

European Commission DG TREN

Preparatory Studies for Eco-design Requirements of EuPs (II)

[Contract N°TREN/D3/390-2006/Lot15/2007/S07.74922]

Lot 15 Solid fuel small combustion installations

Task 2: Economic and Market Analysis

Final version
December 2009

In association with:

 **AEA Energy & Environment**
From the AEA group



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Contents

2	Task 2 – Economic and Market Analysis	5
2.1	Generic Economic data	5
2.2	Market and Stock data	6
2.2.1	Sales	6
→	Indirect heating appliances	7
→	Direct heating appliances	11
2.2.2	Stock.....	16
→	Indirect heating appliances.....	16
→	Direct heating appliances	19
2.2.3	Summary of sales and stock.....	22
2.2.4	Average product life.....	22
2.3	Market trends	23
2.3.1	Expected evolution of solid fuel boiler sales.....	23
2.3.2	Biomass use and pellet boom	25
2.3.3	Key factors influencing the solid fuel SCI market	28
2.4	Consumer expenditure data	29
2.4.1	Purchase cost	30
→	Appliances purchase prices.....	30
→	Installation costs	31
2.4.2	Running costs	33
→	Fuel prices	33
→	Electricity prices.....	35
→	Maintenance and repair costs	36
2.4.3	Disposal costs.....	37
2.4.4	Interest and inflation rates	37
2.5	Conclusions.....	38
2.6	Task 2 Annex.....	40
2.6.1	Market data for central heating systems.....	40
2.6.2	Country groups used for data extrapolation to EU-27	43

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2 Task 2 – Economic and Market Analysis

The purpose of this task is to present the economic and market analysis related to solid fuel small combustion installations (SCIs) for the purpose of the lot 15 EuP preparatory study. The aim is, firstly to place this product group within the context of EU industry and trade policy. Secondly, it provides market (stock) and cost inputs for the assessment of EU-wide environmental impact of the product group. Thirdly, it aims at providing insights into the latest market trends in order to identify market structures and ongoing trends in product design. This market data will serve as an input for subsequent tasks such as base-case analysis and improvement potential (Tasks 5 and 7 respectively). Finally, the data on consumer prices and rates is provided to be used later in the study in Life Cycle Cost (LCC) calculations.

2.1 GENERIC ECONOMIC DATA

Ideally, official EU statistics on import, export and production of SCIs in the EU would be presented here, so as to be coherent with official data used in EU industry and trade policy. PRODCOM, the system for the collection and dissemination of statistics on the production of manufactured goods in EU, mentions 18 categories of products referring to combustion installations. However, these categories do not cover Lot 15 products explicitly; many categories concern appliances that could be fired by all types of fuel (including gas, oil) and not only solid fuels, and some of the categories aggregate different types of appliances.

The PRODCOM categories covering some of the products in the scope of the EuP Lot 15 preparatory study are listed in the Annex of Task 1 report (section 1.4.3).

Only two categories relate exclusively to solid fuel appliances, namely 29.72.11.50 and 29.72.12.70. For these categories, the EU production data¹ is presented in Table 2-1 below.

¹ Data retrieved on Eurostat website: <http://epp.eurostat.ec.europa.eu>.

Table 2-1: Official production data for some Lot 15 products (EU-27, 2007)

PRODCOM code	29.72.11.50	29.72.12.70
description	Iron or steel solid fuel domestic cooking appliances and plate warmers (including those with subsidiary boilers for central heating)	Iron or steel solid fuel domestic appliances (including heaters, grates, fires and braziers; excluding cooking appliances and plate warmers)
2007 EU-27 production [units]	992 244	2 008 249

PRODCOM has the advantage of being the official EU source that is also used and referenced in other EU policy documents regarding trade and economic policy, guaranteeing consistency. However, as this classification is not detailed enough and does not cover all the products identified in Task 1, PRODCOM does not serve as a useful market data source for this study and it was necessary to investigate other sources of sales and stock data. Hence, PRODCOM data have been supplemented by data derived from existing market analysis reports and data collected from the responses of a questionnaire sent to the EuP lot 15 registered stakeholders namely manufacturers, industry associations, experts, Member States' representatives, etc.

2.2 MARKET AND STOCK DATA

The heating appliance market, in general, is characterised by its diversity and complexity. Solid fuel SCIs do not derogate from this fact, rather they add further complexities: they cover a wide range of product types and operations, which can furthermore differ largely from one Member State (MS) to another, and even between different regions of the same MS. Moreover, the market in most of these products is very fragmented and no previous attempt has been made to make an EU-wide estimate of sales and stock figures.

At a macro level, distinction is made between **indirect heating (or central heating) appliances** using a single energy converter to heat a dwelling(s) and **direct heating appliances** which are normally used to heat a single room. Cooking appliances and stoves which can be connected to a hot water tank and can provide central space heating are considered to belong to the direct heating appliances category.

2.2.1 SALES

The aim of this section is to assess the sales volume (i.e. number of units sold in the EU) of different type of SCIs discussed in Task 1 report.

→ Indirect heating appliances

European solid fuel boiler sales in domestic output range² went down drastically in the 1990's, phenomenon largely due to the fall in demand in the countries of the former "Eastern Block" (Poland, Czech Republic, Hungary, Slovakia, Estonia, Latvia, Lithuania, and also former East Germany and Slovenia). Since year 2000, sales have steadily increased (Figure 2-1) partly as a result of measures encouraging the use of biomass as renewable energy (including pellets)³. Annual sales of solid fuel boiler sales per MS over the period 1990-2004 are presented in Annex 2-1.

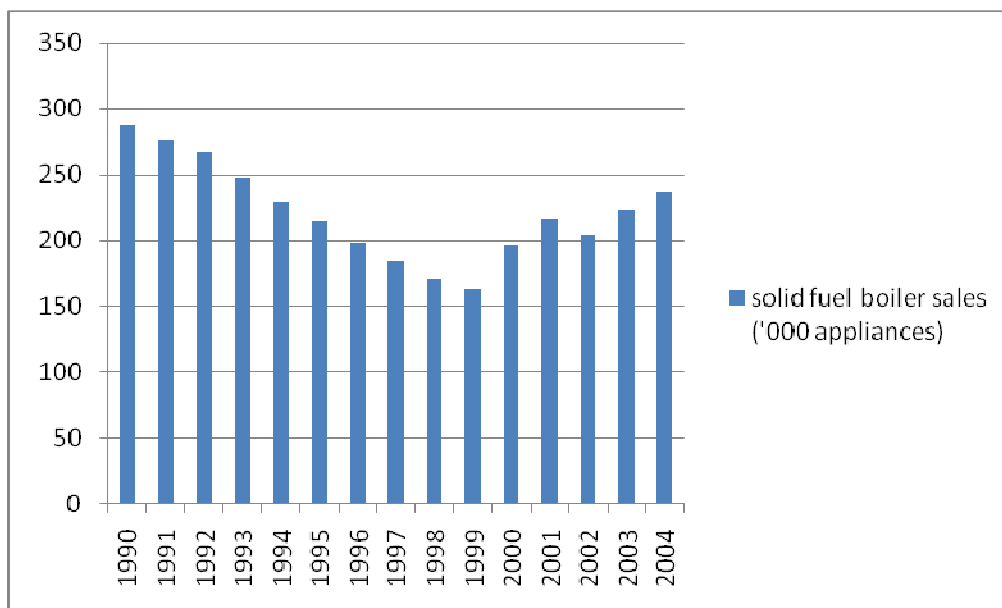


Figure 2-1: Evolution of solid fuel boiler sales in Europe (source: BRG consult 2006)

The market for modern solid fuel boilers (wood logs, chips and pellets) has been continuously expanding.

Table 2-2 presents solid fuel boilers sales in EU-27 which are derived either from data directly obtained from the industry or calculated based on a number of available data sources.

Table 2-2: Solid fuel boiler sales in EU-27, 2007

Member State	Sales [units]	Data source
Austria ¹	11 700	Industry ²
Belgium	300	Industry
Bulgaria	21 500	Extrapolation ³
Cyprus	100	Extrapolation
Czech Republic	44 000	Industry
Denmark	10 000	Industry

² For boilers, the threshold of the "individual domestic" appliances varies between MS. For example: 35kW in Italy, 50 kW in Germany, Spain and UK, 35 kW in the Netherlands and Belgium, 70 kW in France.

³ BRG Consult (2006) The Boiler and Heating System Market in the European Union

Member State	Sales [units]	Data source
Estonia	1 800	Extrapolation
Finland	7 700	Extrapolation
France	20 000	Industry
Germany	20 000	Industry
Greece	1 500	Extrapolation
Hungary	24 300	Extrapolation
Ireland	3 500	Estimation ⁴
Italy	7 500	Industry
Latvia	2 900	Extrapolation
Lithuania	3 800	Extrapolation
Luxembourg	100	Extrapolation
Malta	50	Extrapolation
Netherlands	800	Industry
Poland	50 000	Industry
Portugal	1 500	Extrapolation
Romania	47 800	Extrapolation
Slovakia	10 000	Extrapolation
Slovenia	600	Extrapolation
Spain	5 800	Extrapolation
Sweden	10 000	Industry
UK	6 000	Estimation
TOTAL EU-27	313 000	

1 Austrian boiler sales in 2007 were anomalous and are not indicative of market size, 2006 sales were approximately 21000 units.
2 Based on (confidential) data or estimations provided by product manufacturers and industry associations via questionnaire or direct contacts.
3 Data calculated through the country group extrapolation (see Annexes in Section 2.6), from direct data.
4 Data assessed from 2004 figure and forecast 2010, given in BGR Consult (2006) The Boiler and Heating System Market in the European Union.

◆ Sales by appliance type and capacity range

According to industry associations, boilers sales can be divided as below:

- 80% of hand stoked appliances, i.e. 250 400 boilers in total,
- 20% of automatically stoked appliances, i.e. 62 600 boilers in total.

Table 2-3 presents the estimated distribution of sales according to the capacity range for these two types of appliances.

Table 2-3: Boiler sales by capacity range⁴

Type of boiler	Division by capacity range [%]					
	0-10 kW	10-25 kW	25-50 kW	50-100 kW	100-200 kW	200-500 kW
automatically stoked	5	55	15	15	5	5
hand stoked	5	10	60	10	10	5

◆ **Sales by fuel type**

Wood (wood logs, wood shavings and chips) fuelled boilers dominate the European solid fuel boiler market. Table 2-4 presents the most common fuels used in boilers according to capacity range.

Table 2-4: Fuel used in boiler by capacity range⁴

Boiler capacity range	0-10 kW	10-25 kW	25-50 kW	50-100 kW	100-200 kW	200-500 kW
Most common fuel type	pellets	wood logs, pellets and coal	wood logs, wood chips and coal	wood logs, pellets, wood chips and coal	wood chips and coal	wood chips and coal

Data about wood boiler sales per Member State have been derived from available data about the share of these sales in the total solid fuel boiler sales. Data about pellet boiler sales have been obtained either directly through the questionnaire or indirectly from various data, including data about the share of pellet sales in the total solid fuel boiler sales as well. Table 2-5 presents compiled data for the Member States for which information has been available to date.

⁴ Source: stakeholder consultation.

Table 2-5: Boiler sales by fuel in some Member States, 2007

Member State	2007 sales [unit] (Share of the total solid fuel boiler sales [%])			
	Wood log boilers	Wood pellet boilers	Coal boilers	Other
Austria ¹	4 800 (41%)	3 900 (33%)	-	3 000 (26%) ²
Czech Republic	19 400 (44%)	900 (2%)	23 700 (54%)	-
Finland	6 200 (80%)	200 (3%)	-	1 300 (17%) ²
Germany	8 600 (43%)	6 000 (30%)	1 800 (9%)	3 600 (18%) ³
Italy	6 900 (92%)	450 (6%)	- (0%)	150 (2%) ⁴
Sweden	6 100 (61%)	1 700 (17%)	- (0%)	2 200 (22%) ³
UK	1 400 (24%)		1 700 (28%)	2 900(48%) ⁵
<p>1 Austrian pellet boiler sales in 2007 are not indicative of the norm. The five years preceding 2007 showed 44% of sales as pellet boilers Austria, increasing each year.</p> <p>2 wood chips/wood shavings</p> <p>3 unspecified</p> <p>4 other biomass</p> <p>5 other fossil fuel (coke, anthracite, solid smokeless fuel...)</p>				

Sales of pellet boilers have generally increased since 2000. About 20 000 pellet boilers were sold in Europe in 2005, which represents about 7% of the total solid fuel boiler sales, and an increase of almost 50% compared to 2004. As a result of government subsidies and rising heating oil and natural gas prices, sales in Germany and Austria climbed from 7 000 to 11 000 and from 6 000 to 7 000 pellet boilers in 2004 - 2005 respectively. These two MS with Sweden and Denmark seem to lead the pellet boiler markets in Europe. These markets present a significant growth potential in the future (see also market trends in section 2.3). Other markets with significant growth potential are Italy, France, UK, Ireland, and Netherlands.

◆ Share of new sales

Sales can be divided in two different categories: new sales and replacement sales. New sales correspond to boilers which are installed in new buildings or in existing buildings that were not previously equipped with boilers, or to boilers which replace existing boilers working with fuels other than solid fuels. The share of new sales can be used to estimate the number of appliances which will contribute to the growth of the total stock.

Table 2-6 presents available data on the share of new sales versus replacement sales for EU-22.

Table 2-6: Solid fuel boiler sales by type of sales for EU-22 in 2004³

Total sales 2004	New housing	First time installation in existing housing	Replacement	Non housing*
237 000	43 100	30 500	147 000	16 100
100%	18.2%	12.9%	62.1%	6.8%

* This category corresponds to installations that heat more than one dwelling.

The share of replacement sales can slightly vary according to the type of fuel: it seems to be lower for pellet boilers than for wood chips or wood logs boilers. However, the figure of 62% in the table above can be considered as an average for all solid fuel boilers.

The new sales here encompass “new housing”, “first time installation” and “non housing” categories listed above. Thus, it can be assumed that about 38% of all boilers sales in 2004 were new sales. Even if there can be small variations between Member States (e.g. in Sweden the percentage can be a bit higher if we consider the retrofitting of oil boiler with pellet boiler included in the “new sales” category), this percentage is assumed to be valid for EU-27 in 2007.

➔ Direct heating appliances

Note: Based on the existing harmonised standards, in principle, a fireplace/fireplace insert is installed in a masonry structure, while a stove is a stand-alone appliance. Consequently, the safety requirements are different (e.g. the temperature of the outer side of the appliance). However, the discussions with the industry on market data have revealed that while the standards define clearly the different appliance types, notably fireplaces and inserts vs. stoves, the use of these terms (and their equivalents in national languages) varies between the MS.

In this context, the best attempt has been made to attribute the market data into the right category. For some countries, some doubts have been expressed concerning the distribution of sales between closed fireplaces/inserts and stoves, but in general the total of these two categories is agreed upon.

■ Open fireplaces

The analysis shows that while many open fireplaces can hardly be considered a product in the sense of EuP (they are built on-site as part of the building based on owners’ requirements and not traded as individual products), others are available in product catalogues of SCIs manufacturers. Furthermore, in some countries (e.g. in UK) open fireplaces with a heat exchanger/water tank are rather common and can achieve relatively high efficiencies. Unfortunately, market data is very scarce on open fireplaces. As a best estimate, annual sales/installations of open fireplaces would be assumed to be roughly equal to the sales of closed fireplaces and inserts i.e. around 850 000.

■ Closed fireplaces and inserts

Solid fuel closed fireplace and insert sales have been estimated on the basis of data received in response to the questionnaire and discussions with industry (Table 2-7). Where data were not directly available for a MS, the sales have been estimated through the country group extrapolation⁵.

Table 2-7: Sales of solid fuel closed fireplaces and inserts (built-in appliances) in EU-27, 2007

Member State	Sales [units]	Data source
Austria	5 000	Industry ¹
Belgium	17 000	Industry
Bulgaria	16 500	Extrapolation ²
Cyprus	1 500	Extrapolation
Czech Republic	13 000	Industry
Denmark	5 000	Industry
Estonia	1 300	Extrapolation
Finland	1 800	Industry
France	275 000	Industry
Germany	57 000	Industry
Greece	27 900	Extrapolation
Hungary	18 600	Extrapolation
Ireland	4000	Industry
Italy	189 000	Industry
Latvia	2 000	Industry
Lithuania	2 000	Industry
Luxembourg	1 000	Industry
Malta	700	Extrapolation
Netherlands	5 000	Industry
Poland	59 000	Industry
Portugal	27 200	Extrapolation
Romania	36 600	Extrapolation
Slovakia	7 600	Extrapolation
Slovenia	1 200	Extrapolation
Spain	58 000	Industry
Sweden	12 700	Industry
UK	3 500	Industry
TOTAL EU-27	849 100	
1 Based on (confidential) data or estimations provided by product manufacturers and industry associations via questionnaire or direct contacts.		
2 Data calculated through the country group extrapolation (see Annexes in Section 2.6), from direct data.		

◆ Sales by capacity

The large majority of closed fireplaces and inserts have a capacity between 0 and 15kW. According to the stakeholder responses to the questionnaire, 50 - 90% (this percentage varies among Member States) of closed fireplaces and inserts sold

⁵ See Annex 2-2.

nowadays in Europe have a capacity below 10 kW. There seems to be very small number of fireplaces or inserts at the European market with capacity beyond 15 kW⁶. In that case, the capacity is likely not to go past 25 kW.

◆ Sales by fuel type

In principle, different bulky solid fuels (i.e. wood logs, coal briquettes, etc.) can be used interchangeably. In practice, interchangeability of fuels is predominantly for closed fireplaces with or without inserts and hand stoked stoves which have incorporated appropriate design measures for this function. Even pellets can be burnt in these appliances using an additional pellet basket. As a result, the sales data cannot be differentiated by fuel type.

Nevertheless, log wood is assumed to be the sole fuel used in these appliances except for the few countries where coal fuels play a significant role (see coal production table in Annexes in Section 2.6.2). The use of pellets, although possible, is assumed negligible.

◆ Sales growth rate and share of replacement sales

For these appliances, the annual sales growth rates in Europe (based on EU-25 data) fluctuated between 5% and 16% between 2000 and 2006; average annual rate being close to 10%. However, in 2007 the sales went down by around 2.5% compared to the previous year.⁷

The share of replacement sales for fireplaces and inserts is estimated to be around 10%.

■ Hand stoked stoves

Table 2-8 presents 2007 sales for hand stoked solid fuel stoves (free-standing). A comprehensive single source for market data for these appliances is not available. The data has been presented on the basis of data received from industry via questionnaire and direct contacts. When no data was provided for a MS, the sales have been estimated through the country group extrapolation⁸.

Table 2-8: Sales of hand stoked solid fuel stoves (free-standing) in EU-27, 2007

Member State	Sales [units]	Data source
Austria	26 600	Extrapolation ¹
Belgium	23 000	Industry ²
Bulgaria	18 500	Extrapolation
Cyprus	700	Extrapolation
Czech Republic	41 000	Industry
Denmark	20 000	Industry

⁶ Except in Italy, where the share of appliances whose capacity is above 15 kW is estimated at 40%.

⁷ Based on a stakeholder contribution

⁸ See Annex 2-2

Member State	Sales [units]	Data source
Estonia	5 100	Extrapolation
Finland	35 000	Industry
France	205 000	Industry
Germany	305 000	Industry
Greece	12 300	Extrapolation
Hungary	20 900	Extrapolation
Ireland	3 500	Extrapolation
Italy	79 000	Industry
Latvia	9 000	Industry
Lithuania	8 000	Industry
Luxembourg	1 000	Extrapolation
Malta	300	Extrapolation
Netherlands	10 000	Industry
Poland	40 000	Industry
Portugal	12 000	Extrapolation
Romania	41 200	Extrapolation
Slovakia	8 600	Extrapolation
Slovenia	6 200	Extrapolation
Spain	30 000	Industry
Sweden	22 900	Industry
UK	52 500	Industry
TOTAL EU-27	1 037 200	
<p>1 Data calculated through the country group extrapolation (see Annexes in Section 2.6), from direct data. 2 Based on (confidential) data or estimations provided by product manufacturers and industry associations via questionnaire or direct contacts.</p>		

◆ Sales by capacity range and fuel type

Hand stoked stoves typically have a nominal output capacity of 5 - 10 kW. According to stakeholder's answers to the questionnaire, appliances with a capacity below 5 kW, represent about 5% of the market, whereas the share of appliances of a capacity between 5 to 10 kW varies from 50 to 80%. Stoves with a capacity beyond 15 kW represent a limited share of the EU market (5 - 20%).

As for fireplaces/inserts, hand stoked stoves are not usually fuel specific from the technical point of view, although they are mostly marketed for log wood. Again, it is assumed that except for countries where coal production is significant (see Annexes in Section 2.6.2), log wood is the sole fuel used in these appliances.

◆ Sales growth rate and share of replacement sales

On average, the annual sales growth rate of stoves in Europe (based on EU-25 data) between 2000 and 2006 was 11.5%, but fluctuated between 24% and 2.5%. After a very high growth rate of 24% in 2005-2006, the sales in 2006-2007 went down by 15% compared to the previous year.

The share of replacement sales for stoves seems to be in the range of 5 - 20%.

■ **Automatically stoked stoves , i.e. pellet stoves**

In principle, a pellet stove could be manually stoked. However, in practice, practically all pellet stoves are automatically stoked, which provides ease of use to the consumer and is one of the advantages of a pellet stove. Furthermore, an automatically stoked stove can only be fuelled with pellets, since bulky solid fuels (e.g. log wood) do not allow automatic stoking in a stove-like appliance.

Despite the increasing interest in pellet stoves and significant sales developments in certain MS, the main market of these appliances seems still to be limited to only a few MS, notably Austria, France, Germany and Italy (Table 2-9). For other MS, the current sales are either reported to be negligible or no data is available, in which case the sales are also estimated insignificant. Hence, the EU-27 total is considered to be a conservative estimate.

Table 2-9: Pellet stove sales⁹

Member State	Sales [units]
Austria	12 000
France	10 000
Germany	25 500
Italy	127 000
Sweden	2 000
Belgium, Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Ireland, Latvia, Lithuania, Malta, Poland, Romania	negligible
For Denmark, Finland, Greece, Luxembourg, Netherlands, Portugal, Slovakia, Slovenia, Spain and UK	no data available
TOTAL EU-27*	176 500
* estimate based on the available information.	

The development of pellet market is shortly described in section 2.3.2 (“market trends”).

■ **Cookers**

Very little data were available regarding cooker sales in Europe and the figures presented in Table 2-10 are to be considered rough estimates.

Table 2-10: Solid fuel cooker sales in some MS, 2006-2007⁴

Member State	Sales [units]	Fuel
Austria	10 000	wood
Finland	2 000	wood
France	10 000	wood

⁹ Based on data provided by stakeholders

Member State	Sales [units]	Fuel
Germany	20 000	wood, lignite
Ireland	10 000	-
Italy	166 000	wood
Netherlands	negligible	-
Poland	7 100	-
UK	20 000	wood; SSF ¹⁰

Extrapolation of the above results to other Member States via the country groups (Section 2.6.2) gives a total number of annual cooker sales in Europe of **464 200**.

Based on more detailed data for some Member States (e.g. Germany and Italy), 50-60% of the sold solid fuel cookers have a capacity of 5 to 10 kW, and between 10 to 15 kW for about 40% of the appliances. Appliances whose capacity is above 15 kW are rather rare.

Almost all the solid fuel cookers are hand stoked. According to industry, there are only 1-2 models of automatic, wood pellet cookers available at the European market.

The share of replacement sales for cookers is assumed to be similar as for stoves, i.e. between 5 and 20%.

2.2.2 STOCK

‘Stock’ is the installed base of existing appliances, i.e. the number of units in operation in Europe. Various approaches are possible to calculate the existing stock of such appliances. The first analysis presented here rests upon an estimation of the number of dwellings equipped with central/non central heating appliances.

→ Indirect heating appliances

A recent study³ estimates that at EU-22 level¹¹, the number of dwellings equipped with solid fuel boilers, reached the following values:

- 8 864 000 dwellings in 1990
- 6 202 000 dwellings in 2004

These figures indicate a number of dwellings and not a number of appliances. Nevertheless, as these figures refer mostly to individual, domestic systems, the number of appliances can be assumed to be of a similar order of magnitude.

The number of dwellings equipped with a solid fuel central heating system per Member State is presented in Annexes in Section 2.6.1.

¹⁰ Solid Smokeless Fuel

¹¹ EU-27 except Cyprus, Luxembourg, Malta, Bulgaria and Romania.

Solid fuel appliances make up a modest share of the total stock of central heating boilers, as at the EU-22 level, they represented 4.9% of all boilers in 1990 and 3.0% in 2004.

Table 2-11 presents the stock of boilers in operation in each Member States, either directly obtained from data, or calculated through the country group extrapolation.

Table 2-11: Solid fuel boiler stock by Member State

Member State	Total stock of solid fuel boilers [units]	Data source
Austria	600 000	Direct data ¹
Belgium	61 500	Extrapolation ²
Bulgaria	435 900	Estimation ³
Cyprus	2 700	Estimation
Czech Republic	532 000	Estimation
Denmark	100 000	Direct data
Estonia	51 500	Extrapolation
Finland	330 000	Direct data
France	390 000	Direct data
Germany	577 600	Direct data
Greece	48 800	Estimation
Hungary	492 800	Estimation
Ireland	34 200	Estimation
Italy	244 200	Estimation
Latvia	81 100	Extrapolation
Lithuania	106 200	Extrapolation
Luxembourg	2 200	Extrapolation
Malta	1 100	Estimation
Netherlands	86 800	Extrapolation
Poland	1 373 700	Estimation
Portugal	47 600	Estimation
Romania	968 300	Estimation
Slovakia	202 000	Estimation
Slovenia	22 000	Extrapolation
Spain	187 400	Estimation
Sweden	349 000	Direct data
UK	517 500	Estimation
TOTAL EU-27	7 846 100	

1 Based on data provided by stakeholders or given in published studies.
2 Data calculated through the country group extrapolation (see Section 2.6.2), from direct data.
3 Data calculated through the country group extrapolation, from the share of dwellings equipped with a solid fuel boiler in the total number of dwellings, available in BRG Consult (2006), The boiler and Heating system market in Europe.

Given the results presented above, there are around 8 million solid fuel boilers installed in EU-27 in 2007.

◆ **Stock by capacity range**

On the basis of available data from Germany¹², the division of stock by capacity range in Europe is assumed to be as presented in Table 2-12.

Table 2-12: Boiler stock according to the capacity range

Boiler capacity range		
< 25 kW	25-50 kW	> 50 kW
55%	37%	8%

For boilers whose capacity is above 50 kW (non-domestic appliances), the average observed capacity is around 90 kW for manual boilers and pellet boilers, and around 160 kW for wood chips boilers.

◆ **Stock of pellet boilers**

Table 2-13 gives an overview of pellet boiler stock in Member States where this product presents a significant market share. Data for other MS has not been available and their stock is considered negligible.

Table 2-13: Pellet boiler stock in a few Member States⁴

Member State	Stock of pellet boilers [units]
Austria	51 300
Denmark	30 000
Germany	39 000
Sweden	84 000
TOTAL EU-27*	204 600
* conservative estimate, based on the available information from AT, DE, DK and SE.	

➔ **Direct heating appliances**

The direct heating appliance category includes appliances such as fireplaces and stoves, including combined cookers-heaters.¹³

Stock data about non-central heating appliances is scarce. Table 2-14 provides first estimations for the total number of direct heating appliances (fireplaces, stoves and cookers) in the MS where relatively good stock data is available. But even in these MS the split into the different sub-categories is not always known. For other MS, only anecdotal, if any, data is available. Hence, the stock estimates are subject to an unavoidable uncertainty. In particular, note that below are reported data about the

¹² Struschka, M. et al. (2007) Effiziente Bereitstellung aktueller Emissionsdaten für die Luftreinhaltung (Efficient provision of updated emission data for air quality control), Institute of Process Engineering and Power Plant Technology (IVD), University of Stuttgart, for the German Federal Environmental Agency

¹³ It is acknowledged that some of these appliances may be connected to a central heating system and thus have both a non-central and central heating function. However, at this stage of the analysis, the differentiation is made based on the capability of the appliance to provide direct heat or not.

number of appliances installed, which can be different from the number of appliances really used.

Table 2-14: Direct heating appliances stock per Member State⁴

Member State	Total number of direct heating appliances
Austria	480 000
Denmark	551 000
Finland	1 870 000
France	6 110 000
Germany	14 000 000*
Italy	10 500 000*
Netherlands	863 000
Sweden	1 450 000

* For these countries, the number of appliances that are really used have been assessed to be 12 700 000 (Germany) and 5 500 000 (Italy).

■ Open fireplaces

On the basis of results obtained for France and Italy, the number of open fireplaces has been assumed to be on a similar order of magnitude that the number of closed fireplaces and inserts; this leads to a number of around **16 million** installed open fireplaces in Europe (see below).

■ Closed fireplaces and inserts

Based on available data about stock of closed fireplaces and inserts in a limited number of Member States, the total number of such appliances installed in Europe has been estimated at around **16 139 000**.

■ Stoves

Based on available data about stock of stoves in a limited number of Member States, the total number of such appliances installed in Europe has been estimated at around **25 901 000** (comprising hand stoked and automatic pellet stoves and heat retaining and tiled stoves).

Of the total, pellet stoves are estimated to represent at least around 637 000 units (Table 2-15).

Table 2-15: Pellet stove stock in key Member States⁹

Member State	Stock of pellet stoves [units]
Austria	> 12 000*
France	50 000
Germany	39 500
Italy	525 400
Sweden	20 000
TOTAL EU-27*	634 900

*rough estimate, based on the available information.

Heat retaining or tiled stoves play an important role at least in Germany, Austria, Finland and Sweden. In Germany 43% of the stoves are estimated to be so called “Kachelöfen”¹². It is assumed that this share is also reasonable for Austria. For Finland practically all appliances in the stove category can be classified as heat retaining stoves, where as for Sweden at least 50% of appliance could fall into this category. Hence, a conservative estimate for this product sub-group is around **6 million** installed appliances.

■ Cookers

Based on available data about stock of cookers in a few Member States, the total number of such appliances installed in Europe has been estimated at around **7 594 000**.

■ Stock estimations compared to the number of dwellings

Based on the estimated stock number presented above, the number of installed direct heating appliances in EU-27 amounts to around 65 million.

Considering that around 20% of the 208 million dwellings in the EU did not have a central heating system (2004); and among them, an estimated 20% are without any form of heating (mostly located in areas with a favourable climate in Spain, Italy, Portugal and Greece); and among the remaining 80% (which are also the dwellings in which at least one room heating appliance is used), solid fuel accounts for 40-50% with a predominance of wood over coal (or peat)³, the number of dwellings using solid fuel direct room heating appliances as the primary source of heat was at least 15 million in 2004. Extrapolation for EU-27 in 2007 gives the figure of more than 16 millions. These dwellings are likely to have more than one such appliance. Hence, the number of direct room heating appliances installed in these dwellings could easily reach at least 20 million.

Considering the estimate of the total stock of 65 million, this would leave around 45 million appliances installed as secondary heat source. Around 20% of the dwellings could thus be estimated to have such an appliance. This can be considered a feasible figure.

2.2.3 SUMMARY OF SALES AND STOCK

Table 2-16 provides a summary of the different values of sales and stock of Lot 15 appliances.

Table 2-16: Lot 15 appliances sales and stock (2007)

Appliance type		sales	stock
indirect heating appliances	manually fuelled boilers	250 400	6 433 000
	automatically fuelled boilers	62 600	1 412 000
direct heating appliances	open fireplaces	850 000	16 000 000
	closed fireplaces / inserts	849 100	16 139 000
	stoves	1 306 700	25 901 000
	cookers	464 200	7 594 000

2.2.4 AVERAGE PRODUCT LIFE

The lifetime of the appliances is of interest in this study as a key parameter in assessing the Life Cycle Costs of the appliances in the later stages of the study (Tasks 5 and 7). Lifetime can also be used to estimate the stock data based on sales. In the context of this study, the focus is on ‘active lifetime’, i.e. the time in service.

CITEPA¹⁴ estimates the lifetime of small combustion appliances at 15-25 years, depending on the type of appliance (Table 2-17). As a response to the questionnaire, stakeholders provided somewhat more variable estimations for the different appliance types (Table 2-18).

Table 2-17: Characteristics of small combustion appliances referenced by CITEPA¹⁵

Appliance		Fuel	Lifetime [year]
Boilers	hand stoked	wood	15
		coal	15-25
	automatically stoked	wood	15
		coal	15-25
Fireplaces	open	wood	25
		coal	
	closed / inserts	wood	15
		coal	15-25
Stoves and residential cooking stoves	wood	15	
	coal	15-25	

¹⁴ Centre Interprofessionnel Technique d’Etudes de la Pollution Atmosphérique, France, www.citepa.org

¹⁵ Source: Solid Fuel Combustion in Small Appliances, 2003, and Wood Combustion in Domestic Appliances, 2005, both prepared by CITEPA for EGTEI.

Table 2-18: Average product life time according to stakeholders' input

Appliance		Average product life time [years]
Boilers	hand stoked	10 to 25
	automatically stoked	15 to 25
Fireplaces	open	20 to 50
	closed / insert	15 to 25
Stove	hand stoked	15 to 40
	automatically stoked	10 to 15
Cookers	hand stoked	10 to 30

Small combustion appliances have few moving parts and they are made of durable materials due to safety reasons. Hence, their wear is generally low and their lifetimes are long. In addition, some appliances are used infrequently and remain in use for the lifetime of the building, especially open fires with inserts. 'Occasional use' means only a few times each year, such as at Christmas, New Year, anniversaries, and a few other days of the year (e.g. the few cold days in spring or autumn).

Parameters that have the greatest influence on the lifetime of appliances are quality of material, frequency of use, maintenance and quality of fuel.

With the exception of boilers, which can actually break down, replacement of direct heating appliances is rarely due to technical failure of the appliance, but rather to the wish of the user to install a better performing appliance or change the interior design, for example at the occasion of a house renovation. In that case, replacement is pushed by the (fuel) market and possible environmental/energy policies, more than defects in existing appliances.

2.3 MARKET TRENDS

This section presents recent evolution and expected orientation of the market, as well as a review of the parameters which are likely to influence appliances sales and design in the future.

2.3.1 EXPECTED EVOLUTION OF SOLID FUEL BOILER SALES

A surge in sales of solid fuel (mainly biomass pellet) boilers has been registered in the past years, after a long period of declining solid fuel appliance sales during the 1990's (see section 2.2.1). The increase accelerated in 2005 when sales grew by nearly 30% (notably in Austria, Czech Republic, Denmark, Finland, France, Germany, Poland and Sweden)³. This growth can be partly explained by the following elements:

- Pellet boilers gained an image of a high performance, environmentally friendly heating appliance
- Growing prices of gas and oil (see also section 2.4.2 on fuel prices)

- Incentive programmes/promotion of the renewable energy sources

According to BRG Consult, forecasts show the share of solid fuel boilers among all types of boilers is rising from 3% in 2004 to 6% in 2010. The sales are expected to reach 435 000 pieces by 2010, with seven MS (Austria, Germany, Denmark, Sweden, France, Czech Republic and Poland) together accounting for 76% of sales of solid fuel boilers. However, in the long term, the increase seems to have its limits. Indeed only a limited proportion of homes can handle solid fuel. It is difficult to imagine many urban gas connected dwellings converting to individual solid fuel appliances because of the cumbersome requirements in terms of fuel supply and storage. Hence, saturation could be reached in the not too distant future, followed by sales stagnation. Whether boiler sales are likely to stagnate in the near future remains contested. Some stakeholders see the price difference between oil/gas and biomass fuels as an economic driver for an increased biomass appliance market and argue that sales of solid fuel installations are thus likely to increase rather than to slow down before 2015.

Reflecting these aspects, past and forecasted solid fuel boiler sales for 2010 and 2025 are presented in Table 2-19 and Figure 2-2.

Table 2-19: Past and forecasted solid fuel boiler sales in Europe [units]³

1990	2004	2010	2025	Change 2004-2010	Change 2010-2025
288 000	237 000	436 000	296 000	+ 84%	- 32%

Expected sales per MS, as well as their share in the European market, are presented in Annex 2-1 (Table 2-31).

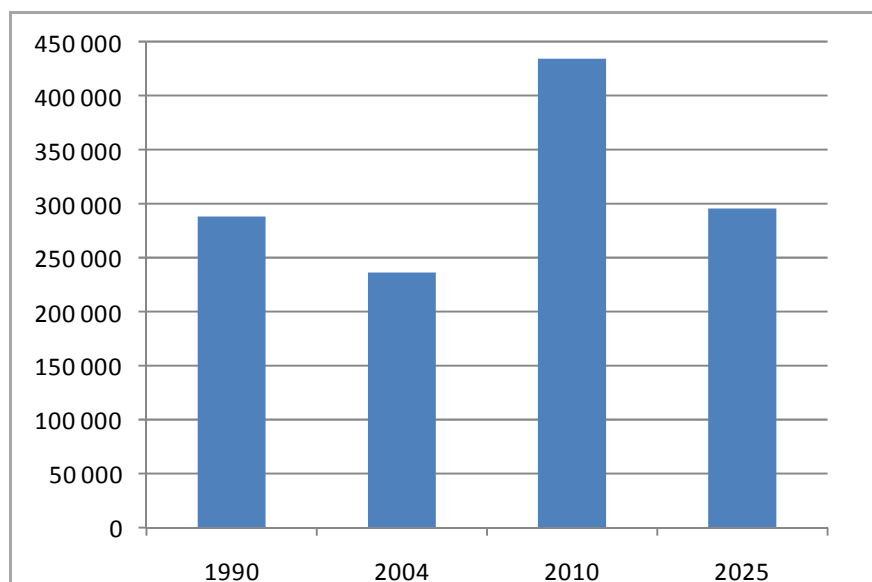


Figure 2-2: Past and forecasted solid fuel boiler sales in Europe³

2.3.2 BIOMASS USE AND PELLET BOOM

Within the solid fuel SCIs, biomass fuelled appliances have seen the greatest growth; regarding the pellet appliances (boilers and stoves) one could even talk about a boom.

Biomass fuels can play a crucial role in meeting the 20% target for renewable energy by 2020 and future reduction of CO₂ emissions in Europe. Furthermore, biomass fuels can improve security of energy supply and help to maintain competitive energy prices (see section 2.4.2).

Biomass is by far the fastest growing renewable energy source. The share of biomass in the energy mix differs widely from one MS to another, e.g. from 1.3% in the United Kingdom to 29.8% in Latvia. On average, the share in the EU is 4.1%.

At the EU level, heat is the most important market for biomass energy: in 2004, 66% of biomass fuel was used for delivering heat.

Wood and by-products of the forest and wood industries are currently the main source of solid biomass energy (85% in 2004), followed by waste (10%) and by agricultural based biomass (5%) (Figure 2-3). It should be noted that this figure presents the overall situation, including not only SCIs but also large thermal power plants.

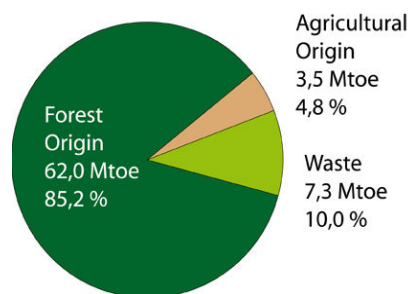


Figure 2-3: Sources of the biomass energy in EU-25, 2004¹⁶

The use of pellets as fuel for domestic stoves and boilers (as well as for co-combustion in coal fired power plants) has seen a significant increase over last ten years. Figure 2-4 presents the sales of pellet boilers in Austria in the last nine years.

¹⁶ AEBIOM (2007) Report on the contribution of biomass to the energy system in Europe 27

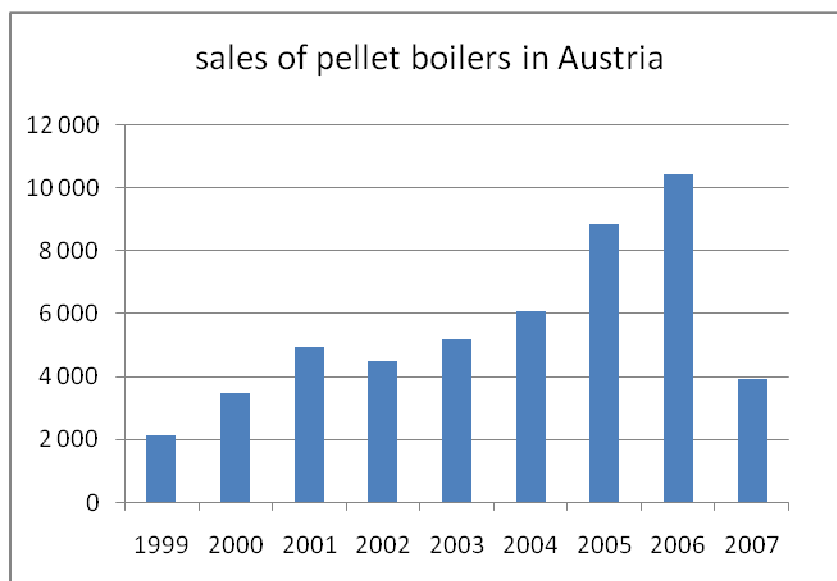


Figure 2-4: Sales of pellet boilers in Austria from 1999 to 2007¹⁷

Pellet market development can be explained by the image of this type of fuel (environmentally friendly, CO₂-neutral, sustainable), as well as the high level of comfort of the appliances. Furthermore, they have benefited from supportive government policies, including subsidies and financial incentives, for example the income tax credit introduced in France in 2005¹⁸. The growth of pellet appliances sales observed in Austria until 2006 is similar in other Member States including France, Germany, Italy and Sweden.

Nevertheless, the recent evolution of pellet market and pellet appliances market does not mean the “boom” will gradually continue: as shown in Figure 2-4, sales may abruptly decrease due to external factors. For the case presented above, this is due to an exceptionally cold winter in 2006 and the fuel supply and quality problems in the following year.

Furthermore, the evolution of pellet market cannot be interpreted as an EU wide trend. Indeed, so far the interest in pellets has been confined to a limited markets in Europe – Sweden, Denmark, Austria, Germany and Italy being the major areas of interest (Figure 2-5) – sales of pellet heating equipment in these markets have been growing on an average between 30% and 50% per year during the last decade¹⁹.

¹⁷ NÖ Landes-Landwirtschaftskammer: Biomasse – Heizungserhebung 2007, available at www.lk-bgld.at

¹⁸ This tax credit, of 40% of the appliance purchase price in 2005, raised to 50% in 2006 and valid up until 2009, is granted when purchasing a wood burning appliance which complies with energy and emissions criteria.

¹⁹ Source: Propellets Austria.

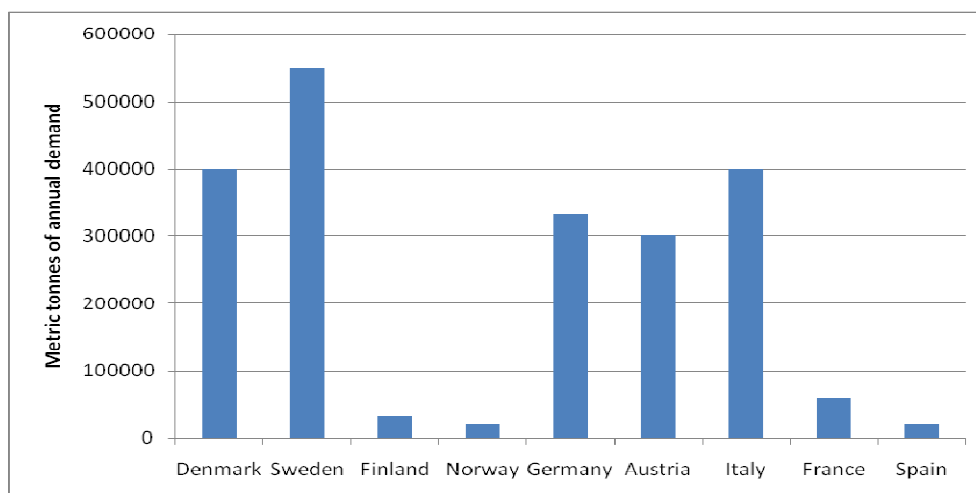


Figure 2-5 European market for residential pellet heating in 2005¹⁹

In many other MS, there is no established pellet supply system or no supply security. According to pellet appliance manufacturers²⁰, pellet supply problems, which have also led to price increases and/or quality problems, have already slowed down the sales of pellet appliance. Pellet SCIs also compete from fuel biomass with large heat and power plants, which can cause further price increase scaling down the growth of the SCI market.

Lack or change of political support can also affect the market development: for examples, in Germany the end of subsidies had a great impact on pellet boiler sales in 2006 (Figure 2-6). This shows that the industry can with difficulty cope with subsidies that appear and disappear unexpectedly. Changing subsidies do not allow continuous investment in R&D.

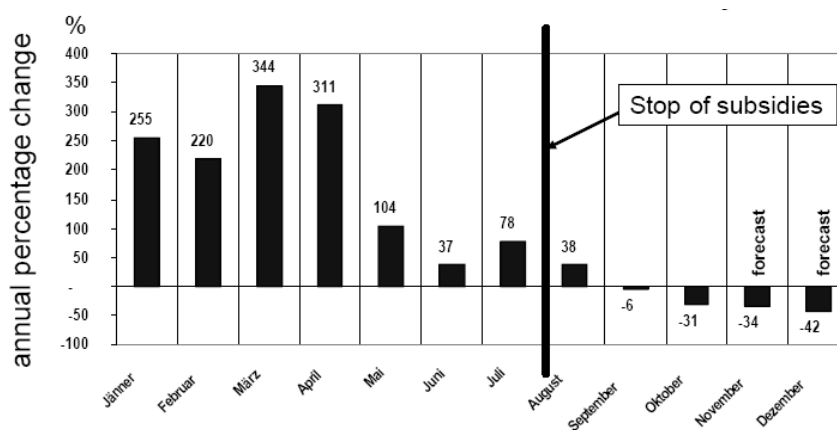


Figure 2-6: Impact of subsidies stop on boiler sales in Germany in 2006²¹

²⁰ Personal communication

²¹ European Bioenergy Business Forum (2006) Market development for small scale pellet boilers in Europe

2.3.3 KEY FACTORS INFLUENCING THE SOLID FUEL SCI MARKET

Based on the analysis presented above and stakeholder input, the key drivers of the solid fuel SCIs include:

- Energy prices, in particular fossil fuel prices (see section 2.4.2)
- Government policies and actions: schemes/financial incentives, subsidies for biomass, environmental regulations²²
- Fuel availability
- Sustainable development and ecological concern/awareness for renewable energy sources
- Functionality of the product

Influenced by these various drivers, the market orientates towards products with better efficiency and lower emissions.

The main elements that may influence the design of solid fuel small combustion installations are the following:

- (For boilers): location within the building and link with the system
- Furthermore, in the “low energy houses”, the heat demand may be so small that an installation of a central heating system is not justified; a direct heating appliance would rather be installed to cover the peak heat demand. This could lead to a shift in sales from central heating boilers to direct heating appliances.
- Size optimisation: in future, houses will have, in general, better energy performance (e.g. by better insulation) due to building regulations²³ and construction rules, therefore less stoves will be needed to heat them and the stoves size would be smaller. The trend is to develop appliances with low capacity to fit the energy demand of new dwellings. In modern houses, appliances are already in the 3-9 kW range. It is likely that the most common capacity will be below 5 kW for such houses.
- Aesthetics and fashion trends, especially for stoves and appliances that are installed in a living room and are used to create an atmosphere. Modern interiors tend to have, for example, appliances with large windows to allow a nice view of the flame.
- Ease of operation and maintenance and new functionalities like automated air control, in-situ filtering of particles.

²² The market impacts of the environmental requirements depend a lot on the requirements themselves. Currently, it is seen that the requirements drive qualitative change in the market rather than quantitative change.

²³ Energy Performance of Buildings Directive

2.4 CONSUMER EXPENDITURE DATA

The total costs of a solid fuel SCI can be divided in:

- Purchase cost: appliance purchase price and installation cost,
- Running costs: energy cost and repair and maintenance costs,
- Disposal cost

All these costs do not necessarily affect the same person. For example, a homeowner can be concerned by the purchase of an appliance, whereas the running costs could be borne by the tenant(s).

Table 2-20 presents the main elements influencing the “total cost” of a solid fuel heating system to the final consumer.

Table 2-20: Main factors influencing the "total costs" of SCIs

Element	Influencing factors	Examples of variability / comments
Choice of system / model	Country habits / preferences	More sophisticated models in Central and Nordic countries
		Preference for wall hung combi-boilers in Italy and Spain
		Simpler and cheaper models in recent accession member countries
	Fuel availability	Availability of solid fuel (central EU and new member countries)
	Country energy policy	Support for Renewable Energy Sources (RES)
	Fuel price	High oil prices influenced the shift towards other types of fuels, among which solid fuel
Accessories and features	E.g. control systems, or weather control	There is a great variability in versions (from the basic versions to the most high tech ones, provided with an internet interface), and thus cost
Other	Legislation / subsidies and incentives	Between countries
	Tax rates	differences in VAT rates
	Purchasing power of consumer	Within countries but also between countries / regions
	Role of the installer	Installers often have a strong influence on the choice of the heating system, and can be motivated (biased) by several drivers, such as their margins, training, experience
	Level of "education" of the consumer	In particular about the long term trade-off between initial investment and running costs and about the environmental impact of various systems

Element	Influencing factors	Examples of variability / comments
		The role of the internet on this issue is reportedly quite considerable
	Public awareness campaigns	Information campaigns, normally driven by public authorities often and associated with some kind of subsidy scheme, seem to have an increasing impact on consumer choice
	The "owner / occupier" dilemma	In rented accommodation, the owner usually pays for the system and its installation, whereas The occupier pays the running costs. This can create a conflict of interests, with the owner ending up choosing a sub-efficient solution.
Pricing policies of manufacturers	Although the introduction of the Euro seems to have reduced the scope for manufacturers to have widely varying pricing policies across the EU, differences still remain, especially between Old and New MS. These price differences can sometimes be due to economic disparity (thus purchasing power) or additional costs (e.g. transport when the appliance is not manufactured in its country of sale)	
Distribution channels	In particular, the largest differences result from the heating system being purchased by a building contracting company for a new build (or new installation), as opposed to individual purchases by consumers through a longer distribution channel	

2.4.1 PURCHASE COST

Purchase costs can be split among:

- Appliance purchase price
- Appliance installation costs

➔ Appliances purchase prices

In the context of this study, average appliance consumer prices are of interest as they are required as an input for Life Cycle Cost (LCC) calculations that will be performed in Task 5. Prices presented in this paragraph are product purchase prices only; costs related to product installation or maintenance are discussed in section 2.4.

Prices within an appliance category can vary widely. Parameters that are the most critical for fixing the price are the type of material used, the technical features and the design of the appliance. For instance, a stone stove can be twice more expensive than a steel or cast iron stove. Aesthetic appears to be an important parameter in particular in case of fireplaces and stoves, because these products are often considered not only as heat source, but as interior decoration as well: they give life quality to its users in form of an improved atmosphere. On the contrary, size of the appliance (within the same capacity range) and fuel type do not play a very high role in the final price.

Stakeholder responses to the questionnaire and prices observed in product catalogues indicate that average product prices²⁴ for the ranges of capacity concerned in this study are 3 000 - 20 000 Euros for boilers and 2 000 - 3 000 Euros for other appliance types (Table 2-21).

Table 2-21: Average consumer appliance prices (excluding installation costs)

Appliance		Product price range [Euros]	Average product price [Euros]
Boiler	automatically stoked	3 000 - 20 000	4 000
	hand stoked	1 500 - 20 000	3 000
Fireplace*	open	600 - 10 000	2 000
	closed / insert	1 000 - 8 000	2 000
Stove*	automatically stoked	1 000 - 4 000	2 000
	hand stoked	300 - 10 000	2 000
Cooker		1 000 - 3 000	2 000

* For fireplace, the price only correspond to the fire chamber, the materials and work to build for example a slow heat release appliance or tiled stove ("Kachelofen") are not included in this price. At cheapest, bricks are estimated to cost around 500 Euros, but material costs can be significantly higher.

Table 2-22 gives an example of the variation that can be observed according to the price range of the products. An alternative division of appliances could be made based on the current market, between the cheap products offered by the DIY (Do It Yourself) stores, manufactured in low cost countries and of an uncertain quality, and the high quality products offered by specialist dealers.

Table 2-22: Prices scales on the French market of fireplaces and stoves

Appliance	Price [Euros]		
	economic	middle scale	Upscale
closed fireplace	< 1000 €	2 000 - 4 000€	> 4 000 €
insert	< 500 €	500 - 2 000€	> 2000 €
stove	300 - 500€	500 - 2 000€	> 2000 €

➔ Installation costs

The installation costs of a heating system to the final consumer can vary according to many parameters. Table 2-23 presents the main factors and gives examples of the variability that can be observed.

According to the CITEPA²⁵, installation costs can be 20-60% of the appliance price for fireplaces and stoves, and 10-20% for new boilers (excluding the installation of the central heating system itself).

²⁴ "Average" product price in this context is not understood as an arithmetic mean, but more as a representative price for a typical average product in each category.

²⁵ Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique. www.citepa.org

Table 2-23: Main factors influencing appliances installation costs

Element	Influencing Factors	Examples of variability / comments
Type of project	Type of building	New construction vs. replacement vs. first time installation
		Conversion from central or district heating
		Detached house vs. flat
	Existing system	Radiators already in place, chimney available/suitable. Installing a new chimney adds at least 900-1500 Euros to the costs.
	Boiler / system location	A preference for location in the basement, in the loft or on the balcony can have a considerable impact on the installation costs
	Regulation and legal requirements	Vary widely, although now EPBD should bring them more in line
Labour hourly rates	Country	Great variety, especially between old and new member countries
	New build / existing building	In new build labour cost may be less clearly identified
	Size of installer firm	Sole trader vs. large firm
	Relative scarcity of installers	In areas where few installers are available higher prices can be charged
	"Black" market	In many countries this is a relevant phenomenon - making labour costs considerably lower
Cost of components	Quality of components	Influenced by consumer, installers, building contractor
	Price of comparable components	Fairly comparable across countries, with some difference between old and new member countries

Stakeholders' responses to the questionnaire allowed to estimate the installation costs as indicated in Table 2-24.

Table 2-24: Average installation costs²⁶ per type of appliance

Appliance	Average installation cost [Euros]
Boiler	1 500
Fireplace	700 ¹
Stove	500 ²
Cooker	500

1 Costs for installing inserts are highly dependent on the presence of an existing heart or recess. Costs related to chimney surround are not included in the price.
2 For heat-retaining stoves, installation labour costs are estimated $\geq 5\,000$ Euros.

²⁶ This price only refers to the installation/connection of the appliance to the system, without the installation of the system itself (chimney, central heating piping and radiators, etc.)

2.4.2 RUNNING COSTS

Running costs, understood as costs generated by the use of the appliances, can be split in:

- Energy costs (fuel price and possibly electricity price)
- Maintenance and repair costs

➔ Fuel prices

In order to calculate the life cycle costs of small combustion appliances in the later stages of the study, it is necessary to determine representative solid fuel prices. It is acknowledged that solid fuel prices vary widely over time, similar to other fuel prices in general. Figure 2-7 illustrates the fuel price (wood pellets, gas, and heating oil) developments in Germany from January 2006 to March 2008.

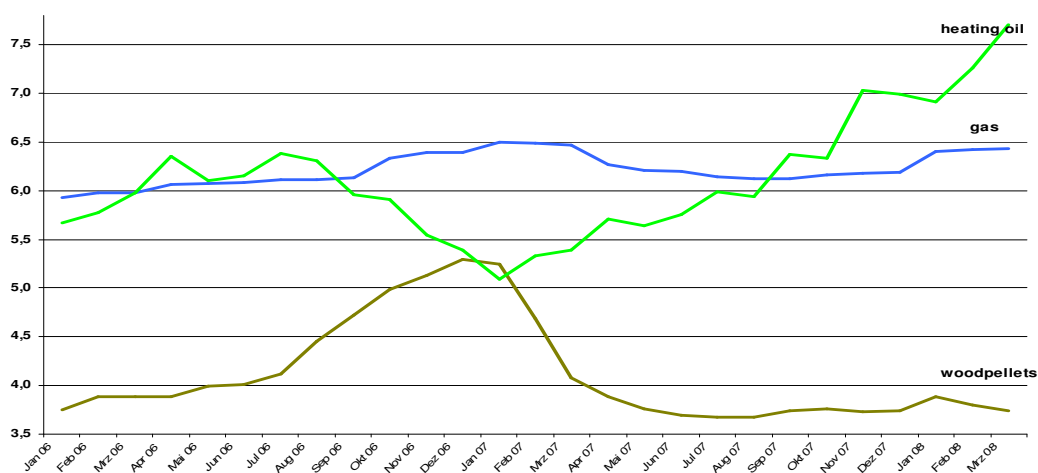


Figure 2-7: Price development of heating oil, gas and wood pellets in Germany in ct/kWh²⁷

Furthermore, fuel prices differ widely from a country to another depending on the local characteristics, e.g. availability of different resources. Table 2-25 provides an overview of retail prices in Member States for the main types of solid fuel: wood logs, refined wood fuels (pellets and briquettes), and coal. Even for a particular country the indicated price is an average: there can be large variations within a country due to local fuel availability, characteristics of delivery and packaging, etc.

²⁷ Source: stakeholder contribution.

Table 2-25: Fuel prices without VAT in 18 Member States, in June 2005²⁸

	Retail prices [€/GJ, net basis]			
	Forest residues	Firewood logs	Refined wood fuels ¹	Coal ²
Austria	N.A	5.56	8.61	12.68
Belgium	N.A	3.90	10.00	N.A
Czech Rep.	2.79	5.51	4.57	1.29
Denmark	4.48	10.90	9.21	20.80
Estonia	N.A	1.43	N.A.	3.31
Finland	N.A	8.33	7.21	N.A.
France	7.13	5.10	10.03	15.03
Germany	2.87	5.31	10.83	9.23
Greece	N.A	8.39	22.65	N.A.
Hungary	N.A	4.80	6.41	3.88
Ireland	3.77	23.18	16.70	12.59
Latvia	N.A	0.81	4.50	1.75
Netherlands	N.A	5.8 ³	16.00	N.A.
Poland	N.A	2.50	5.58	3.49
Portugal	2.78	3.61	6.80	N.A.
Slovakia	N.A	1.55	5.38	4.49
Spain	4.09	15.89	12.93	N.A.
Sweden	N.A	5.10	12.72	N.A.
EU average	4.0	6.5	10.0	8.0
1 Pellets and briquettes				
2 It is acknowledged that price varies according to the type of coal. This table presents a typical price for a commonly used coal type in the relevant Member States.				
3 Data provided by a stakeholder.				

Energy price plays a major role in appliance operating costs and also in appliance choice: it has been identified as one of the main drivers of SCI market trends (see section 2.3). Therefore it is interesting to compare solid fuel prices with the prices of other energy sources. Figure 2-8 shows the differences observed in France. Solid fuels are in general cheaper than other energy sources. Within the solid fuel category, refined wood fuel and coal appear to be the most expensive ones.

²⁸ E. Alakangas et al. (2007) Biomass fuel trade in Europe, Summary Report. Eubionet II.

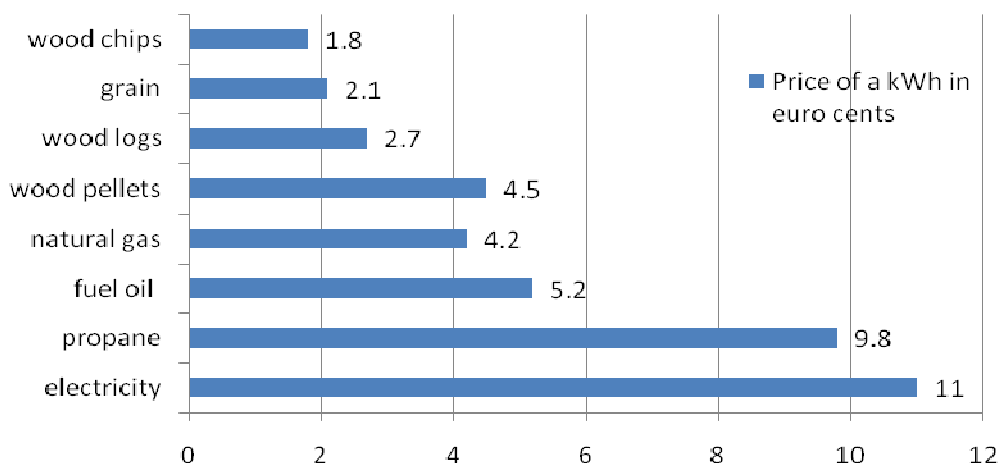


Figure 2-8: Price of different energy sources in France in 2005²⁹

In the discussion about the fuel price, it is to be kept in mind that many people obtain wood freely from forests and thus do not pay much (or nothing!) for biomass fuel use. For example in Finland it has been estimated that 80% of the wood used in SCIs is received free of charge. Thus, the informal market, as well as private forest lands contributes to a significant extent to the SCI fuel supply.

→ Electricity prices

Electricity costs have to be taken into account for appliances having an automatically controlled part. Electricity prices reported by Eurostat are presented in Table 2-26.

Table 2-26: Electricity prices for household consumers³⁰

Member State	Electricity Prices S2 2007 [Euros/kWh]
Austria (AT)	0.18
Belgium (BE)	0.20
Bulgaria (BG)	0.07
Cyprus (CY)	0.18
Czech Republic (CZ)	0.13
Germany (DE)	0.21
Denmark (DK)	0.26
Estonia (EE)	0.08
Spain (ES)	0.14
Finland (FI)	0.12
France (FR)	0.12
Greece (EL)	0.10

²⁹ Source: French Ministry of the Economy, the Exchequer and the Industry (2005) <http://www.arecpc.com/Energie/bois/combustible.htm>

³⁰ Data retrieved on Eurostat website: <http://epp.Eurostat.ec.Europa.eu>. Household consumers refer to consumer band Dc (annual consumption between 2 500 and 5 000 kWh).

Member State	Electricity Prices S2 2007 [Euros/kWh]
Hungary (HU)	0.15
Ireland (IE)	0.18
Lithuania (LT)	0.09
Luxembourg (LU)	0.16
Latvia (LV)	0.08
Malta (MT)	0.10
Netherlands (NL)	0.17
Poland (PL)	0.13
Portugal (PT)	0.15
Romania (RO)	0.11
Sweden (SE)	0.17
Slovenia (SI)	0.11
Slovakia (SK)	0.14
United Kingdom (UK)	0.15
TOTAL EU-27	0.16

➔ Maintenance and repair costs

Main elements influencing maintenance are presented in Table 2-27.

Table 2-27: Factors influencing maintenance costs

Influencing Factors	Examples of variability / comments
Legal requirements	Imposing frequency of inspections
Actual practice	How well are legal requirements enforced
Terms of warranty	Standard length of warranty varies by more than 100% across countries
Relative cost of repair vs. replacement	Heating systems being typically a "distress purchase", they will often be repaired until it is economical, rather than be replaced
Cost of inspections	Maintenance contracts vs one-off calls
Cost of component replacement	Related to type and quality of system installed

Costs for maintenance and repair of the appliances (excluding chimney sweep) over the appliance lifetime (see section 2.2.3) have been estimated based on the stakeholder input (Table 2-28).

Table 2-28: Average maintenance and repair costs per type of appliance over the appliance lifetime

Appliance	Maintenance cost for the life time [Euros]		Repair cost for the life time [Euros]	
	cost range	average cost	cost range	average cost
Boiler		500		500
Fireplace	100 - 500	300	0-500	250
Stove (excl. pellet stoves)	50 - 500	250	0-500	250
Pellet stoves	100-500	350		200
Cooker	50 - 500	250	200	

In addition, the cost of the check by a chimney sweeper for the concerned appliances is estimated to be around 100 Euros per year, although it is acknowledged that the price varies between MS depending on whether the sweeping is voluntary or mandatory, and how the mandatory schemes are organised at the national/local level.

2.4.3 DISPOSAL COSTS

All solid fuel boilers and most stoves are made of either steel or cast iron, and in the current market situation, they have a positive value as a scrap metal at end-of-life. However, in practice, in most cases the installer of the new heating appliances or system takes back the old appliance without any charge. Thus, the revenue at the end-of-life goes to the installer rather than to the consumer, who nevertheless benefits as he does not need to worry about the transport of the heavy and bulky appliance. With the exception of a few decorative appliances (e.g. traditional cast iron cookers), there is no second hand market for SCIs.

Hence, on average both the disposal costs and resale value (as scrap metal or second-hand product) for SCIs are considered negligible.

2.4.4 INTEREST AND INFLATION RATES

Table 2-29 shows national inflation and interest rates for the EU-27 as published by Eurostat and the European Central Bank (ECB).

Table 2-29: Interest and inflation rates for EU-27

Member State	Inflation rate ¹ [%]	Interest rate ² [%]
Austria (AT)	2.9	4.29
Belgium (BE)	2.8	4.33
Bulgaria (BG)	10.9	4.54
Cyprus (CY)	3.4	4.48
Czech Republic (CZ)	5.1	4.28
Denmark (DK)	2.3	4.29
Estonia (EE)	9.3	5.69
Finland (FI)	2.5	4.29
France (FR)	2.5	4.30

Member State	Inflation rate ¹ [%]	Interest rate ² [%]
Germany (DE)	2.7	4.22
Greece (EL)	3.7	4.50
Hungary (HU)	7.2	6.74
Ireland (IE)	3.1	4.31
Italy (IT)	2.7	4.49
Latvia (LV)	13.8	5.28
Lithuania (LT)	8.6	4.55
Luxembourg (LU)	3.5	4.56
Malta (MT)	2.3	4.72
Poland (PL)	3.6	5.48
Portugal (PT)	2.6	4.42
Romania (RO)	6.7	7.15
Slovakia (SK)	2.6	4.49
Slovenia (SI)	5.3	4.52
Spain (ES)	3.7	4.31
Sweden (SE)	2.4	4.17
The Netherlands (NL)	1.7	4.29
United Kingdom (UK)	n.a.	5.06
Euro area	2.8	4.32
EU-27 Average	3.0	4.58

¹ 12 month average rates May 08-07 / May 07-06, source: Eurostat³¹
² ECB long-term interest rates; 10-year government bond yields, secondary market. Annual average (%), 2007³²

2.5 CONCLUSIONS

The data presented in Task 2 will form the basis for selecting the most representative products on the European market and eventually formulating the base-case(s) in Task 5. However, estimating sales and establishing the stock of solid fuel small combustion installations in sufficient detail to allow base-case selection through existing data sources represents a challenge. This report represents the best estimates based on a number of individual sources.

The available data shows that the yearly sales of the products are higher than the 200 000 unit threshold set in the EuP Directive.

The general trend observed is a growth of both sales and stock of solid fuel SCIs. This growth is partly due to the development of biomass use, as it is clearly visible through the example of pellets market. However, this growth may be limited in the future because of a “natural ceiling” due to requirements in term of fuel storage and supply.

Energy prices and fuel availability are the most important parameters that explain the current structure of the market. Government actions at a national level (e.g. financial

³¹ <http://europa.eu/rapid/pressReleasesAction.do?reference=STAT/08/85&format=HTML&aged=0&language=EN&guiLanguage=en>

³² http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-30-08-410/EN/KS-30-08-410-EN.PDF

incentives) have played a fundamental role in some countries. Increasing environmental concerns on the one hand and consumers' preference for aesthetic quality and comfort on the other hand appear to be the main elements that currently determine appliance design.

2.6 TASK 2 ANNEX

2.6.1 MARKET DATA FOR CENTRAL HEATING SYSTEMS

Table 2-30, Table 2-31, and Table 2-32 present sales and stock data of central heating solid fuel boilers per MS (source: BRG Consult (2006) The Boiler and Heating System Market in the European Union).

Table 2-30: Solid fuel boiler sales for 22 Member States 1990 - 2004 ('000 appliances)

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Austria	21	19	18	16	14	14	13	13	12	13	15	17	16	17	18
Belgium	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Czech Republic	28	27	30	19	21	25	27	29	28	27	28	42	35	35	39
Denmark	1	1	1	1	1	1	2	2	2	2	5	4	3	3	5
Estonia	0	0	0	0	0	1	1	1	1	1	1	1	2	2	2
Finland	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
France	17	16	14	14	13	12	10	9	8	7	9	9	7	7	8
Germany	19	17	15	14	13	12	11	11	11	12	16	19	16	18	20
Greece	3	3	3	2	2	2	2	2	1	1	1	1	1	1	1
Hungary	18	14	12	11	10	8	8	8	8	6	5	4	4	4	4
Ireland	6	5	5	5	5	4	4	4	4	4	4	4	4	4	4
Italy	5	5	6	5	5	5	5	5	5	5	5	5	4	5	5
Latvia	3	4	4	4	4	4	4	4	4	4	5	6	6	6	6
Lithuania	4	7	8	8	8	9	9	9	9	10	10	10	11	11	11
Netherlands	5	4	5	4	2	2	2	2	1	1	1	1	1	1	1
Poland	100	95	90	85	78	65	60	55	50	47	64	65	65	72	75
Portugal	2	2	2	2	2	1	1	1	1	1	0	0	0	0	0
Slovakia	14	14	16	22	16	13	10	6	4	5	6	8	9	15	15
Slovenia	7	7	6	5	5	4	3	3	3	4	8	7	8	8	8
Spain	6	6	5	4	4	4	3	2	2	1	0	0	0	0	0
Sweden	12	13	13	14	15	15	12	9	7	6	5	5	5	7	9
UK	14	13	13	12	11	11	9	9	8	7	6	5	5	5	5
Total	288	275	267	248	230	214	198	185	171	163	196	216	204	223	237

Table 2-31: Past and forecasted solid fuel boiler sales in 22 Member States ('000 appliances)

Country	1990		2004		2010		2015		2020		2025	
	'000	%	'000	%	'000	%	'000	%	'000	%	'000	%
Austria	21	7.3%	18	7.4%	32	7.3%	26	7.0%	23	7.2%	22	7.4%
Belgium	1	0.3%	1	0.4%	1	0.3%	1	0.3%	1	0.4%	1	0.4%
Czech Republic	28	9.7%	39	16.6%	56	12.7%	43	11.9%	41	12.5%	40	13.5%
Denmark	1	0.4%	5	1.9%	13	2.9%	11	2.9%	9	2.8%	8	2.8%
Estonia	0	0.0%	2	0.8%	3	0.6%	2	0.6%	2	0.6%	2	0.7%
Finland	2	0.7%	2	1.0%	3	0.7%	3	0.8%	3	0.8%	2	0.8%
France	17	5.9%	8	3.2%	40	9.2%	37	10.1%	29	9.0%	20	6.9%
Germany	19	6.6%	20	8.4%	74	17.1%	57	15.5%	40	12.3%	32	10.7%
Greece	3	1.0%	1	0.3%	0	0.0%	-	-	-	-	-	-
Hungary	18	6.3%	4	1.5%	10	2.3%	10	2.7%	9	2.8%	8	2.5%
Ireland	6	2.1%	4	1.6%	3	0.6%	3	0.8%	3	0.9%	3	1.1%
Italy	5	1.7%	5	2.1%	6	1.4%	4	1.2%	5	1.4%	5	1.6%
Latvia	3	0.9%	6	2.5%	9	2.0%	7	1.9%	6	2.0%	6	2.1%
Lithuania	4	1.4%	11	4.4%	14	3.1%	13	3.4%	12	3.7%	12	4.1%
Netherlands	5	1.7%	1	0.4%	1	0.2%	1	0.3%	1	0.3%	1	0.4%
Poland	100	34.8%	75	31.7%	113	25.9%	97	26.3%	91	27.9%	87	29.6%
Portugal	2	0.7%	0	0.0%	0	0.0%	-	-	-	-	-	-
Slovakia	14	4.9%	15	6.2%	17	3.9%	16	4.2%	15	4.5%	14	4.7%
Slovenia	7	2.4%	8	3.5%	9	2.1%	9	2.4%	9	2.9%	10	3.2%
Spain	6	2.1%	0	0.0%	1	0.2%	1	0.2%	1	0.3%	1	0.3%
Sweden	12	4.2%	9	3.8%	25	5.7%	23	6.2%	19	5.8%	15	5.1%
UK	14	4.9%	5	2.1%	7	1.6%	4	1.2%	6	1.8%	6	2.0%
Total	288	100%	237	100%	436	100%	367	100%	325	100%	296	100%

Table 2-32: Solid fuel boiler stock per Member State in 1990 and 2004 ('000 equipped dwellings)

Country	1990		2004		% change*
	'000	%	'000	%	90-04
Poland	1 794	20.2%	1 761	28.4%	-2%
Czech Republic	512	5.8%	511	8.2%	0%
France	724	8.2%	492	7.9%	-32%
Sweden	611	6.9%	467	7.5%	-24%
Austria	320	3.6%	420	6.8%	31%
UK	807	9.1%	385	6.2%	-52%
Spain	541	6.1%	345	5.6%	-36%
Finland	325	3.7%	322	5.2%	-1%
Slovakia	300	3.4%	241	3.9%	-20%
Ireland	243	2.7%	197	3.2%	-19%
Hungary	695	7.8%	173	2.8%	-75%
Slovenia	150	1.7%	166	2.7%	10%
Lithuania	148	1.7%	145	2.3%	-2%
Germany	1 181	13.3%	128	2.1%	-89%
Greece	97	1.1%	100	1.6%	3%
Italy	52	0.6%	79	1.3%	50%
Latvia	89	1.0%	74	1.2%	-17%
Belgium	158	1.8%	59	1.0%	-63%
Denmark	41	0.5%	51	0.8%	25%
Netherlands	50	0.6%	50	0.8%	-
Portugal	14	0.2%	22	0.4%	54%
Estonia	11	0.1%	14	0.2%	28%
Total	8 864	100%	6 202	100%	-30%

*Figures are original figures given in the reference document; signs have been added for a better visibility of the direction of the change (increase or decrease of the stock).

2.6.2 COUNTRY GROUPS USED FOR DATA EXTRAPOLATION TO EU-27

The EU encompasses a large variety of space heating profiles, reflecting differences in culture, history, energy resources, fuel supply as well as climate and housing stock. Indeed, each MS has specific characteristics - sometimes with significant regional variations within the MS. However, some Member States could be considered similar enough in order to simplify the analysis.

Three main parameters have been taken into account:

- The climate and weather conditions, based on the heating degree-days,
- The importance of local coal resources as a proxy for the use in small combustion installations,
- The forest coverage.

■ Heating degree-days

The mean heating degree-days over the period 1980-2004³³ are presented below, ranked from the highest to the lowest.

Table 2-33: Mean heating degree-days for member states between 1980 and 2004

Member State	Mean heating degree-days over period 1980 - 2004
Finland (FI)	5 849
Sweden (SE)	5 444
Estonia (EE)	4 445
Latvia (LV)	4 265
Lithuania (LT)	4 094
Poland (PL)	3 616
Austria (AT)	3 574
Czech Republic (CZ)	3 571
Denmark (DK)	3 503
Slovakia (SK)	3 453
EU-27 average*	3 254
Germany (DE)	3 239
Luxembourg (LU)	3 210
Romania (RO)	3 129
United Kingdom (UK)	3 115
Slovenia (SI)	3 053
Hungary (HU)	2 922

³³ Source: Eurostat.

Member State	Mean heating degree-days over period 1980 - 2004
Ireland (IE)	2 906
Netherlands (NL)	2 902
Belgium (BE)	2 872
Bulgaria (BG)	2 687
France (FR)	2 483
Italy (IT)	1 970
Spain (ES)	1 842
Greece (EL)	1 663
Portugal (PT)	1 282
Cyprus (CY)	782
Malta (MT)	560

* weighted by dwelling stock.

■ Coal use

Coal is used in small combustion installations principally in countries where this kind of fuel is produced as local supply enables competitive prices. The table below presents the coal production for 2006 in Europe³⁴.

Note that the lignite and coal production given here may not correspond exactly to use in SCIs. These figures are an indicator that enables identification of countries where these types of fuel are mainly produced, and hence where it is most likely that coal is used in combustion appliances.

Table 2-34: Coal production of Member States in 2006³⁴

Member State	Lignite and hard coal production [Mt]
Germany	200
Poland	156
Greece	64
Czech Republic	62
Romania	38
Bulgaria	25
UK	19
Spain	18
Estonia	15
Hungary	10
Slovenia	5
Slovakia	2

³⁴ Source : <http://www.euracoal.be/newsite/referenzkarte2005engl.pdf>

Austria	0
Belgium	0
Denmark	0
Finland	0
France	0
Ireland	0
Italy	0
Latvia	0
Lithuania	0
Netherlands	0
Portugal	0
Sweden	0
Cyprus	na*
Luxembourg	na*
Malta	na*

*not available. For these countries, coal production can be assumed to be 0.

■ Forest coverage

The forest and other wooded land (FOWL)³⁵ area per capita is presented below, ranked from the highest to the lowest.

Table 2-35: Forest and other wooded land area of member states³⁵

Member State	FOWL per capita [ha]
Finland (FI)	4.42
Sweden (SE)	3.46
Estonia (EE)	1.58
Latvia (LV)	1.27
Spain (ES)	0.66
Greece (EL)	0.61
Lithuania (LT)	0.61
Slovenia (SI)	0.60
Austria (AT)	0.49
Cyprus (CY)	0.49
Bulgaria (BG)	0.48
Slovakia (SK)	0.38
Romania (RO)	0.34
Portugal (PT)	0.33

³⁵ Source: European Forest Institute: <http://www.efi.int/databases/ltfra/data.php?group=5&land%5B%5D=11002&land%5B%5D=11004&land%5B%5D=11005&land%5B%5D=11006&source=502>

Member State	FOWL per capita [ha]
France (FR)	0.29
Czech Republic (CZ)	0.26
Poland (PL)	0.24
Luxembourg (LU)	0.20
Italy (IT)	0.19
Hungary (HU)	0.18
Ireland (IE)	0.17
Germany (DE)	0.13
Denmark (DK)	0.11
Belgium (BE)	0.07
United Kingdom (UK)	0.05
Netherlands (NL)	0.02
Malta (MT)	0

■ Country groups

Considering the above-mentioned parameters as well as the “cultural” similarity and socio-economic situation in a more general level, the following country grouping is derived. The grouping of countries shall only be used for extrapolation of unavailable market data.

- Group 1: Finland, Sweden, Estonia, Latvia, Lithuania and Denmark

This group is characterised by “cold” climate, practically no coal production whose use is the SCI is thus assumed close to nothing. Ample forest resources encourage the use of wood and wood-based fuels. Lithuania has lower forest resources compared to other MS in this group, but they are nevertheless higher than in most other MS. Due to its similar history and geographical vicinity, it is thus grouped together with the other Baltic States.

Table 2-36: Country group 1 data

Country	Heating degree-days	Lignite and hard coal production [Mt]	FOWL per capita [ha]
Finland	5 849	0	4.42
Sweden	5 444	0	3.46
Estonia	4 445	15	1.58
Latvia	4 265	0	1.27
Lithuania	4 094	0	0.61
Denmark	3 503	0	0.11

- Group 2: Ireland and United Kingdom

Both countries are characterised by a “moderate” climate (in the European scale). The availability of coal and forest resources differs, but due to geographic and socio-economic similarity, these two MS are grouped together.

Table 2-37: Country group 2 data

Country	Heating degree-day	Lignite and hard coal production [Mt]	FOWL per capita [ha]
United Kingdom	3 115	19	0.05
Ireland	2 906	0	0.17

- Group 3: Netherlands, Belgium, Luxembourg and France

These MS also have a “moderate” climate in general, coal production and thus use in SCIs is considered negligible. Forest resources vary from 0.02 – 0.29 ha/capita.

Table 2-38: Country group 3 data

Country	Heating degree-day	Lignite and hard coal production [Mt]	FOWL per capita [ha]
Netherlands	2 902	0	0.02
Belgium	2 872	0	0.07
Luxembourg	3 210	0	0.20
France	2 483	0	0.29

- Group 4: Germany, Austria and Slovenia

The three MS have a “moderate” climate. Coal is produced in Germany, but based on other sources its use in SCIs is limited. Coal might also be used to some extent in Slovenia. Forest resources vary from 0.13 – 0.60.

Table 2-39: Country group 4 data

Country	Heating degree-day	Lignite and hard coal production [Mt]	FOWL per capita [ha]
Germany	3 239	200	0.13
Austria	3 574	0	0.49
Slovenia	3 053	5	0.60

- Group 5: Poland, Czech Republic, Slovakia, Hungary, Romania and Bulgaria

Again, these MS can be characterised by a “moderate” climate. Coal resources are variable but existing, so coal use in SCIs is assumed to play a role. Forest resources per capita are also in the similar order of magnitude.

Table 2-40: Country group 5 data

Country	Heating degree-day	Lignite and hard coal production [Mt]	FOWL per capita [ha]
Poland	3 616	156	0.24
Czech Republic	3 571	62	0.26
Slovakia	3 453	2	0.38
Hungary	2 922	10	0.18
Romania	3 129	38	0.34
Bulgaria	2 687	25	0.48

- Group 6: Portugal, Spain, Italy, Greece, Cyprus and Malta

These are the “warm” MS. Despite some coal resources in Greece and Spain, the role of this fuel is estimated negligible in this group. With the exception of Malta, all of these MS have reasonable forest resources per capita.

Table 2-41: Country group 6 data

Country	Heating degree-day	Lignite and hard coal production [Mt]	FOWL per capita [ha]
Italy	1 970	0	0.19
Greece	1 663	64	0.61
Portugal	1 282	0	0.33
Spain	1 842	18	0.66
Cyprus	782	0	0.49
Malta	560	0	0

The country grouping is the basis for the extrapolation in order to derive estimations for MS for which data is not directly available.

Example: assuming that boiler sales are available for Belgium, Netherlands and France, but are missing for Luxembourg.

The average boiler sales per number of dwellings for this country group (group 2) have been calculated as follow:

$$\frac{sales_{BE} + sales_{NL} + sales_{FR}}{dwellings_{BE} + dwellings_{NL} + dwellings_{FR}}$$

Then boiler sales in Luxembourg have been derived by multiplying the ratio above by the number of dwellings in Luxembourg.