into account many cast iron and virtually indestructible boiler installations with a product life of over 30 years.

The scope of the Life Cycle Calculation is not the past, but the future. It reflects the investment decision by an economically rational consumer who has to invest in product option A or B. In that case. In that case, we are talking about the product life that can be expected. For that reason e.g. the SAVE Stock Model took into account an average product life of around **17 years**, reflecting the fact that many of the models currently offered on the market are gas-fired wall hung boilers and a much higher number of components.

[22] EEA, 2001 (http://themes.eea.europa.eu/Environmental_issues/waste/indicators/household_waste/w2_household.pdf)

[23] ECB Statistics Pocket Book, updated monthly, available at http://www.ecb.eu/pub/spb/html/index.en.html

[24] http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/LN-072006/EN/LN-072006-EN.PDF

4 INDUSTRY, DISTRIBUTION AND COSTS

4.1 Manufacturers

4.1.1 Market share

According to BBT press material there are some 250 manufacturers of boilers and water heaters active in Europe in 2005 [25]. However, mergers and acquisitions are very prominent and almost 55% of the market is produced by only five major manufacturer groups.

A presentation by Baxi[26] presents these main boiler manufacturers by market share (2003):

Table 4-1. Boiler manufacturers by market share 2003

	Manufacturer group	Share	Brand names
1	Vaillant	18%	Vaillant, AWB, Bulex, Glow-Worm, Saunier Duval
2	BBT	16%	Bosch, Buderus, Nefit, ELM Leblanc, Geminox, Worcester
3	Baxi	10%	Baxi, Brötje, Chappée, Ideal Standard, Potterton
4	MTS	6%	MTS, Rendamax, Ariston, Chaffoteaux & Maury, Elco
5	Riello	5%	Riello, Beretta, Thermital
6	Ferroli	5%	Ferroli, Joannes, Rapido, Euroterm
7	Viessmann	4%	Viessmann, Tasso
8	Immerfin	3%	Hydrotherm
9	Caradon	2%	Ideal Stelrad
10	others	31%	a.o. Remeha/DeDietrich, Fonderie SIME, Biasi, MCC, TUI, Intergas, Frisquet, Atlantic, Ravenheat, ZDB, etc.

Obviously Vaillant and BBT are the two major players for central heating boilers, with Baxi as a good third. The differences between 4th to 7th place are much smaller and almost one-third of the boiler market is serviced by brands that may operate only locally (may not be part of a pan-European organisation, exceptions apply).

The major players (groups) offer products in all categories (oil, gas, electric, heat pumps, biomass). The market shares are based upon overall central heating boiler sales: When assessed at specific boiler types (e.g. oil boilers, heat pumps) the overall ranking may change.

4.1.2 Duration of (re)design cycle of boilers

The (re)design cycle of boilers in this study is defined as the time between and the development of two successive boiler platforms. With platform is meant the type of primary heat exchanger around which the boiler (range) is designed. Most other

[25] http://www.bbt-thermotechnik.de/sixcms/detail.php/1898145

[26] Stares, Ian, "MicroCHP", Baxi Group, Micropower 2005, 7 July 2005.

components (circulator, electronics, fan, valves, etc.) have more "drop-in replacement" characteristics and are subject to much shorter redesign cycles.

Based upon impressions of the largest European Biannual Trade Fair "ISH Frankfurt" it is noticed that modern platforms by major boiler manufacturers last two successive shows, indicating a platform life of 4 years. This does not mean that a platform is discontinued after 4 years. Most platforms stay in range longer than that, but the changes are most often limited to more cosmetic aspects.

Obviously redesign cycles of products that compete on technical features (e.g. condensing gas combis) are much shorter than those of products that use a more established technology and mainly compete on boiler price (e.g. standard wall hung gas combis, standard oil boilers). This is of course a simplification of reality since technical features and price play their role in whatever kind of market. Even today there is still a market for boiler designs that are essentially over 20 years old (e.g. cast iron gas/oil boilers). It is just to show the intrinsic character of the market and its effect on boiler (re)design.

4.2 Distribution

The prevalent form of distribution is: manufacturer/importer > wholesaler > installer/contractor. For two main boiler categories the distribution is presented in the figures below.

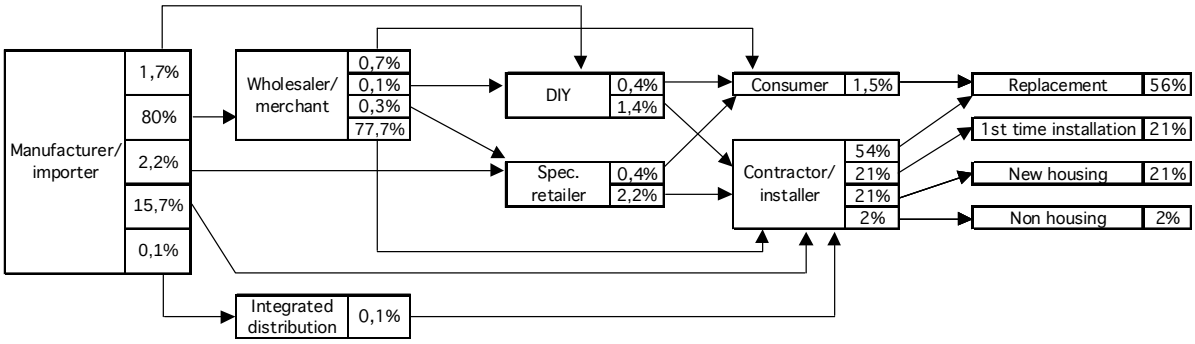


Figure 4-1. Wall hung boiler distribution (Source: BRGC, 2006)

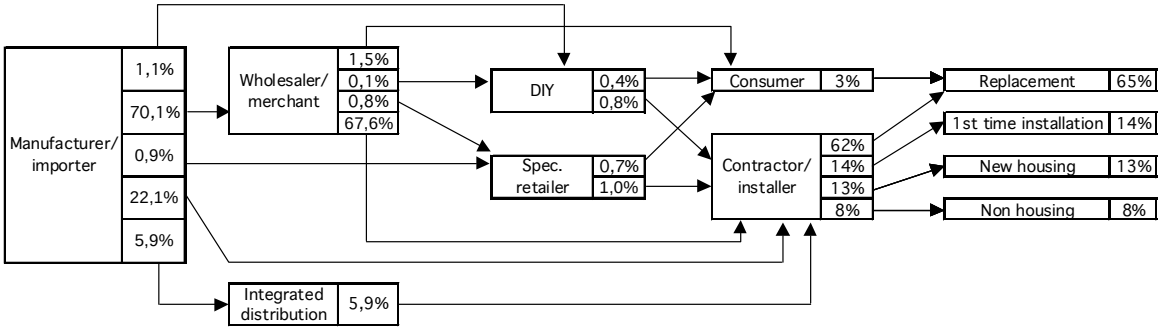


Figure 4-2. Floor standing gas boiler distribution (Source: BRGC, 2006)

The bulk of sales go through wholesalers/merchants. Especially for wall hung gas boiler market wholesalers are becoming increasingly concentrated (less wholesalers serving the market), with Wolsely and SaintGobain taking the lead.

Another significant portion of sales (approximately 20-30%) are delivered from factory to installers, sometimes through integrated distribution channels (e.g. the Buderus-brand has its own sales organisation).

When looked upon at country level the amount of boilers sold through DIY channels is still limited in volume and ranges from 1 to 3% maximum. The amount of boilers installed by consumers themselves (including boilers obtained through installers) ranges from 5 to 17% for a specific number of countries for which these sales are known (FR, NL, PL, SK).

A recent phenomenon related to such sales is the increased importance of online sales. Although factual data is lacking, the mere (growth in) presence of websites that offer boilers to end consumers indicate a market demand for these services.

Most of these online sales channels focus on wall hung gas boilers, that are relatively easy to ship, but oil and solid fuel fired boilers are being offered as well. Offers for heat pumps remain rare (or do not exist yet). The installation of the boiler is optional: consumers may decide to install the boilers themselves, leaving only the commissioning of the system (final check of safety and performance) to certified installers, depending on what local or national regulation prescribes/allows.

4.3 Associations

Consumer organisations regularly test central heating boilers. The German consumer magazine Stiftung Warentest appears most dedicated towards these tests and covers a boiler test at least once a year. The results of the tests in the years 2003-2006 are described below (the 2005 solid fuel (pellet) boiler test results are omitted).

4.4 Manufacturing costs

In order to evaluate the impact of specific design options (task 6, 7) it is needed to clarify mark-ups and margins on the manufacturing costs. The estimates in this paragraph are based on expert interviews, analogies with similar sectors as well as VHK costing and engineering experience.

A first step in the split-up is the calculation of the manufacturer selling price from the consumer price. For this we assumed wholesale margins of ca. 30% and installer margins of 20% and VAT of 19%. The table shows the result, which comes down to a manufacturing selling price excl. VAT of around € 800 per heat generator (€ 812,- to be exact, but with an accuracy of ± 10%).

Table 4-2. Assessment of Manufacturing Selling Price (est. VHK 2006)

	Price in Euro	Factor of msp	mark-up
List price, incl. VAT 19%	1744		15%
Consumer street price, incl. VAT 19%	1500	1,84	19%
Consumer street price, excl. VAT 19%	1260	1,55	20%
Wholesale price	1055	1,3	30%
Msp: Manufacturer selling price	812	1	

This is some 20% (€ 140,-) higher than what was found as in average in the PRODCOM Eurostat data (average € 660). Possible explanations are:

- the PRODCOM data only relate to gas-and oil-fired boilers, whereas we have included also the more expensive electric heat pump boilers.
- The PRODCOM data are running some 3 years behind, i.e. 2004 data relate to a time when e.g. the market share of the more expensive condensing boilers was lower.

- PRODCOM product definitions are not always very clear, leading to cross-contamination of unit-sales with production of water heaters or boiler components (burners, heat exchanger bodies, etc.).
- PRODCOM statistics also include OEM-deliveries of complete boilers between boiler manufacturers. For these deliveries the overhead –and thereby the manufacturing selling price—is significantly lower than for boilers sold directly..

The second step is the split-up of the manufacturing selling price into its main components: overhead, labour, purchases from OEM and raw materials industry. Starting point is the current practice that –even though some manufacturers may still have some component production (e.g. a foundry for heat exchangers or some basic metal working— this component production is in most cases regarded by management as a separate profit center, completely independent of the boiler production. Hence, for purchasers of these components also the in-house component production is to be seen as an OEM, usually with no specific obligations to buy in-house.

In that sense, the 'OEM' purchases make up some 50% of manufacturer's costs and the only direct labour costs (15%) are attributed to activities such as the final assembly, testing and packaging. Some manufacturers have still retained the finishing (powder-coating of envelope) as an in-house activity, although this is also quite seldom. Direct purchases of raw materials from the metals industry are almost non existing, as most components are purchased in a (semi) finished and –as much as possible-- pre-assembled state.

A fairly large proportion of the msp is made up of overhead costs, relating to marketing, administration and margin. For the manufacturer this is around 35% of the total, but also the primary and secondary OEMs take their share in overhead, leading up to a situation where almost half of the final selling price (47%) is made up by overhead and the other half (53%) consists of direct labour and raw materials in roughly equal proportions. The raw materials fraction amounts to around

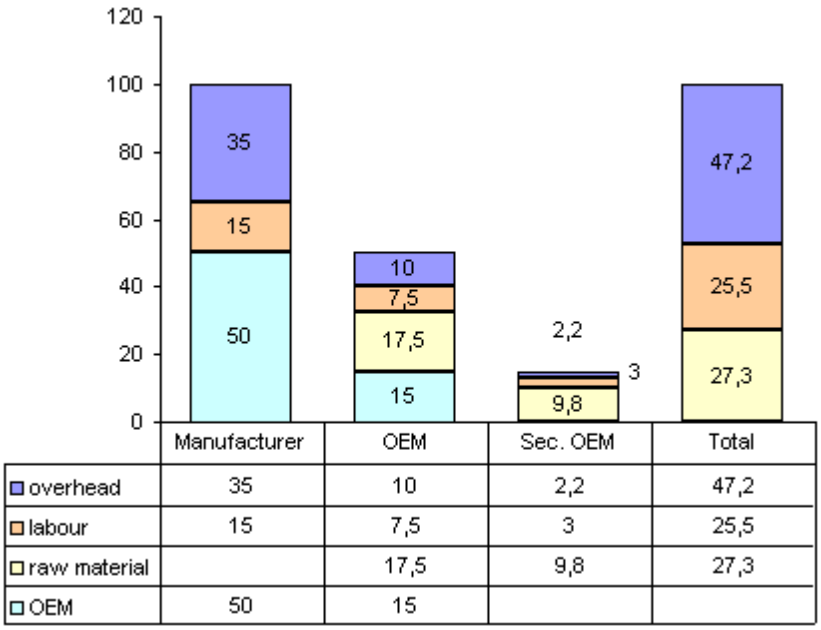
€ 220,-. At a product weight in the range of 50-100 kg this amounts to some €2,50 to €4,- per kg, which is not an unrealistic figure in view of the current ferro and non-ferro prices.

Finally, the OEM material costs (50% of total, € 406,- average) can be split-up per sub-assembly. Naturally, these costs will vary according to specific design characteristics and it is difficult to give an exact EU average in this respect. The table below gives some general examples relating to high-end EU-produced wall-hung gas-boilers. It is intended as a first guidance, but no more than that. Low-end versions of each category may well have manufacturing costs 30-40% lower, whereas jet burners will have higher manufacturing costs. In the Task 4 report (Technical Analysis) and the Task 6 report (on design options), more specific information will be supplied.

Table 4-3. MSP (manufacturer selling price) split up (est. VHK 2006)

			€	€	€
MSP (manufacturer selling price)	100%		812		
Overhead (marketing, admin, margin)	35%		284		
Labour (finishing, assembly, testing, packaging)	15%		122		
Subassemblies & components (OEM)	50%		406		
of which					
OEM: Overhead				81	
OEM: Labour		15% (=7,5% * msp)		61	
OEM: Raw materials		35% (=17,5% * msp)		142	
OEM: Secondary OEMs		30% (= 15% * msp)		122	
of which					
Sec. OEM: Overhead		15% (=2,2% * msp)			18
Sec. OEM: Labour		20% (=3% * msp)			24
Sec. OEM: Raw materials		65% (=9,8% *msp)			79

Overall: Overhead 47,2% (€ 383), labour 25,5% (€ 205), materials 27,3% (€ 221)



	Manufacturer	OEM	Sec. OEM	Total
overhead	35	10	2,2	47,2
labour	15	7,5	3	25,5
raw material		17,5	9,8	27,3
OEM	50	15		

Table 4-4. OEM materials costs indications per subassembly, gas-fired wall-hung (estimate VHK 2006)

	A	B	C	D
condensing or not	non-condensing	non-condensing	condensing	condensing
flue/air system	open	open	room-sealed	room-sealed
solo/combi	solo	combi	solo	combi
hot water store		4		25
Power range	20-24 kW	20-24 kW	20-24 kW	29-36 kW
SUB-ASSEMBLY	euro	euro	euro	euro
heat exchanger, incl. combustion chamber, heat exchanger, flue duct	80	85	125	145
el. control unit, incl. electronics base unit, 230 V cable & plug, max. thermostat, sensors, pressure diff. switch, cable subass.	50	50	95	110
burner unit, incl. ignition, mixing chamber, burner sensors (thermostat/ionisation)	20	20	25	35
gas control unit, incl. internal gas pipes to burner and valve	35	35	35	35
CH return assembly, incl. piping, circulator pump	40	40	70	80
CH supply assembly, incl. piping, overflow valve (excl. 3-way valve, because taken into account with hot water production)	10	10	10	10
air supply unit, incl. 24 V fan, fan control, internal duct to burner	.	.	35	40
casing, frame & human interface, incl. external casing, inner casing, insulation, panel	30	30	45	60
condensate collector & drain, incl. collector, drain, diverters/condensing plate	.	.	30	35
hot water production, incl. tank and/or flow-thru heat-exchanger, 3-way valve, temp. sensor	.	60	.	160
packaging, incl. foil, instruction manual, pallet (4 on 1)	10	10	13	15
Total	**275**	**340**	**483**	**725**

ANNEX A

Country Tables

Country Tables, summary of BRG Consult data

- Stock 2004
- Sales 2004
- Technical Segmentation Gas Wall Hung Boilers
- Technical Segmentation Gas Floor Standing Boilers
- Technical Segmentation Jet Burners (mostly oil-fired)
- Forecasts, time series 1990, 2004, 2010, 2025.

Table A-1. Park of main boiler types, by Country, in ' 000 dwellings (source: BRG Consult, 2006)

	INDIVIDUAL WET CENTRAL HEATING (excl. solid fuel boilers)																COLLECTIVE WET CENTRAL HEATING		TOTAL WET CH SYSTEMS (excl. solid fuel boilers)		OTHER: Solid fuel, district heating, dry electric, local heaters, no heating		TOTAL NUMBER OF DWELLINGS	
	Gas wall-hung non-condens		Gas WH condens.		Gas floorstanding		Gas jet burner		Oil jet burner		Electric boiler		Heat pump		Total indiv. wet CH (excl. solid fuel)									
	1990	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*	*1990*	*2004*
Austria	264	340	1	175	201	134	67	83	260	343	0	0	46	58	839	1,134	970	905	1,809	2,039	1,720	1,981	3,529	4,020
Belgium	318	692	0	84	386	475	51	65	790	919	0	0	0	0	1,546	2,236	465	255	2,011	2,491	1,740	1,233	3,751	3,724
Czech R.	86	742	0	25	90	376	1	2	1	2	16	11	0	0	194	1,158	475	280	669	1,438	3,415	2,556	4,084	3,994
Denmark	124	227	0	59	10	17	5	5	602	369	0	0	0	13	742	690	246	109	988	799	1,585	2,001	2,573	2,800
Estonia	1	13	0	0	1	3	0	0	19	21	1	3	0	0	22	40	66	66	88	106	514	516	602	622
Finland	0	0	0	0	0	0	0	0	391	455	5	6	5	40	402	501	76	77	478	578	1,956	2,293	2,434	2,871
France	3,450	6,697	120	184	1,735	2,026	0	0	3,580	4,361	0	0	0	86	8,885	13,354	3,922	4,889	12,807	18,243	13,531	11,975	26,338	30,218
Germany	1,602	4,150	32	1,243	2,054	3,577	1,223	2,040	4,781	6,467	0	0	0	66	9,691	17,542	8,640	12,047	18,331	29,589	15,019	8,809	33,350	38,398
Greece	4	30	0	0	0	1	10	47	1,480	1,630	0	0	0	0	1,493	1,709	800	1,000	2,293	2,709	2,544	2,941	4,837	5,650
Hungary	324	768	0	7	169	477	2	9	1	4	0	0	0	0	495	1,266	120	160	615	1,426	3,238	2,747	3,853	4,173
Ireland	75	435	0	6	16	29	0	0	170	460	29	37	0	0	289	967	33	60	322	1,027	660	343	982	1,370
Italy	4,667	12,022	0	223	1,072	1,683	211	266	3,430	884	0	0	2	89	9,382	15,166	5,750	5,500	15,132	20,666	9,587	7,275	24,719	27,941
Latvia	0	25	0	1	9	5	1	2	0	1	0	0	0	0	10	34	100	167	110	201	893	764	1,003	965
Lithuania	0	55	0	1	1	24	0	2	6	8	0	0	0	0	6	89	60	100	66	189	1,087	1,115	1,153	1,304
Netherlands	3,513	1,548	193	3,310	155	180	0	0	0	0	0	0	0	9	3,861	5,048	800	1,000	4,661	6,048	1,141	762	5,802	6,810
Poland	236	856	0	26	58	214	27	102	70	145	0	0	0	0	392	1,343	942	1,320	1,334	2,663	9,698	10,020	11,032	12,683
Portugal	3	179	0	0	1	7	1	3	1	34	0	0	0	0	7	223	4	32	11	255	4,086	5,016	4,097	5,271
Slovakia	16	136	0	14	163	251	0	0	0	0	0	0	0	0	179	401	150	150	329	551	1,428	1,348	1,757	1,899
Slovenia	1	41	0	3	0	10	1	8	189	221	0	0	0	0	191	284	63	60	254	344	385	452	639	796
Spain	715	4,094	0	3	32	69	10	6	403	1,548	0	0	0	0	1,159	5,720	1,100	1,700	2,259	7,420	14,571	14,678	16,830	22,098
Sweden	5	15	0	0	0	0	0	0	396	390	459	472	77	566	938	1,443	492	400	1,430	1,843	3,295	3,217	4,725	5,060
United K.	6,381	13,143	1	1,150	6,790	5,412	0	0	937	1,100	427	587	0	0	14,536	21,392	430	147	14,966	21,539	6,744	3,516	21,710	25,055
Total EU22	21785	46207	346	6514	12943	14971	1608	2642	17510	19361	937	1115	129	928	55259	91,739	25704	30,425	80,963	122,164	98834	85,560	179797	207,724
% of total	12,10	22,20	0,20	3,10	7,20	7,20	0,90	1,30	9,70	9,30	0,50	0,50	0,10	0,40	35,70	47,10	14,30	14,60	60,30	71,90	10,30	10,10	100,00	100,00

Table A-2. Boiler Sales, by country, by type (BRGC 2006)

	Gas Wall Hung non condensing		Gas Wall Hung condensing		Gas Floor Standing,non condensing		Gas Floor Standing, condensing		Jet Burner (oil and gas)		Solid Fuel		Electric		Heat Pumps		TOTAL		% of EU22	
	1990	2004	1990	2004	1990	2004	1990	2004	1990	2004	1990	2004	1990	2004	1990	2004	1990	2004	1990	2004
Austria	29	26	1	18,2	11,6	3,1	0,4	2,2	33	12,9	21	17,5	0	0	1	3,78	97	84	*1,4%*	*1,2%*
Belgium	26	78,2	0	27	29	25,4	0	1,2	51	41,7	1	1	0	0	0	0,425	107	175	*1,5%*	*2,5%*
Czech	7	76,5	0	8	25	10,3	0	1,7	0,5	1,12	28	39,3	2	10,8	0	0	62,5	148	*0,9%*	*2,1%*
Denmark	9	6,6	0	16,65	0,7	0,65	0	0	6,5	5,8	1,1	4,5		0	0	0,2	17,3	34	*0,2%*	*0,5%*
Estonia	0,4	2	0	0,27	0,1	0,43	0	0	0,1	0,675	0,1	1,9	0	0,2	0	0	0,7	5	*0,0%*	*0,1%*
Finland	0	0	0	0	0	0	0	0	9,6	12,4	2	2,1	0,7	0,2	0	4,5	12,3	19	*0,2%*	*0,3%*
France	318	505	14	32,3	62	68,8	0	0	130	198,7	17	7,5	0	0	0	21,495	541	834	*7,7%*	*11,9%*
Germany	292	155	8	340	212	62	3	18	294	202	19	20	0	0	0	12,65	828	810	*11,8%*	*11,6%*
Greece	0,7	11,5	0	0,2	0	0,35	0	0,3	58	67	3	0,7	0	0	0	0	61,7	80	*0,9%*	*1,1%*
Hungary	43	84	0	2,05	65	18	0	2	1	1	18	3,6	0	0	0	0	127	111	*1,8%*	*1,6%*
Ireland	12	55,3	0	2,7	1,25	2,4	0	0	26	47	6	3,8	0,9	1,4	0	0	45,925	113	*0,7%*	*1,6%*
Italy	848	1171,3	0	59,1	160	59,9	0	5	99	46,4	5	4,9	0	0	2	13,378	1114	1360	*15,9%*	*19,5%*
Latvia	0	5	0	0,5	0,1	1	0	0	0,6	0,5	2,6	6	0	0	0	0	3,3	13	*0,0%*	*0,2%*
Lithuania	0	7,6	0	0,45	1	3,2	0	0	0	0,49	4	10,5	0	0	0	0	5	22	*0,1%*	*0,3%*
Netherlands	196	44	43	364	44	4,2	3	3,7	1	0,8	5	1	0	0	0	2,072	292	420	*4,2%*	*6,0%*
Poland	15	115	0	11,4	15	16,7	0	1,2	7	17	100	75,2	0	0	0	0	137	237	*2,0%*	*3,4%*
Portugal	1,8	33	0	0	0,3	1,3	0	0	0,5	16	1,9	0,1	0	0	0	0	4,5	50	*0,1%*	*0,7%*
Slovakia	1	20,5	0	5,8	12	16,9	0	1	0	0,39	14	14,6	0	0,4	0	0	27	60	*0,4%*	*0,9%*
Slovenia	0,5	6,45	0	1,45	0,2	0,8	0	0	12	9,6	7	8,3	0	0,13	0	0	19,7	27	*0,3%*	*0,4%*
Spain	160	437	0	1	4	7,6	0	0	90	100	6	0,1	0	0	0	0,1	260	546	*3,7%*	*7,8%*
Sweden	0	0,25	0	0,9	0,5	0,3	0	0,2	12,5	3	12	9	22,5	7,5	20,05	60,2	67,55	81	*1,0%*	*1,2%*
UK	543	1144,8	1	403,97	297	67,8	0	16,027	70	106	14	5	10	18	0	0,32	935	1762	*13,4%*	*25,2%*
EU22	2502	3985	67	1296	941	371	6	53	902	890	288	237	36	39	23	119	4765	6989	100,0%	100,0%

Table A-3a. EU Boiler Sales 2004, by country, by end-use (source: BRGC 2006)

Product	Total sales	New house	1st install.	Replace-ment	Non house	Total sales	New house	1st install.	Replace-ment	Non house	Total sales	New house	1st install.	Replace-ment	Non house	Total sales	New house	1st install.	Replace-ment	Non house
	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000
	AUSTRIA					BELGIUM					CZECH REPUBLIC					DENMARK				
Wall Hung Gas Non Cond	26	4,9	3,9	17,2	-	78	20,3	12,7	39,6	5,6	77	23,7	22,2	30,6	-	7	0,7	1,0	5,0	-
Wall Hung Gas Cond	18	7,8	2,4	7,8	0,2	27	9,5	3,7	9,0	4,8	8	2,5	2,3	3,2	-	17	5,8	3,4	7,5	-
Gas Floor Standing	5	0,4	0,5	3,9	0,4	27	6,1	3,6	13,8	3,1	12	0,8	1,8	3,4	6,0	1	-	0,1	0,5	0,1
Jet Burner Boilers	13	2,2	2,1	7,1	1,5	42	4,1	6,0	27,0	4,6	1	0,3	0,4	0,2	0,2	6	0,3	0,3	4,5	0,6
Solid Fuel	18	5,1	4,4	7,9	0,2	1	-	-	1,0	-	39	3,1	4,7	27,5	3,9	5	0,9	0,5	3,2	-
Electric											11	0,9	1,3	8,6	-					
Heat Pumps	4	2,0	1,1	0,5	0,2															
Total	84	22	14	44	3	175	40	26	90	18	148	31	33	74	10	34	8	5	21	1
	ESTONIA					FINLAND					FRANCE					GERMANY				
Wall Hung Gas Non Cond	2	0,6	1,2	0,2	-	-	-	-	-	-	505	141,9	77,3	258,6	27,3	155	17,8	27,9	109,3	-
Wall Hung Gas Cond	0	0,1	0,1	0,0	0,0	-	-	-	-	-	32	9,9	4,2	16,8	1,5	340	142,8	34,0	159,8	3,4
Gas Floor Standing	0	0,0	0,2	0,1	0,1	-	-	-	-	-	69	7,6	5,6	51,7	3,9	80	4,0	4,0	65,6	6,4
Jet Burner Boilers	1	0,1	0,1	0,2	0,3	12	1,5	0,7	9,5	0,6	199	12,1	11,9	163,5	11,1	202	20,2	16,2	141,4	24,2
Solid Fuel	2	0,3	0,2	1,0	0,5	2	0,3	0,2	1,6	0,0	8	0,1	0,7	6,7	-	20	1,9	2,4	15,5	0,2
Electric	0	0,0	0,1	0,1	0,0	0	0,0	0,0	0,2	0,0										
Heat Pumps						5	2,6	1,4	0,3	0,2	21	11,5	4,0	4,0	2,0	13	6,7	4,0	0,6	1,3
Total	6	1	2	2	1	19	4	2	12	1	834	183	104	501	46	810	193	89	492	36
	GREECE					HUNGARY					IRELAND					ITALY				
Wall Hung Gas Non Cond	12	2,9	8,4	-	0,2	84	12,6	21,0	48,7	1,7	55	37,5	14,4	3,4	-	1171	205,8	66,3	893,4	5,9
Wall Hung Gas Cond	0	0,1	0,1	-	0,0	2	0,3	0,5	1,2	0,1	3	1,9	0,6	0,2	-	59	20,1	0,6	33,5	5,0
Gas Floor Standing	1	-	0,7	-	-	20	8,0	9,8	0,4	1,8	2	0,3	0,2	1,8	0,2	65	7,5	3,3	50,9	3,3
Jet Burner Boilers	67	26,7	15,2	21,7	3,4	1	0,5	0,4	0,0	0,1	47	19,7	11,3	10,3	5,6	46	2,5	1,3	36,6	6,0
Solid Fuel	1	-	-	0,7	-	4	2,9	0,4	0,1	0,2	4	1,4	0,5	1,6	0,2	5	0,7	1,7	2,5	-
Electric											1	0,6	0,2	0,6	-					
Heat Pumps																	13	12,4	0,5	0,5
Total	80	30	24	22	4	111	24	32	50	4	113	61	27	18	6	1360	249	74	1 017	20

Table A-3b. EU Boiler Sales 2004, by country, by end-use (source: BRGC 2006) c'td

Product	Total sales	New house	1st install.	Replace-ment	Non house	Total sales	New house	1st install.	Replace-ment	Non house	Total sales	New house	1st install.	Replace-ment	Non house	Total sales	New house	1st install.	Replace-ment	Non house
	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000	'000
	LATVIA					LITHUANIA					NETHERLANDS					POLAND				
Wall Hung Gas Non Cond	5	1,0	3,4	0,6	0,2	8	3,5	3,8	0,4	-	44	6,9	3,8	29,0	4,3	115	63,7	22,0	25,9	3,4
Wall Hung Gas Cond	0	0,2	0,2	0,0	0,0	0	0,2	0,2	0,0	0,0	364	57,1	31,7	239,9	35,3	11	6,1	2,5	2,4	0,4
Gas Floor Standing	1	0,0	0,4	0,3	0,2	3	0,4	1,6	0,7	0,5	8	0,5	-	7,2	0,2	18	8,8	3,7	4,0	1,4
Jet Burner Boilers	1	0,0	0,1	0,3	0,2	1	0,1	0,1	0,1	0,2	1	-	-	0,8	-	17	7,7	3,7	4,5	1,2
Solid Fuel	6	0,3	0,6	4,2	0,9	11	0,9	3,5	5,5	0,6	1	-	-	1,0	-	75	22,6	1,2	48,4	3,0
Electric																				
Heat Pumps												2	2,0	-	-					
Total	13	2	5	5	1	22	5	9	7	1	420	67	35	278	40	237	109	33	85	9
	PORTUGAL					SLOVAKIA					SLOVENIA					SPAIN				
Wall Hung Gas Non Cond	33	28,4	3,0	1,0	0,7	21	4,5	6,2	9,8	-	6	4,5	0,9	0,5	0,6	437	243,4	89,6	101,4	2,2
Wall Hung Gas Cond	-	-	-	-	-	6	1,3	4,2	0,3	-	1	1,0	0,2	0,1	0,1	1	-	1,0	-	-
Gas Floor Standing	1	0,1	0,0	0,7	0,5	18	2,7	4,5	7,2	3,6	1	0,2	0,2	0,2	0,2	8	3,5	1,1	1,7	1,3
Jet Burner Boilers	16	3,5	6,1	5,0	1,4	0	0,1	0,1	0,0	0,2	10	1,0	2,4	1,0	5,2	100	30,0	17,0	40,0	13,0
Solid Fuel	0	-	-	0,1	-	15	1,5	5,3	6,4	1,5	8	0,1	1,7	2,4	4,2	0	-	-	0,1	-
Electric						0	0,1	0,2	0,2	-	0	0,0	0,0	0,0	0,1					
Heat Pumps																				
Total	50	32	9	7	3	60	10	20	24	5	27	7	5	4	10	546	277	109	143	16
	SWEDEN					UK														
Wall Hung Gas Non Cond	0	0,0	0,2	0,0	0,0	1 145	99,5	190,9	854,4	-										
Wall Hung Gas Cond	1	0,1	0,5	0,2	0,1	404	60,9	85,3	257,7	-										
Gas Floor Standing	1	0,0	0,1	0,3	0,2	84	3,4	5,7	65,9	9,0										
Jet Burner Boilers	3	0,1	-	2,3	0,6	106	6,6	15,9	70,5	13,0										
Solid Fuel	9	0,8	2,3	5,2	0,6	5	0,3	0,3	4,4	-										
Electric	8	1,3	3,4	2,6	0,3	18	1,2	2,5	14,3	-										
Heat Pumps	60	7,2	37,3	12,0	3,6															
Total	81	10	44	23	5	1762	172	301	1267	22										

Table A-4. EU Boiler Sales 2004, by Country, Technical Segmentation for Wall Hung Gas Boilers in '000 units (BRGC 2006)

Product characteristics	Total	Output (kW)					Condensing		Hot water production						Burner type			Flue type	
		SMALL (limit)		MEDIUM	LARGE (limit)		No	Yes	Combis:	- conv./ pre-heat	- storage combis (>40 l)	- with cylinder	- without cylinder	Mounted on fs cylinder	conv.	fan assisted premix	other low NO_x	open	room sealed: fanned
Austria	44,2	3,9	*(<12 kW)*	23,2	17	*(>20 kW)*	26,0	18,2	16,8	16,2	0,6	19,7	7,7	–	6,5	18,2	19,5	27,3	16,9
Belgium	105,2	8,2	*(<23 kW)*	60,8	36,2	*(>25 kW)*	78,2	27,0	90,2	78,3	11,9	2,6	12,4	–	58,7	27,0	19,6	31,3	73,9
Czech Republic	84,5	11,5	*(<12 kW)*	12,2	60,8	*(>20 kW)*	76,5	8,0	71,0	63,4	7,7	8,1	5,4	–	68,1	8,8	7,7	46,2	38,3
Denmark	23,0	16,6	*(<18 kW)*	2,4	1,5	*(>25 kW)*	6,6	16,5	0,6	0,3	0,3	20,5	2,0	–	0,0	16,5	6,5	–	23,0
Estonia	2,3	–		–	–		2,0	0,3	1,5	1,4	0,1	–	–	–	–	–	–	–	–
Finland	0,0	–		–	–		0,0	0,0	–	–	–	–	–	–	–	–	–	–	–
France	537,3	–	*(<15 kW)*	430	107,3	*(>25 kW)*	505,0	32,3	471,1	356,1	115,0	35,4	24,3	6,5	500,9	32,3	4,1	232,3	305,0
Germany	495,0	72,1	*(<15 kW)*	359,4	63,5	*(>25 kW)*	155,0	340,0	135,0	116,0	19,0	219,5	81,5	59,0	7,8	340,0	147,3	250,7	244,3
Greece	11,7	0,0	*(<15 kW)*	8,3	3,4	*(>25 kW)*	11,5	0,2	10,9	10,2	0,7	0,3	0,5	–	11,5	0,2	0,0	0,7	11,0
Hungary	86,1	9,2	*(<15 kW)*	68,9	7,9	*(>25 kW)*	84,0	2,1	71,1	61,6	9,6	8,0	7,0	–	80,6	2,1	3,4	48,7	37,4
Ireland	58,0	20,0	*(<12 kW)*	34,9	3,1	*(>24 kW)*	55,3	2,7	7,6	7,2	0,4	45,7	4,6	–	55,3	2,7	0,0	0,5	57,5
Italy	1230,4	1,2	*(<17 kW)*	1084,3	144,9	*(>25 kW)*	1171,3	59,1	1198,1	1078,5	119,7	16,6	15,6	–	1101,0	111,8	17,6	281,1	949,3
Latvia	5,5	–		–	–		5,0	0,5	4,1	4,0	0,1	0,7	0,7	–	0,0	0,0	0,0	0,0	0,0
Lithuania	8,1	–		–	–		7,6	0,5	7,8	7,1	0,7	0,1	0,1	–	0,0	0,0	0,0	0,0	0,0
Netherlands	408,0	210,3	*(<23 kW)*	153,3	44,4	*(>30 kW)*	44,0	364,0	359,5	255,0	104,5	18,5	30,0	–	32,6	364,0	11,4	9,5	398,5
Poland	126,4	2,4	*(<15 kW)*	113,5	10,5	*(>24 kW)*	115,0	11,4	84,0	82,9	1,2	13,8	28,6	–	113,0	10,5	2,9	103,5	22,9
Portugal	33,0	–	*(<15 kW)*	30,4	2,6	*(>25 kW)*	33,0	*0,0*	31,7	28,4	3,3	1,0	0,3	–	33,0	0,0	0,0	14,9	18,2
Slovakia	26,3	2,1	*(<12 kW)*	6,4	17,9	*(>20 kW)*	20,5	5,8	21,3	19,4	1,8	2,7	2,4	–	19,5	6,0	0,8	14,1	12,2
Slovenia	7,9	0,6	*(<15 kW)*	6,3	1	*(>25 kW)*	6,5	1,5	6,8	6,6	0,2	0,5	0,6	–	3,9	1,5	2,6	3,9	4,0
Spain	438,0	3,0	*(<18 kW)*	371	64	*(>25 kW)*	437,0	1,0	434,0	414,0	20,0	3,0	1,0	–	438,0	–	–	97,0	341,0
Sweden	1,2	0,1	*(<15 kW)*	1	–	*(>15 kW)*	0,3	0,9	–	–	–	0,3	0,8	–	–	1,0	0,2	–	1,2
UK	1548,8	203,0	*(<12 kW)*	1044	317,8	*(>24 kW)*	1144,8	404,0	1095,8	1005,1	90,7	384,5	68,5	–	1137,9	410,9	0,0	70,0	1478,8
Europe - Wall Hung Gas	5280,8	564		3810	904		3985	1295,9	4119	3611,6	507	801	294	65	3668	1353	243	1231	4033
in %	100%	11%		72%	17%		75%	25%	78%	68%	10%	15%	6%	1%	69%	26%	5%	23%	76%

Table A-5. EU Boiler Sales 2004, by country, Technical Segmentation for Gas Floor Standing Boiler in '000 units (BRGC 2006)

Product characteristics	Total	Output (kW)					Condensing		Hot water production					Burner type			Flue type	
		<30		30-<70		70+	No	Yes	Combi	Non-combi	with built-in cylinder	with external cylinder	without cylinder	conventional	fan assisted premix	other low NO_x	open	room sealed: fanned
Austria	5,3	4,0	(<30 kW)	1,0	0,4	*(>60 kW)*	3,1	2,2			0,6	4,0	0,7	0,5	2,2	2,6	5,3	0,0
Belgium	26,6	17,1	(<35 kW)	7,0	2,5	*(>70 kW)*	25,4	1,2			9,3	5,7	11,6	25,4	1,2		22,9	3,7
Czech Republic	12,0	10,8	(<49 kW)	1,2		*(>60 kW)*	10,3	1,7			0,6	6,8	4,6	9,6	1,8	0,6	11,3	0,7
Denmark	0,7			0,7		*(>70 kW)*	0,4	–			0,3	0,3		0,3		0,3	0,0	0,7
Estonia	0,4			0,4			0,4	–										
Finland	0,0			0,0			–	–										
France	68,5	55,0	(<30 kW)	10,1	3,4	*(>70 kW)*	77,0	2,5	0,2		11,3	23,6	33,3	34,5	2,2	31,8	48,4	20,1
Germany	80,0	45,5	(<25 kW)	18,9	15,6	*(>50 kW)*	62,0	18,0			12,4	44,5	23,1	3,1	18,0	58,9	50,6	29,4
Greece	0,6			0,6			0,3	0,3										
Hungary	20,0	2,7	(<25 kW)	7,9	9,4	*(>49 kW)*	18,0	2,0			0,9	6,1	13,0	17,3	2,0	0,7	17,1	2,9
Ireland	2,4	1,1	(<18 kW)	1,2		*(>24 kW)*	0,6	1,8				0,4	2,0	2,4			2,0	0,4
Italy	64,9	61,3	(<50 kW)	3,6		*(>50 kW)*	59,9	5,0	19,8		22,7	9,9	12,4	52,7	11,0	1,2	53,9	11,0
Latvia	1,0			1,0			1,0	–										
Lithuania	3,2			3,2			3,2	–										
Netherlands	7,9	2,9	(<30 kW)	1,2	3,9	*(>60 kW)*	4,2	3,7			0,6	1,7	5,6	4,2	3,7	0,0	4,2	3,7
Poland	17,9	12,2	(<35 kW)	5,3	0,3	*(>150 kW)*	16,7	1,2			1,8	6,4	9,6	9,7		8,2	16,7	1,2
Portugal	1,3	0,7	(<30 kW)	0,5	0,1	*(>70 kW)*	1,3	–	0,4		0,1	0,7	0,1	1,3			1,3	0,0
Slovakia	17,9	12,6	(<30 kW)	3,6	1,8	*(>60 kW)*	16,9	1,0			0,5	3,0	14,4	16,7	1,1	0,2	17,1	0,8
Slovenia	0,8						0,8	–										
Spain	7,6	0,8	(<25 kW)	3,8	3,0	*(>50 kW)*	7,6	–	0,6		5,0	1,4	0,6	7,6			5,6	2,0
Sweden	0,5			0,5		*(>50 kW)*	0,3	0,2				0,3	0,2	0,1	0,2	0,2	0,4	0,1
UK	83,8	69,1	(<24 kW)	5,7	9,0	*(>44 kW)*	67,8	–	23,0			20,8	40,0	67,8	16,0		48,3	35,5
EU22	423	296		78	49		377	41	44		66	136	171	253	59	105	305	112
in %	100%	70%		18%	12%		89%	10%	10%		16%	32%	40%	60%	14%	25%	72%	26%

Table A-6. EU Sales 2004, by country, Technical Segmentation for Jet Burner Boilers (mostly oil) in '000 units (BRGC 2006)

Product characteristics	Total	jet oil					Condensing		Hot water production			Flue type	
		SMALL (limit) ca. <30 kW		MEDIUM	LARGE (limit) ca. >70 kW		No	Yes	with built-in cylinder	with external cylinder	without cylinder	open	room sealed
Austria	12,9	8,7	*(<30 kW)*	3,4	0,8	*(>60 kW)*	12,4	0,5	2,5	5,7	4,7	11,6	1,3
Belgium	41,7	22,2	*(<35 kW)*	15,0	4,5	*(>60 kW)*	41,6	0,2	12,2	13,7	15,8	41,5	0,2
Czech Republic	1,1	*0,1*	*(<30 kW)*	0,1	0,9	*(>60 kW)*	1,0	0,1	0,1	0,3	0,8	1,1	
Denmark	5,8	4,9	*(<35 kW)*	0,5	0,4	*(>70 kW)*	5,7	0,1	4,2	0,6	0,9	5,8	
Estonia	0,7			0,7			*0,7*						
Finland	12,4	11,8	*(<35 kW)*	0,6	0,0	*(>50 kW)*	12,3	0,1	5,3	1,6	5,5	12,4	
France	199,0	161,8	*(<30 kW)*	24,9	12,2	*(>70 kW)*	196,5	2,5	100,2	37,7	61,1	164,3	34,7
Germany	202,0	117,4	*(<25 kW)*	57,5	27,1	*(>50 kW)*	178,0	24,0	39,4	107,2	55,4	134,8	67,2
Greece	67,0	26,9	*(<30 kW)*	23,1	17,0	*(>70 kW)*	67,0		14,4	26,2	26,4	65,2	1,8
Hungary	1,0			1,0			*1,0*						
Ireland	47,0	35,3	*(<27 kW)*	11,8		*(>27 kW)*	47,0			45,1	1,9	23,5	23,6
Italy	46,4	20,8	*(<35 kW)*	6,0	19,6	*(>50 kW)*	46,4		5,0	5,3	36,1	43,9	2,5
Latvia	0,5						*0,5*						
Lithuania	0,5						*0,5*						
Netherlands	0,8	0,0	*(<60 kW)*	0,3	0,5	*(>120 kW)*	0,8				0,8	0,8	
Poland	17,0	13,6	*(<50 kW)*	2,6	0,8	*(>200 kW)*	17,0		6,0	7,7	3,4	11,1	5,9
Portugal	16,0	3,9	*(<30 kW)*	10,8	1,3	*(>70 kW)*	16,0		4,9	3,7	7,4	14,0	2,0
Slovakia	0,4			0,4			*0,4*						
Slovenia	9,6			9,6			*9,6*						
Spain	100,0	24,3	*(<25 kW)*	69,6	6,1	*(>50 kW)*	100,0		44,0	14,7	41,3	92,0	8,0
Sweden	3,0	0,6	*(<30 kW)*	1,7	0,7	*(>50 kW)*	3,0		0,6	0,4	2,0	3,0	
UK	106,0	90,4	*(<44 kW)*		15,6	*(>44 kW)*	99,5	6,5		93,0	13,0	1,0	105,0
EU22	891	543		240	108		857	34	239	363	276	626	252
	100,0%	61,0%		27,0%	12,1%		96,2%	3,8%	26,8%	40,7%	31,0%	70,3%	28,3%

Table A-7a. Country sales outlook 1990 - 2025 (source: BRGC)

Boiler Type	AUSTRIA						BELGIUM						CZECH REPUBLIC						DENMARK					
	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025
Gas W/H Non Cond.	29	26	20	18	11	7	26	78	84	83	86	77	7	77	60	43	38	24	9	7	0	-	-	-
Gas W/H Cond.	1	18	27	39	47	58	-	27	72	84	98	115	-	8	22	38	51	74	-	17	25	29	32	33
Gas Floor Standing Non Cond	12	3	1	1	1	-	29	25	19	14	9	7	25	10	9	6	3	2	1	1	1	-	-	-
Gas Floor Standing Cond	-	2	2	1	1	1	-	1	-	2	4	5	-	2	-	1	3	3	-	-	-	0	1	2
Jet Burner Non Cond	33	13	3	2	1	-	51	42	22	14	7	5	1	1	1	1	2	2	7	6	3	2	1	1
Jet Burner Cond	-	-	2	1	2	2	-	-	1	2	4	7	-	-	0	-	-	2	-	-	1	1	2	3
Solid Fuel	21	18	32	26	23	22	1	1	1	1	1	1	28	39	56	43	41	40	1	5	13	11	9	8
Electric	-	-	-	-	-	-	-	-	-	-	-	-	2	11	10	7	8	6	-	-	-	-	-	-
Heat Pumps	1	4	9	15	19	20	-	0	-	4	9	14	-	-	-	4	6	8	-	0	3	4	6	8
Total	97	84	98	103	106	110	107	175	199	206	218	230	63	148	158	145	150	160	17	34	46	48	51	55

Boiler Type	ESTONIA						FINLAND						FRANCE						GERMANY					
	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025
Gas W/H Non Cond.	0	2	4	3	3	3	-	-	-	-	-	-	318	505	298	277	263	235	292	155	75	76	60	63
Gas W/H Cond.	-	0	3	4	5	6	-	-	-	-	-	-	14	32	340	415	472	538	8	340	502	501	557	578
Gas Floor Standing Non Cond	0	0	0	0	0	-	-	-	-	-	-	-	64	69	18	9	5	3	215	62	30	-	-	-
Gas Floor Standing Cond	-	-	-	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	18	25	57	60	63
Jet Burner Non Cond	0	1	1	0	0	0	10	12	8	5	2	0	128	199	50	28	10	10	294	178	116	95	80	53
Jet Burner Cond	-	-	-	0	0	0	-	0	0	2	4	4	-	-	56	65	78	82	-	25	51	95	119	158
Solid Fuel	0	2	3	2	2	2	2	2	3	3	3	2	17	8	40	37	29	20	19	20	74	57	40	32
Electric	-	0	0	0	0	0	1	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Heat Pumps	-	-	0	0	0	0	-	5	11	13	16	17	0	22	80	92	117	133	0	13	55	66	80	105
Total	1	5	11	11	12	13	12	19	23	23	24	25	541	834	882	923	974	1020	828	810	929	946	995	1050

Boiler Type	GREECE						HUNGARY						IRELAND						ITALY					
	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025
Gas W/H Non Cond.	1	12	50	55	61	66	43	84	70	81	94	105	12	55	52	52	53	49	848	1171	1066	1018	974	912
Gas W/H Cond.	-	0	1	6	12	13	-	2	6	9	12	15	-	3	10	18	28	40	-	59	226	308	391	483
Gas Floor Standing Non Cond	-	0	1	3	6	7	65	18	7	8	8	8	1	2	0	-	-	-	160	60	50	51	46	40
Gas Floor Standing Cond	-	0	-	1	2	3	-	2	1	1	3	5	-	-	-	-	0	0	-	5	-	15	30	48
Jet Burner Non Cond	58	67	52	41	31	33	1	1	1	1	1	1	26	47	43	43	45	48	99	46	31	15	15	16
Jet Burner Cond	-	-	-	3	6	7	-	0	0	0	0	0	-	-	-	2	4	8	-	-	4	15	15	16
Solid Fuel	3	1	0	-	-	-	18	4	10	10	9	8	6	4	3	3	3	3	5	5	6	4	5	5
Electric	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	2	1	2	-	-	-	-	-	-
Heat Pumps	-	-	-	2	4	4	-	-	-	1	4	9	-	-	-	2	6	10	2	13	20	29	46	80
Total	62	80	104	112	122	133	127	111	95	111	130	150	46	113	110	123	141	160	1114	1360	1403	1455	1523	1600

Table A-7b. Country sales outlook 1990 - 2025 (source BRGC 2006) c'td

Boiler Type	LATVIA						LITHUANIA						NETHERLANDS						POLAND					
	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025
Gas W/H Non Cond.	-	5	7	6	8	10	-	8	10	8	8	7	196	44	31	24	16	6	15	115	113	106	107	108
Gas W/H Cond.	-	1	1	3	5	8	-	0	1	4	5	8	43	364	408	440	474	504	-	11	55	76	97	122
Gas Floor Standing Non Cond	0	1	1	1	0	0	1	3	3	1	1	1	47	4	2	5	-	-	15	17	9	6	3	2
Gas Floor Standing Cond	-	-	-	0	0	1	-	-	-	1	1	1	-	4	5	5	10	11	-	1	-	3	6	7
Jet Burner Non Cond	1	1	0	0	0	0	-	0	0	0	0	0	1	1	0	0	0	0	7	17	7	6	3	2
Jet Burner Cond	-	-	-	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-	1	3	6	7
Solid Fuel	3	6	9	7	6	6	4	11	14	13	12	12	5	1	1	1	1	1	100	75	113	97	91	87
Electric	-	-	-	-	-	-	-	-	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Heat Pumps	-	-	-	-	-	-	-	-	0	0	1	1	-	2	9	10	16	28	-	-	3	6	10	14
Total	3	13	18	17	21	25	5	22	28	28	29	30	292	420	457	485	517	550	137	237	301	302	323	350

Boiler Type	PORTUGAL						SLOVAKIA						SLOVENIA						SPAIN					
	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025
Gas W/H Non Cond.	2	33	40	47	55	60	1	21	20	18	17	15	1	6	4	3	3	3	160	437	591	661	711	761
Gas W/H Cond.	-	-	1	1	4	10	-	6	14	18	24	31	-	2	9	12	15	18	-	1	6	7	8	8
Gas Floor Standing Non Cond	0	1	2	1	2	1	12	18	15	10	7	1	0	1	0	-	-	-	4	8	8	10	10	11
Gas Floor Standing Cond	-	-	-	1	1	1	-	-	-	2	3	7	-	-	-	0	1	1	-	-	-	-	-	-
Jet Burner Non Cond	1	16	17	20	20	20	-	0	0	1	-	-	12	10	9	7	5	3	90	100	109	123	123	112
Jet Burner Cond	-	-	-	1	3	5	-	-	0	-	1	1	-	-	-	1	2	3	-	-	-	-	-	-
Solid Fuel	2	0	0	-	-	-	14	15	17	16	15	14	7	8	9	9	9	10	6	0	1	1	1	1
Electric	-	-	-	-	-	-	-	0	0	-	-	-	-	0	0	0	0	0	-	-	-	-	-	-
Heat Pumps	-	-	-	1	1	2	-	-	-	1	1	1	-	-	1	1	1	2	-	0	7	16	26	37
Total	5	50	59	73	87	100	27	60	67	65	66	70	20	27	31	33	36	40	260	546	723	818	880	930

Boiler Type	SWEDEN						UK					
	1990	2004	2010	2015	2020	2025	1990	2004	2010	2015	2020	2025
Gas W/H Non Cond.	-	0	0	-	-	-	543	1145	3	-	-	-
Gas W/H Cond.	-	1	1	1	1	0	1	404	1.267	1.291	1.709	1.744
Gas Floor Standing Non Cond	1	0	1	-	-	-	297	68	1	-	-	-
Gas Floor Standing Cond	-	0	-	0	0	0	-	16	31	36	35	34
Jet Burner Non Cond	13	3	0	-	-	-	70	100	12	-	-	-
Jet Burner Cond	-	-	0	0	0	0	-	7	72	58	58	56
Solid Fuel	12	9	25	23	19	15	14	5	7	4	6	6
Electric	23	8	24	21	18	14	10	18	28	14	19	20
Heat Pumps	20	60	130	107	88	70	-	0	29	43	96	140
Total	68	81	182	153	126	100	935	1762	1450	1447	1922	2000

ANNEX B

Consumer Association Tests

Tests Stiftung Warentest on

- Gas combi boilers, 8/2003
- Oil-fired boilers, 7/2004
- Gas storage combis, 6/2006
- Solar thermal systems, 4/2003

Table B-1. Gas combi-boilers (condensing, with external storage) Stiftung Warentest 8/2003

	Price (euro)	Output (kW)	Storage volume (l)	Electric power - full load (W)	Electric power - standby (W)
Brötje Ecotherm Plus	4300	4.3-19.4	120	75	5
Vaillant ecoTEC classic	4000	9.0-20.0	150	103	6
Viessmann Vitodens 222	4600	6.0-24.0	86 (integrated)	109	13
Buderus Logamax plus	4780	4.3-21.4	160	77	10
Junkers Cerasmart	3770	7.6-20.6	120	100	10
Wolf Comfort-line	4240	5.6-19.0	115	83	6
DeDietrich Domoplus	4320	4.0-23.6	130	113	13
MAN Micromat	4970	3.1-21.4	120	103	13
ATAG HR 3003	4160	21.2	148	105	11
Remeha Quinta 25	4000	21.2	130	105	14

Scoring on basis of:

Energy efficiency	30%
Environment	20%
Quality	15%
Operation & maintenance	35%

Prices are list prices, installers may offer discounts of 10-15%.

Table B-2. Oil Boilers Stiftung Warentest 7/2004

	Price (euro)	Output (kW)	Storage volume (l)	Electric power - full load (W)	Electric power - standby (W)
Giersch Multijet	4760	14-16	condensing	129	4
Viessmann Vitola Plus	6470	18	condensing	106	3.5
Hoval Multi jet	4750	14-16	condensing	129	3.5
Wolf TOK 22 Premio	6800	21.4	condensing	98	3.5
Elco-Klöckner Straton	6250	18-22	condensing	106	6
Veritherm Typ 25	4470	25	condensing	156	8
Buderus Logano	5240	25	non-condensing	110	9
Vaillant iroVit VKO	3530	23.5	non-condensing	113	6
DeDietrich Interdomo	3080	17-21	non-condensing	123	6
Fröling Primatherm	2830	18-22	non-condensing	105	4

Installers may offer discounts of 5-20%.

Scoring on basis of:

Energy efficiency	30%
Environment	20%
Safety	5%
Quality	15%
Operation & maintenance	30%

Table B-3. Gas storage combis Stiftung Warentest 6/2006, p.56-59

	Price	kW	Storage volume	Electric power - full load	Electric power - standby
	(euro)	(kW)	(l)	(W)	(W)
Buderus logamax plus GB132 T-19	4250	7.8-18.8	135	101	6
Wolf CGS-20/160	4410	6.1-20.5	160	83	6
Junkers Cerasmart modul ZSB22/120S	4610	8.6-21.6	122	94	10
Remeha AvantaComfort	4000	6.2-23.2	100	94	4
Vaillant EcoCompact SC 196-C150	4350	9.7-21.6	100	92	6
Weishaupt Thermo Condens Kompakt WTC 25-A	4500	7.5-25.2	115	88	10
Brötje EcoCondens BBS Pro 20C SSP	5020	3.7-20.8	135	53	6
Viessmann Vitodens 333	4280	6.6-26.0	86	111	7
DeDietrich Elidens DTG 1300-25	4250	4.5-24.9	130	100	8
Elco Thision Compact 17 B120	3400	3.2-17.5	120	93	8

Prices are list prices, installers may offer discounts of 5-20%.

Scoring on basis of:

Energy efficiency	30%
Environment	20%
Safety	5%
Quality	15%
Operation & maintenance	30%

Table B-4. Solar thermal systems - for heating (Stiftung Warentest 4/2003)

	Price w.o. installation	Price with installation	savings on ann. heat demand	aperture	collector	Storage – sanitary /system	Electricity cons.
	(euro)	(euro)	(%)	(m²)	(type/quantity)	(l)	(kWh/yr)
Wagner Solarpaket SH1440AR	8890	11430	29	14.22	Flatplate/6	200/977	84
Paradigma Kombipaket CPC Optima	12510	15190	24	10.47	Vacuumtube/3	250/794	74
Buderus Logasol Diamant Classic H750/6Ü-B+FM443	11010	13550	25	13.03	Flatplate/6	250/750	80
Consolar TUBO-SOLUS 6/560L Komplettpaket	10390	13050	18	5.74	Vacuumtube/6	100/530	100
Nau Variolux Vakuun-Röhrenkollektro mit Schichtspeicher BS800	22660	25160	21	8.80	Vacuumtube/8	300/788	149
Viessmann Solarsystem mit 4 Vitosol 100 Aufdachmontage	8380	10920	22	9.98	Flatplate/4	150/723	143
Ikarus Powerröhre mit Schichtspeicher HSK	8750	11410	21	8.04	Vacuumtube/12	100/795	72
UFE Solar Solarpaket Ecoplus Gold K4/518 Aufdach	7310	9850	17	7.90	Flatplate/4	125/546	73
internal gas burner - condensing							
Solvis max-Paket SX 6:Max 950 und Fera Flachkollektor	18040 (condensing)	19690	28	12.81	Flatplate/2	225/923	55
Rotex Solaris	10330 (condensing)	11980	11	7.00	Flatplate/3	150/447	78
internal gas burner - non-condensing							
Solatherm Solamax + Multibag 500 RW	not available anymore	not available anymore	15	6.45	Vacuumtube/2	275/517	116

For test on heat pumps see Stiftung Warentest (06/2007)

ANNEX C

Background Product Life Assessment

VHK Memo

Estimation of average boiler product life in the EU

Average age and product life

In a completely static market, where all sales are replacement sales and product characteristics remain constant, the product life is calculated as the stock divided by annual sales. If stock is 98 million and sales are 4.2 million (60% of 7 million units sales are replacements) the product life would be 23 years. The average age of boilers in the park would be identical to half of the product life.

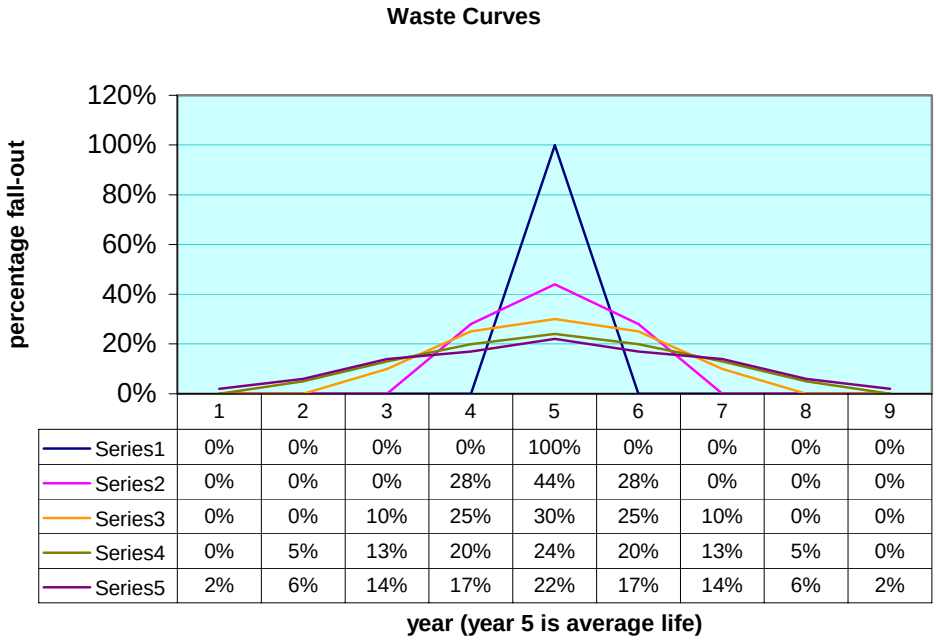
However, the boiler market is not static: Product characteristics change, market volume evolves, fuel switching takes place. This makes outcomes of calculations as shown above are in need of refinement, adjusting them to specific stock and market characteristics (such as: a relatively old park or new park).

The underlying memo presents data regarding product life and average age from previous studies, supplemented by more recent, anecdotal, data.

Product life spread

The product life represents the average life expectancy of the boiler. Normally the product life is not fixed at a certain period, but distributed around an average life expectancy. This distribution is called the "waste curve" and represents how "fast" products will disappear from the stock: A low and broad waste curve indicates that that there is a wide spread in product age when they are discarded. A narrow and spiky waste curves indicates that there is less variation in product life when they are discarded.

Figure C-1. Product life spread



	1	2	3	4	5	6	7	8	9
Series1	0%	0%	0%	0%	100%	0%	0%	0%	0%
Series2	0%	0%	0%	28%	44%	28%	0%	0%	0%
Series3	0%	0%	10%	25%	30%	25%	10%	0%	0%
Series4	0%	5%	13%	20%	24%	20%	13%	5%	0%
Series5	2%	6%	14%	17%	22%	17%	14%	6%	2%

For boilers a narrow waste curve seems more applicable than a broad one: In many cases installers advice end-users to replace boilers having reached a certain age (called average product life). It is believed that this average age at which renewal is advised depends on boiler type and is quite uniform throughout Europe, e.g. 15 years for gas wall hung boilers, some 15-20 years for gas floor standing boilers and some 20-25 years for oil boilers.

Technical or economic product life ?

It is known that, especially regarding oil boilers, the overall product life is essentially composed of products lives of components: (oil)burners, fans, circulator pumps, electronics and other components

may fail during product life and are often replaced. It is quite normal to extend boiler product life up to the point that repair costs exceed the costs of boiler replacement (for instance if an expensive component like the heat exchanger fails critically). Thus the technical life of a boiler is, in a way, also governed by economic motives (costs of repair versus costs of replacement). Another economic argument are the running costs of the old system compared to the running costs of a new system. Essentially it is the total cost of ownership that determines "maintaining old boiler" versus "replacement by new boiler".

End-users rarely do the math of total cost of ownership and rely on expert judgement / advice by installers, especially in case of emergencies (boilers fails in midst of winter). Most installers recommend boiler replacement after a life of say 15 years for a wall hung gas boiler, and 20 tot 25 years for a floor standing gas or oil boiler, depending on certain product characteristics (like material of heat exchanger: cast iron usually outlives copper fin/tube, aluminium, etc.).

This notion of 15 years as product life (of gas boilers) is confirmed by warranties from manufacturers on components: E.g. the manufacturer Nefit [27] offers a 15 year warranty on the primary heat exchanger of their premium condensing gas boiler range and 2 years for other components like electronics and circulators. Interesting to note is that after 11 years the user is offered two options in case of a heat exchanger failure: Either he/she can decide to replace the heat exchanger (only charges for installation apply) or he/she can opt for a discount of 115 euro on a new boiler (of the same brand).

Product Life

The SAVE Heating Systems 2001 study used an average boiler product life constructed from 1995 stock and sales data [28] and corrected for stock characteristics (aged or relatively new, mainly gas or substantial amount of oil boilers, etc.). As a general rule, the product life (average 17 years) was only moderately because exact data was lacking. Nonetheless, the stock model seemed to be quite accurate in its 2005 forecasts.

In the MEEUP study (product case Boilers) a product life of 17 years for both oil and gas boilers was used. The EHI contribution in this study used a product life of 15 years. Many other studies (including the MURE database) and various sources indicate a boiler product life ranging from 15 to 25 years (15 for younger, gas, models, longer lives apply to oil and floor standing boilers).

This study will base its assumption of product life on an average value of 17 years. Through sensitivity analysis the effects of longer or shorter product life will be investigated.

Average age

If the product life is determined by boiler type, the average age of boilers is determined by stock characteristics and can be used to interpret or adjust estimates of replacement rates.

In a fairly new stock (e.g. wall hung gas boilers in Spain) the average age is fairly low and replacement rates should be lower as well. In a well established market (like the Netherlands) the age and replacement rate of gas boilers is obviously higher.

The average age of central heating boilers in European stock has been described by the 2001 SAVE Study Heating Systems (Contract XVII/4.1031/SA/99/283), whose data is mostly based upon the 1999 SAVE Study on *Replacement of Oil and Gas Boilers* (Contract XVII/4.1031/Z/96-072). Gas boiler age ranges from say 10 to 14 years, oil boiler age ranges from 12 to over 23 years. Oil boilers are on average some 3 to 7 years older than gas boilers (Sweden and UK excluded).

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[27] http://www.nefit.nl/faq/p_ni_li.asp?ItemID=178&ID=217

[28] Kemna, R. (VHK), SAVE Heating Systems, Task 3.1 Stock model, p.18, 2001

Table C-1. Boiler age in SAVE Heating Systems Study 2001 and Gas/oil boiler replacement study 1999

reference year 1999		Denmark		France		Germany		Italy		Netherlands		Sweden		UK	
Periods	Average age in period	gas	oil	gas	oil	gas	oil	gas	oil	gas	oil	gas	oil	gas	oil
older than 30 yrs	35	0,00	0,31	0,00	0,19	0,00	0,00	0,00	0,01	0,01	na	0,00	0,46	0,01	0,08
between 20 and 30 yrs	25	0,19	0,28	0,22	0,34	0,19	0,33	0,11	0,24	0,14	na	0,00	0,27	0,16	0,11
between 10 and 20 yrs	15	0,54	0,33	0,48	0,30	0,28	0,31	0,48	0,56	0,44	na	0,45	0,17	0,45	0,28
less than 10 yrs	5	0,27	0,09	0,30	0,18	0,53	0,36	0,41	0,19	0,41	na	0,55	0,10	0,39	0,54
Overall average age	(calculation)	14,20	23,25	14,20	20,55	11,60	14,70	12,00	15,70	12,50	na	9,50	25,90	13,05	12,5

More recent sources reveal anecdotal data for three countries which seem in line with data indicated above, although the average oil boiler appears to be somewhat younger than above.

A Belgian presentation on boiler replacement in Flanders [29] lists average boiler ages for gas and oil boilers. Over 50% of the oil boiler stock is older than 15 years, compared to 38% of the gas boiler stock. Assuming the indicated average group ages the overall age is 12.4 years for gas boilers and 15 years for oil boilers. This is however susceptible to what is used as average group age - if for the "20+ group" 30 years is assumed instead of 25, the average oil boiler age becomes 16.7 years and the average gas boiler age 13.2 years).

Table C-2. Boiler age in Belgium

Age group	Group age used in calculation	gas	oil	oil burner
0-4	2	13%	15%	23%
5-9	7	23%	17%	20%
10-14	12	23%	12%	13%
15-20	17,5	22%	22%	19%
20+	25	16%	33%	24%
average age (yrs)	(calculation)	12,4	15,0	12,7

In a BBT presentation[30] a breakdown of boiler age (*"Altersstruktur des Heizungsanlagen-Bestands"*) in Germany is provided. Some 77.5% of stock appears older than 9 years and 29.2% of stock is older than 16 years. The average age (when calculated with the group averages indicated) is 13.9 years (oil and gas combined).

Table C-3: Boiler age in Germany

Age group	Age (reference 2006)	Group age used in calculation	# of boilers	%
up to 1978	28 yrs or older	30	1.085.100	7.3%
1979 - 1982	24 to 27 yrs	25	900.700	6.1%
1983 - 1990	16 to 23 yrs	20	2.346.400	15.8%
1991 - 1997	9 to 15 yrs	12	7.162.800	48.3%
1998 - 2003	3 to 8 yrs	6	3.088.200	20.7%
2004	2 yrs or younger	1	261.700	1.8%
Total			14.844.900	
Average age (yrs)	(calculation)	13.9		

[29] Vekemans, Guy, "Beslissingsinstrumenten voor ketelvervanging", VITO, Energieforum Heuased-Zolder, 7 October 2004.

[30] (anon.), "Effiziente Energienutzung im Blick", BBT, 8 March 2006.

An English study [31] presented an inventory of the UK gas appliance stock, including the date of construction of heating only boilers, combi-boilers and back boiler units, assessed during visits of service personnel / installers. The average age calculated on this basis was 8.4, 3.5 and 14.3 years respectively (calculation excluding year 2005), indicating that especially the combi-boiler only recently gained its popularity.

Table C-4. Boiler age in the UK

Year	Boiler type			Group age used in calculation
	Heating only	Combi	BBU	(ref.: 2005)
2005	20%	32%	1%	<1
2004	7%	18%	3%	1
2003	3%	7%	7%	2
2002	2%	8%	1%	3
2001	3%	4%	1%	4
2000	7%	6%	7%	5
1999	2%	5%	1%	6
1998	6%	4%	0%	7
1997	6%	4%	0%	8
1996	3%	4%	6%	9
1995	6%	4%	7%	10
1994	2%	1%	1%	11
1993	1%	1%	4%	12
1992	2%	0%	0%	13
1991	2%	0%	3%	14
1990	8%	1%	12%	15
1989	2%	0%	6%	16
1988	2%	0%	0%	17
1987	1%	0%	0%	18
1986	3%	1%	9%	19
1985	2%	1%	6%	20
1984	1%	0%	0%	21
1983	1%	0%	0%	22
1982	1%	0%	3%	23
1981	1%	0%	0%	24
1980	3%	0%	16%	25
1979	0%	0%	0%	26
1977	0%	0%	0%	28
1976	0%	0%	0%	29
1975	1%	0%	0%	30
1971	0%	0%	0%	34
1970	0%	0%	3%	35
Total sample (#)	407	583	68	
Average age (yrs)	8,39	3,45	14,31	(calculation)

Based upon the Belgian and German findings an average boiler age of approximately 12.5 years for gas boilers and 15 years for oil boilers in stock seems acceptable. For electric boilers (immersion and heat pumps) no data was found.

[31] (anon.), "Assessment of the size and composition of the UK gas appliance population", Department of Trade and Industry, November 2005.

ANNEX D

EuroStat Energy Prices 1990-2004

Table D-1. Electricity prices in the EU25 1990-2004

(euro/100kWh)	1990	1995	2000	2001	2002	2003	2004
EU25	10,73	12,43	11,86	12,09	12,27	12,4	12,37
EU15	10,73	12,59	12,23	12,43	12,57	12,73	12,75
BE	11,49	13,54	13,2	13,57	13,43	13,24	13,7
CZ			4,86	5,64	7,08	6,61	6,6
DK	12,54	13,8	18,4	19,43	20,74	21,72	21,41
DE	11,61	14,69	14,04	14,66	15,24	15,65	15,69
EE					5,48	5,97	5,97
E	7,93	7,95	6,86	6,85	7,1	7,42	7,6
ES	10,37	11,25	10,01	9,61	9,61	9,76	9,9
FR	10,86	12,51	11,47	11,22	11,33	10,92	11
IE	8,18	8,06	8,59	8,59	9,36	10,89	11,44
IT	14,99	18,29	18,48	19,73	18,51	19,35	19,01
CY			9,03	10,8	9,17	10,4	10,76
LV							5,82
LT							6,47
LU	9,89	10,95	10,86	11,33	11,82	12,23	12,52
HU		5,71	7,15	7,28	8,3	8,42	10,15
MT		5,25	8,16	8,27	8,45	8,08	7,88
NL	8,58	9,26	14,21	16,98	16,35	17,23	17,95
AT			12,35	13,3	13,35	12,95	13,19
PL			7,99	8,55	9,18	8,6	7,84
PT	9,27	11,73	11,14	11,19	11,43	11,75	11,99
SI		6,58	9,07	9,14			9,27
SK							9,87
FI		7,35	7,48	7,37	7,89	8,36	9,12
SE			9,52	9,68	10,51	12,38	3,41
UK	7,79	9,29	10,12	9,55	9,83	9,16	8,37

Table D-2. Gas prices in the EU25 1990-2004

(euro/GJ GCV)	1990	1995	2000	2001	2002	2003	2004
EU25	10,31	11,05	11,62	12,93	13,11	13,37	10,93
EU15	10,31	11,32	12,14	13,54	13,65	13,96	11,55
BE	12,77	15,07	15,87	18,49	17,25	17,66	17,48
CZ			5,53	6,85	8,67	8,03	8,76
DK			18,14	22	17,98	18,98	19,12
DE	12,16	14,19	14,06	17,16	17,35	17,53	17,82
EE						5,99	5,99
EL							
ES	12,84	12,77	13,5	16,3	15,42	15,4	14,81
FR	12,65	13,18	12,81	15,24	16,36	16,24	19,38
IE	14,3	16,83	16,2	16,2	16,19	16,33	17,82
IT	11,83	10,44	12,32	14,42	13,6	13,84	13,97
CY							
LV							4,43
LT							8,07
LU	11	10,75	11,3	13,37	12,32	12,61	12,28
HU		2,95	3,66	3,95	4,79	4,86	6,36
MT							
NL	7,94	9,99	10,39	8,57	9,45	12,71	12,53
AT			11,27	15,19	15,19	16,04	
PL			6,51	6,83	8,63	8,25	7,44
PT					16,66	16,93	17,21
SI		13,83	15,77	12,98			10,7
SK							8,86
FI							
SE			15,7	18,44	19,75	20,24	21,5
UK	8,03	8,91	10,03	9,56	10,07	9,85	10,07

Table D-3. Oil prices in the EU25

(euro/1000ltr)	1990	1995	2000	2001	2002	2003	2004
EU25							603,7
EU15	289,4	430,6	441,4	393,4	425,4	431	605,2
BE	176,2	298,5	340	278,2	296,9	326,4	482,1
CZ							596,1
DK	531,7	697,7	707,8	673,4	706,6	754,8	956,6
DE	211,6	3609	378,5	331,3	369,9	360	547,3
EE							496,6
EL	374,1	455,3	481,4	460,5	503,8	529,7	704
ES	247,4	383,8	400,8	353,9	392,1	393,8	550,6
FR	303,6	431,6	404,7	328,9	387,9	413,6	582,2
IE	222,9	428,1	474,1	410,9	444,1	478,8	629,9
IT	607,5	820,9	820,4	821,2	847,7	877,9	1047,2
CY							721,9
LV							554,9
LT							478
LU	197,3	306,2	322,3	273,5	302	323,5	481,3
HU							1017,5
MT							427,6
NL	292,4	522,8	601,5	561,5	601	633	812,3
AT	322,9	400,7	416,3	371,6	397,1	446,1	608,2
P L							545,9
PT		334,2	359,1	369,5	432,5	447,5	610,5
SI							561,8
SK							512,3
FI	250,4	357,9	435,9	341	383,2	409,7	576,5
SE	439,6	583,3	658,8	653	697,8	802	953,7
UK	166,8	313,9	322,3	265,5	264,4	297,8	484,2