Study on the Competitiveness of the EU Gas Appliances Sector

Within the Framework Contract of Sectoral Competitiveness Studies – ENTR/06/054

Final Report

Client: Directorate-General Enterprise & Industry

Rotterdam, 11 August 2009

Disclaimer: The views and propositions expressed herein are those of the experts and do not necessarily represent any official view of the European Commission or any other organisations mentioned in the Report

ECORYS SCS Group
P.O. Box 4175
3006 AD Rotterdam
Watermanweg 44
3067 GG Rotterdam
The Netherlands

T +31 (0)10 453 88 16
F +31 (0)10 453 07 68
E fwc-scs@ecorys.com
W www.ecorys.com
Registration no. 24316726

ECORYS Macro & Sector Policies
T +31 (0)31 (0)10 453 87 53
F +31 (0)10 452 36 60

Table of contents

Tables

Figures

Executive Summary

Scope of the study

The scope of the study is based on the Directive 90/396/EEC on appliances burning gaseous fuels (GAD). The GAD covers mainly common consumer and commercial products, these are:

- final products, gas appliances burning gaseous fuels used for cooking, space heating, hot water production, refrigeration, washing (including ironing) or lighting. Where applicable, normal water temperature does not exceed 105ºC (i.e. water temperature can exceed 105 ºC for a short period). Forced draught burners and heating bodies to be equipped with such burners fall also under the directive's scope and
- intermediary products, referred to as fittings, such as, safety, controlling or regulating devices and sub-assemblies. Sub-assemblies are understood as separately marketed for trade use and designed to be incorporated into an appliance burning gaseous fuels or assembled to constitute such an appliance.

Appliances specifically designed for use in industrial processes carried out on industrial premises are excluded.

Distribution, installation, maintenance and repair are crucial for the marketing of gas appliances (GA). This view is supported by the fact that most of the appliances and fittings are components which provide full benefit only as part of complete systems. There is an inextricable linkage between manufacturing industry and services that is followed in this study. The gas appliances sector (GAS) comprises two subsectors, the manufacture of physical products (GAS-M) and the supply of downstream services GAS-S).

For the final products there are three market segments that exhibit different environments.

- The market for heating, ventilation and air conditioning (HVAC) comprises appliances for heating, hot water production and cooling.
- The market for domestic appliances comprises refrigerators and freezers, cookers, ovens, lighting equipment, washing and drying machines.
- The market for portable gas appliances comprises appliances for heating, hot water production and cooling, refrigerators and freezers, cookers, ovens, lighting equipment, washing- and drying machines.

In contrast to the other products portable appliances are dedicated for changing usage sites, in remote areas with no access to the gas grid and for outdoor leisure time activities. To a certain extent portable appliances are used as substitutes for domestic appliances, in particular in southern European countries and the new Member States.

GA compete with appliances that are run by other feedstock or by electricity (non-GA). For the most part GA and non-GA dedicated for the same purpose are manufactured and distributed by the same companies and to a certain substitution between them is possible.

As a consequence the study takes into account two broader market segments. The application area HVAC comprises GA and non-GA that – generally speaking - are distributed via the same channels. The broader market segment for domestic appliances also comprises GA and non-GA.

Both of these broader market segments show differences in the environment. One objective of the study was to investigate in the performance of GA as compared with non-GA in each of the market segments.

Performance of the gas appliances manufacturing sector

In 2007 the production of the GAS-M reached a value of € 12 billion and at around 85% of it are appliances of the subsector HVAC. The complementary non-GAS manufacturing was much bigger with an output of € 26 billion of which around 85% are domestic appliances. The GAS and the non-GAS together reached a production of € 38 billion.

The growth of the GAS-M slowed down over the period under investigation. Between 1995 and 2001 the production of the subsector HVAC grew at an average annual rate of 9.9% at current prices, the following years until 2007 its increase was only 7.0%. This was equal to 8.6% on average for the 12 years under consideration. For domestic appliances the respective figures are 4.9% and 2.9%. For all of the years under consideration the average growth rate came up to 3.8%. A comparison with non-GAS discloses noteworthy discrepancies in the growth momentum. Domestic appliances run by other feedstock and electricity grew at an average rate of 4.9% somewhat stronger than GA. For HVAC the relationship was the opposite non-gas appliances grew only at an average rate of 4.4%.

Performance in international markets

The analysis of foreign trade does not show a European specialization on the GAS-M as compared to other important nations in the market for GA. The contribution of European manufacturers to global trade shrank markedly over the period under consideration. In 1999 it came up to 54% and shrank to 36% in 2007. The underlying reason for this development was the access of emerging countries in the world market, in particular, China and Turkey.

This reduction in the contribution to world trade has not been caused by a noteworthy weakness of the European manufacturers. A comparison with the non-GAS and all of the manufacturing industries disclosed that the GAS-M did not perform worse than the non-GAS manufacturing sector and even much better than the average of manufacturing industries. This result indicates that the reduced share in global trade has been a consequence of an increasing globalization and the emergence of new manufacturers of GA.

The GA imports originated from China and Turkey has gained much importance. The focus of Chinese exports to Europe is on domestic appliances and underscores the extremely high level of globalization in this subsector. The supply side is dominated by global players with stakes in the more important worldwide markets. The imports from Turkey are more balanced between HVAC and domestic appliances. An explanation is provided by the fact that for most of the HVAC products marketing is more dependent on

consultancy and services than for domestic appliances. The access to remote markets is more challenging because it requires qualified service personnel and distribution representatives in the sales market. In contrast, Turkey is a candidate country, economic ties have been strengthened with the European Union and the regulatory framework is converging. Turkey has become as well a production location with a broad industrial basis as the most promising market by size and growth. Many European manufacturers have invested in this country and the division of labour with the EU has been intensifying.

European manufacturing cluster

Total EU-27 employment of the GAS-M is estimated at around 476 thousand employees or 1.46 percent of total manufacturing employment. The old Member States (EU-15 area) employs approximately 360 thousand people, equalling 1.2 percent of the total manufacturing workforce. 116 thousand were employed in the new Member States. This equals a share of close to 2.0% of total manufacturing employment.

The GAS-M is well integrated in the European economy. It has exploited regional comparative advantages and the new Member States have become part of the European production network. The division of labour along the value chain is characterized by the availability of manufacturers of key components for GA. Therefore a supply of advanced components on the leading edge of technology is available. This is a precondition for the manufacture of high performance GA. The major manufacturers of burners, heat exchangers etc. are located in the old Member States. They are driven as well by product and production technology and are pivotal for the performance of the European GAS in international competition.

The European subsector HVAC of the GAS-M is in a situation of self-supply with the most important key components. Imports, in particular from Asia, concern commodities, such as small electronics and to a certain extent low-end mechanical components. For the subsector domestic appliances the situation is a bit different. Large-scale production and global players exploit comparative advantages in production location to a higher degree. This is also indicated by the import ratios. For GA of the subsectors HVAC and domestic appliances they come up to 4% and around 40% respectively.

Companies' strategies

Most prominent representatives of the *HVAC* are those bigger manufacturing companies that pursue market share related strategies and exploit economies-of-scale. Mergers and acquisitions have taken place but this has not led to the extinction of brands. The firms use their market value of brand names and regional preferences. Other big manufacturers with around 1,000 to 2,000 employees put much emphasis on technologies and try to gain a leading edge. They are permanently challenged by their bigger counterparts who are eager to catch up technology and further price competitiveness. Small firms in the market for final products are focusing in niches, such as customizing and the design of environmentally friendly products with specific features. They are strongly dependent on regional conditions and preferences of small client groups.

Many companies from the new Member States have been taken over by Western competitors and become part of their internal value chain, in particular specializing in metal parts and components. The firms that have remained independent face tough competition from bigger western European companies. Most of them try to exploit their traditional trade channels with other new Member States and Eastern Europe countries. Their presence in western European markets is limited. The structural change from the transition period has not yet come to an end. Their major challenges lie in a poor access to resources and growing labour costs that reduce their price competitiveness.

Globalization of the *domestic appliances'* markets is far more advanced than for HVAC. All of the big players command noteworthy market shares in Europe, the Americas and Asia. Domestic appliances are highly standardized products and many of the products are plug-in appliances. The big global players of domestic appliances run production facilities all over the world. However, as in HVAC it is necessary to use numerous brands in line with their regional awareness and reputation to meet differences in regional habits and preferences. Branding, consumer preferences and design are the most important action parameters in the sales market. There is only little room left for SMEs in final products.

In the new Member States there exist some independent medium-sized manufacturers of domestic appliances. Nearly all of them were privatized during the transition period, but have not been acquired by Western companies. They trust their regional client basis and their traditional distribution channels in Central and Eastern Europe. They face growing competitive pressure from two sides, the West European companies with their attractive brands and sophisticated products, on one hand, and competitors from Turkey or the Far East that supply above all low-end appliances, on the other hand. Their ability to allocate resources is limited to develop more sophisticated products or to exploit cost-saving potentials. The situation has not yet stabilized.

The market for *portable GA* is strongly characterized by globalization there are European manufacturers, but much of the domestic demand is met by imports, above all from China. The imports are carried out by trading firms and by manufacturing companies. Only few market segments are served by European manufacturers that for instance have specialized in the equipment of vehicles, boats and cars used in the small trade and for leisure time activities.

Procurement strategies

The production of GA requires certain key components, such as controls, burners and heat exchangers. There are some companies in the market that manufacture these parts for their own needs, but total supply is dominated by specialized manufacturers who are on the leading edge of product and process technology. Most of the supply is manufactured in Europe. Only low-end components are procured from China, Turkey and other emerging countries.

Electronics have gained importance in the manufacture of GA. Many of these parts, such as probe heads, sensors etc. are procured from Germany, France and Italy. China and other Asian countries have become suppliers during the decade.

However for HVAC customization and smaller series than for domestic appliances hamper global sourcing of labour intensive parts such as cable harnesses. They often are procured from the Balkans or North Africa. Indicator units, such as manometer, thermometers etc. are manufactured in intra EU low-wage countries such as Poland, Bulgaria and Romania.

The market for pumps is dominated by two European manufacturers that pursue global strategies. They equip most of the OEM-manufacturers. For servodrives and actuators there exists numerous European companies. However Asian products are also marketed in Europe.

Other parts and components, such as taps, valves, cocks, recuperators etc., are procured from manufacturers who traditionally are located in south European countries, Portugal, Italy Spain. With the accession of the new Member States new suppliers tapped into the Single Market. In this respect, Slovakia has become an attractive location for production and some companies reported investment activities.

Small internal combustion engines are the state of the art drives for micro-cogeneration systems (µCHP). Such engines are manufactured in high numbers in Japan and have been adapted to the use in µCHP. Many European manufacturers of GA import such engines as components for their own µCHP.

Competing technologies

In HVAC the introduction of condensing boilers took place first with GA, appliances with other feedstock followed suit. In the short-term the pace of technology will slow down and appliances that use other feedstock will catch up. Moreover the market penetration of heat pumps and small air conditioning appliances provides an edge to equipment that is run by electricity. This will put some pressure on the market for GA and have an impact on the medium-term growth perspectives. But this will come to an end in the foreseeable future by technological progress in HVAC. It will follow different trends that provide an edge to GA by

1) combination with heating equipment that uses different feedstock because GA can easily be installed and does not need a storage if gas grid is available,
2) the progress in µCHP that provides the opportunity to reduce heat losses by the production of electricity. The Stirling engine run by gas is more suited than other drives and
3) in the long-term by the introduction of the fuel cell that gives a further edge in energy efficiency to gas.

In domestic appliances GA play a minor role only, although a broad range of products is mentioned by the GAD. In the market only few products are marketed in noteworthy numbers: these are cookers and ovens. In the past they have been on an equal level with electric appliances and had an edge in energy efficiency and a quick response control. Both advantages dwindled more recently caused by induction cookers and ovens. Electric appliances enjoy higher consumer preferences and manufacturer heavily worked on innovation. This leads to the perspective that GA will lose further importance in the subsector domestic appliances.

International competition in technologies

A real European market for GA has emerged over the past two decades. This is reflected by the big manufacturers that have stakes in most of the Member States. Nevertheless there exist numerous regional manufacturers who are successful in niches. Among the group of SMEs some firms have become drivers in technologies and contributed to the pace of progress. In this segment the supply structure is dynamic. New companies emerge and others are taken over by bigger players in the market.

In spite of the strong performance of the European GAS the Japanese manufacturers of GA are in the lead with the most advanced products, heat pumps and fuel cells. This cannot only be explained by initiatives carried out by the sector itself. Japanese manufacturers enjoyed strong support from other sectors. The Japanese Ministry of Industry and the big utilities together with the manufacturers of GA merged their efforts to increase the pace in technological progress. Beyond joined R&D efforts the execution of broad field-tests contributed to experience in these technologies. This is a real threat to the European GAS that does not enjoy a comparable support. R&D activities in Europe are not co-ordinated and national schemes incorporate the risk of double work. This remains true in spite of isolated cross-border initiatives.

The Japanese manufacturers have strongly been integrated in international markets. They command a noteworthy share in the US market and co-operate with indigenous players. They are also present in Europe and market their products via European partners. This underscores that their lead in some advanced technologies is not a theoretical but a tangible threat.

Impact of the framework conditions on the GAS-M

Since the mid-eighties, the European Union has made substantial efforts to develop technical harmonisation and conformity assessment in order to ensure the free movement of goods and guarantee a high level of protection of public interest. Legislation has included the definition of mandatory essential requirements, the setting up of appropriate conformity assessment procedures and the introduction of CE marking. The so-called New Approach to technical harmonisation and the Global Approach to conformity assessment have given way to directives that can provide more flexibility than before. The Gas Appliances Directive was one of the first.

The GAD is an important driver for the development of the GAS-M and has contributed much to the creation of a pan European industry that exploits comparative advantages in different regions. The free movement of goods is not a problem to the sector. Problems have been identified in the legal framework that affects the installation and putting into operation of GA. Different pieces of EU legislation could be of application on gas appliances in relation to different aspects. Manufactures are obliged to comply with all these requirements.

Generally speaking, the high interest in European policies to meet high environmental standards provides stimuli for technological progress. From the GAS' perspective this is a demand push that can contribute to the international competitiveness of the European manufacturers. However, in particular in the area of the more advanced technologies, such as heat pumps and fuel cells Japan is on the lead. One factor is the joint effort from

all the stakeholders, including public policy. In Europe R&D is less focused and parallel initiatives by Member States incorporate the risk of a non-efficient use of resources that aggravates the chance to catch up the Japanese lead. Joint initiatives are recommended.

Distribution channels for gas appliances

The analysis of the distribution channels for gas appliances differ between HVAC and domestic and portable appliances. While most of the latter are plug-in products HVAC requires labour with specific qualifications for installation, maintenance and repair.

The manufacturers of *HVAC* gas appliances also produce appliances for same and similar applications which use other feedstock or electricity. By far the most of their products are marketed via the same distribution channels. Predominant are wholesalers who serve as a one-stop shop for installers that do not only provide GA but all parts and auxiliary material for services. There are major differences between the structures of the distribution systems of Member States but generally speaking wholesale commands a share of 60 to 80%.

The *domestic and portable GA* are distributed via the same channels as domestic and portable appliances run by other feedstock. In principle two different distribution channels are available, a one-tier and a two-tier network. The distribution via wholesalers and retailers has a longstanding tradition in some countries but loses ground and its share only comes up to 10% and 20%. Usually the final consumers purchase at the retailers. Traditionally specialized shops, retail chains, buying co-operatives, department stores and hypermarkets divide most of the market. They yet command more than 60% of the market but are losing shares. Specialized chains that pursue aggressive strategies have already reached 20% to 25%. Mail order business and Internet do most of the remaining sales and gain importance in particular in the markets of small appliances.

Gas appliance services

The major threat from the use of GA is asphyxia and CO-poisoning, but not fire or explosions, the overall number of accidents in Europe is low. However there is some need for the qualification of craftsmen in Europe that are working in the area of installation, maintenance and repair of GA to reduce the residual risk. But there is only little self-interest in craftsmen to become qualified for the installation of gas appliances because most of them are installing all kind of appliances using different feedstock and often only a small portion of their workload is related to gas appliances.

The framework conditions for the gas appliance services differ strongly between the Member States of the EU. Some countries practice a relatively modest approach of regulation with low access barriers for installers other countries have put into effect a comprehensive system of qualification and supervision. In most of the member countries specific conditions and qualification requirements must be fulfilled before a worker gets the accreditation, to install, put in service, repair and maintain gas appliances. In principle, these provisions restrain the free movement of workers.

Yet some EU directives contain regulations that affect harmonization of specific qualification requirements:

- The freedom to provide cross-border services is in the scope of Article 16 of the directive 2006/123/EC on services in the internal market. The directive has to be transposed before 28 December 2009. By the end of 2011 the Commission shall submit a report on the application of this article, in which it has to consider the need to propose harmonisation measures regarding service activities covered by the directive. This might also comprise gas appliance services.
- Directive 2002/91/EC on the energy performance of buildings stipulates regular maintenance of boilers by qualified personnel. Member states have to ensure that the certification of buildings and the inspection of boilers are carried out in an independent manner by qualified and/or accredited experts, whether operating as sole traders or employed by public or private enterprise bodies.
- In the proposal for a directive on the promotion of the use of energy from renewable sources, presented by the Commission (COM (2008) 19 final), Member States are envisaged to develop certification schemes for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems and heat pumps. Each Member State shall recognise certification awarded by other Member States.

Beside the necessity to increase the qualification of installers to enable them to meeting the requirements of the more complex and environmentally friendly systems that are about to come into the market safety aspects are of importance to reduce the residual risk. Additionally the definition of certain minimum standards to be placed upon installers' qualification contributes to free movement of services and can contribute to a more efficient supply of services provided by GAS-S.

1 Introduction

The Final Report for gas appliances (GA[1]) was prepared by Ifo in cooperation with ECORYS and Cambridge Econometrics within the framework contract on Sectoral Competitiveness Studies ENTR/06/054. Its structure is in line with the Table of Contents as suggested in the latest version of the Interim Report.

Much effort had to be made to create a satisfying database for the gas appliances sector (GAS). The officially available data bases are clustered around specific industries and the GAS is a sector not well reported in these statistics. This is explained by the fact that the GAS is a segment of an appliances sector that comprises two subsectors heating, ventilation and air condition (HVAC) and domestic appliances (DA). Both of these subsectors are more or less homogenous industries that are reported in official statistics. The investigation underscored this fact since a majority of firms have a stake in only one of the two subsectors. However most of the firms manufacture appliances that are run by gas, electric power, oil or other feedstock. Within the study the project team had to identify from both of the subsectors those economic indicators available in official statistics that can be used for the description of the GAS, its evolution over the period under investigation and structural changes. This means that these statistics do not contain information for appliances run by other feedstock. For a detailed list of product classes used to define the GAS and the non-GAS see Annex A.

Beyond desktop research, literature analysis (Annex D) and the creation of a statistical data base, comprehensive fieldwork was carried out. Representatives of industry associations, notified bodies, individual companies and other experts were interviewed, face-to-face and by telephone (Annex C). They contributed much background information for a better understanding of the sector and qualitative information on companies' behaviour and strategies.

Chapter 2 refers to the objectives and the policy rationale of the study that served as a guideline for the project. Chapter 3 provides a summary of the major results of the study.

The Final Report starts with Chapter 4. It provides an overview of the sector and the main subsectors. The description does not only focus on GA but on appliances that are run by other fuel and electricity. Moreover the relation between the scope of the GAD[2] and official statistics is discussed. It has turned out to be extremely difficult to construct a match. The major explanation for this problem lies in the fact that the scope of the GAD is on appliances run by gas whereas official nomenclatures for production and trade

[1] A complete list of Acronyms is available in **Annex E**

[2] Annex B

follow other principles. Sectors defined by similar manufacturing processes and markets can be identified in official statistics more easily than gas appliances, which in many cases are manufactured by companies that produce other appliances used for the same and related tasks. The definition of GAS and non-GAS for the statistical analysis is disclosed.

Chapter 5 is dedicated to an analysis of the sector. It provides insight in the evolution of the sector. There are noteworthy differences between the major subsectors that have been defined, the heating, ventilation and air-condition (HVAC) and domestic appliances. The output of HVAC shows a much higher growth momentum than the other subsector and in trade there are noteworthy regional differences. Within the EU, some changes in the importance of production locations did take place. The work was concluded and topics missing in the interim report have been added, these are

- the structure and development of employment,
- the industry structure by the size of companies,
- the notified bodies and their role in the sector,
- companies' behaviour and sourcing strategies by regions and intermediary products.

Chapter 6 comprises the regulatory and framework conditions. Only minor changes have been carried out in Subchapter 6.2. The additions in section 6.2.5 are marked in red and take into account not only the view of the GA manufacturers but aspects mentioned by other stakeholders. Subchapter 6.3 provides a comprehensive overview on other framework areas that had to be covered in the study. The work is concluded and contains the following sections:

- Characteristics of distribution channels are unveiled in 6.3.1.
- A qualitative analysis of GAS-S related to installation, maintenance and repair of GA is carried out. Different national framework conditions are highlighted. The final report incorporates some additions on the qualification of installers, the safety of gas installations and the need for minimum qualification requirements. These additions are added in red at the end of 6.3.2.
- The access to input markets is discussed in 6.3.4.
- The access to third markets is discussed in 6.3.5.

The Subchapter 6.4 has been concluded. The different sources of gas supply, gas grid and non-gas grid have been analysed and trends highlighted. Energy prices for different kinds of feedstock and electricity are compared and their evolution over time presented.

Chapter 7 starts with an assessment of the GAS's performance as compared to the non-GAS. Subchapter 7.2 discloses the development of production and demand. Moreover it differentiates the evolution by Member State. Subchapter 7.3 focuses on an international comparison of the EU with the most important competing nations. International trade is used as an indicator for the global performance and the level of specialization. A trade analysis is carried out that provides an overview of the regional structure and the pace of growth for imports and exports. Growing international interdependencies and the stimulus from the past, strong global upswing are shown. Emerging new competitors tapped into the global market. As a result Europe's share in global trade is decreasing. However, a comparison with non-GA trade shows that GA did perform better. Subchapter 7.4 discusses technological trends of relevance for the GAS. The relationship to non-GAS technologies is unveiled as well as the position in comparison to the most important competing nations.

Chapter 8 is added. It provides a long-term perspective based on the ceteris paribus assumption. The SWOT analysis puts together the results of the competitiveness analysis and the assessment of the impact of the framework conditions on the evolution of the sector. Weaknesses and strengths have been identified and possible measures identified.

2 Objectives and policy rationale

The scope of the study is based on the Directive 90/396/EEC on appliances burning gaseous fuels (GAD). However, one objective of the study was to investigate if some changes in the scope were necessary. Generally speaking, fittings and appliances downstream of the delivery point by the gas supply network operator are within the scope of the study. Applications specifically designed for industrial processes in industrial premises are excluded. A stringent definition of the sector shall be derived in co-ordination with stakeholders of the sector.

There is an inextricable linkage between industry and services. Distribution, installation and maintenance are of importance for the marketing of manufactured fittings and appliances. The close relationship between manufacturing and services implies an integrated approach for the analysis of the structure and the changes over time. This view is supported by the fact that fittings and appliances are components which provide full benefit as part of complete systems. This suggests a definition of the sector GAS by the manufacture of physical GAS products (GAS-M) and the supply of downstream GAS services GAS-S).

It is assumed that the GAD applicable since 1 January 1992 has had a strong impact on GAS. The consultant was asked to investigate the development of the sector's structure and market environment and identify the driving forces. The emphasis of the investigation will be on structural and micro-economic factors affecting competitiveness. This means an investigation into strategies applied by the players with special attention to marketing, distribution and the organization of the value-added chains in manufacturing is carried out. These aspects will have to be verified in intra-European competition and in comparison with competitors in the global markets.

Some structures, in particular in GAS-services, strongly differ between Member States. Partly there are historic reasons which have not yet been overcome by the convergence in the Single Market. However, most importance for the explanation of the differences are numerous national regulations which range from requirements on the qualification of installers to building regulations. Special attention is paid to the identification and documentation of these elements of the framework conditions which conserve national structures and hamper cross-border market access.

The performance of GAS is strongly dependent on the underlying network industry. Its penetration of the market, the quality of the sector's supply and the price competitiveness of gas in comparison with competing energy commodities will be taken into account, as well as consumer preferences. These are exogenous variables which differ among Member States of the EU although to a certain extent a process of convergence has taken place. Alternative and competing energies and their related burning technologies are of

interest for the study because of their potential to substitute gas burning or being substituted.

Technology is a crucial feature behind the international competitive performance of the GAS and its position in comparison to sectors which provide appliances using other energy feedstuff. Special attention is paid to the pace and direction of the progress, in particular in fuel cells. Perspectives of promising technologies are verified and contribute to the outlook for GAS.

The sector's environment ranges from the long-term access to gas and the quality of the feedstock to the demand side, the consumer behaviour and the activity in the construction industry. This information is a prerequisite for the assessment of the perspectives of GAS and data on the demand side will provide insight into the discrepancy between the leading edge in the technology of available gas appliances in the market and the average state of the art in the stock. This provides insight into the sector's potential contribution to GHG-emission reduction by investing in the latest technology.

The regulatory framework is another critical element for the performance of GAS. The technical specifications closely linked to gas appliances and fittings and their impact on the GAS are to be investigated. Special attention must be paid to different national regulations and activities. An inventory of existing Member State measures and schemes shall be created which contains regulations, subsidies etc.

The conclusions for GAS will be derived from the investigation into the sector and the comprehensive consideration of its environment. A ceteris paribus outlook for the respective time periods will be derived with regard to available macro forecasts and studies on the availability and price position of gas. National regulations, schemes and measure will be scrutinised to identify:

- well-suited activities and framework conditions for the stimulation of innovation and the dissemination of new technologies and
- hindrances for penetration of advanced technologies and obstacles for free market access in other EU-Member States.

3 Main findings and conclusions

Size and evolution of the sector

The production of the GAS-M reached a value of € 12 billion in 2007, at around 85% of it was appliances of the subsector HVAC. The complementary non-GAS-M was much bigger with an output of € 26 billion of which around 85% are domestic appliances. The GAS-M and the non-GAS-M together reached a production of € 38 billion.

The growth of the GAS-M slowed down over the period under investigation. Between 1995 and 2001 the production of the subsector HVAC grew at an average annual rate of 9.9% in current prices, the following years until 2007 it only grew by 7.0% per year. This was equal 8.6% on average for the 12 years under consideration. For domestic appliances run by gas the respective figures are 4.9% and 2.9%. For all the years under consideration the average growth rate came up to 3.8%. A comparison with non-GAS-M discloses noteworthy discrepancies in the growth momentum. Domestic appliances run by other feedstock and electricity grew at an average rate of 4.9% somewhat stronger than GA. For HVAC the relationship was the opposite non-gas appliances grew only at an average rate of 4.4%.

Performance in international markets

The analysis of foreign trade does not show a European specialization on the GAS as compared to other important nations in the market for GA. The contribution of European manufacturers to global trade shrank markedly over the period under consideration. In 1999 it came up to 54% and shrank to 36% in 2007. The underlying reason for this development was the access of emerging countries to the world market. In particular China and Turkey gained in importance.

This reduction in the contribution to world trade has not been caused by a noteworthy weakness of the European manufacturers. A comparison with the non-GAS and all of the manufacturing industries indicated that the GAS did not perform worse than the non-GAS and even much better than the average of manufacturing industries.

As regards competitive pressure, imports originating from China and Turkey are of most importance. The focus of Chinese exports to Europe is on domestic appliances and underscores the extremely high level of globalization in this subsector. The imports from Turkey are more balanced between HVAC and domestic appliances.

European manufacturing cluster

The GAS-M is well integrated in the European economy. It has exploited regional comparative advantages and the new Member States have become part of the European production network. The division of labour along the value chain is characterized by the availability of manufacturers of key components for GA. Therefore, the availability of

high performance elements at the leading edge of technology is a precondition for the manufacture of high performance GA. The major manufacturers of burners, heat exchangers etc. are located in the old Member States. They are driven by product and production technology and are pivotal for the performance of the European GAS in international competition.

The European subsector HVAC of the GAS is in a situation of self-supply with the most important key components. Imports, in particular from Asia, concern commodities, such as small electronics and to a certain extent low-end components. For the subsector domestic appliances the situation is slightly different. Large-scale production and global players exploit comparative advantages in production location to a higher degree. This is also indicated by the import ratios. For GA of the subsectors HVAC and domestic appliances they come up to 4% and around 40% respectively.

Competing technologies

In HVAC the introduction of condensing boilers took place first with GA, appliances with other feedstock followed suit. In the short-term, the pace of technology will slow down and appliances that use other feedstock will catch up. Moreover the market penetration of heat pumps and small ACs provides an edge to appliances that are run by electricity. This will put some pressure on the market for GA. But this will come to an end in the foreseeable future by technological progress in HVAC. It will follow different trends that provide an edge to GA by:

1) combination with heating equipment that uses different feedstock
2) the progress in µCHP that provides the opportunity to reduce heat losses by the production of electricity. The Stirling engine run by gas is more suited than other drives and
3) in the long-term by the introduction of the fuel cell that gives gas a further edge in energy efficiency.

In domestic appliances GA play only a minor role. The GAD mentions a broad range of products. But in the market only few products play a noteworthy role. These are cookers and ovens. In the past they have been on an equal level with electric appliances and had an edge in energy efficiency and a quick response control. Both advantages dwindled more recently caused by induction cookers and ovens. Electric appliances enjoy higher consumer preferences and manufacturer heavily worked on innovation. This leads to the perspective that GA will lose further importance in the subsector domestic appliances.

International competition in technologies

A real European market for GA has emerged over the past two decades. This is reflected by the big manufacturers that have stakes in most of the Member States. Nevertheless, numerous regional manufacturers exist who are successful in niches, regional or by their supply. Among the group of SMEs some firms have become drivers in technologies and contributed to the pace of progress. In this segment, the supply structure is dynamic. New companies emerge and others are taken over by bigger players in the market.

In spite of the strong performance of the European GAS the Japanese manufacturers of GA are in the lead with the most advanced products, heat pumps and fuel cells. This cannot solely be explained by initiatives carried out by the sector itself. Japanese

manufacturers enjoyed strong support from other sectors. The Japanese Ministry of Industry and the big utilities together with the manufacturers of GA merged their efforts to increase the pace in technological progress. Beyond joined R&D efforts the execution of broad field-tests contributed to experience in these technologies. This is a real threat to the European GAS that does not enjoy a comparable support. R&D activities in Europe are not co-ordinated and national schemes incorporate the risk of duplication. This remains true in spite of some isolated cross-border initiatives.

Impact of the framework conditions on the GAS

The GAD is an important driver for the development of the GAS and has contributed much to the creation of a pan European industry that exploits comparative advantages in different regions. The free movement of goods is not a problem in the sector. However, problems have been identified in the legal framework that affects the installation and putting into operation of GA. There is some overlapping of European directives and different views on the jurisdiction, in particular the CPD and the GAD. Some problems are derived from directives that provide leeway to national provision. This refers to necessity of the European legislation to accept different boundary conditions in the national construction industry and the residential sector. With regard to the directives that tackle environmental provisions similar problems exist. These directives refer to Art. 175 EC Treaty and give national authorities room for stricter regulation than on the European level. With ever growing requirements for energy efficiency and CO2 reduction this can raise some difficulties for manufacturers that face logistical problem with a growing number of variants to meet different, but high requirements.

Generally speaking, the high interest in European policies to meet high environmental standards provides stimuli for technological progress. From the GAS's perspective this is a demand push that can contribute to the international competitiveness of the European manufacturers. However, in particular in the area of the more advanced technologies, such as heat pumps and fuel cells Japan is in the lead. One factor is the joint effort from all the stakeholders, including public policy. In Europe R&D is less focused and parallel initiatives by Member States bring with them the risk of a non-efficient use of resources that reduces the prospects of catching up the Japanese lead.

4 The gas appliances sector

4.1 Introduction

This chapter provides the analysis framework used for this study. It presents our understanding of the gas appliances sector, the scope of the gas appliances directive (GAD) and an overview of the different markets for gas appliances. Some manufacturers and retailers specialise in gas appliances, while others have gas appliances as one of their manufacturing lines or product offers. Sub-sectors are usually defined according to the end-use of the appliance rather than according to the energy source to operate them. In terms of markets, two broad categories can be identified: heating, ventilation, and air conditioning on one hand, and domestic appliances on the other. Official statistics reflect this state of affairs in their nomenclatures for production and trade. Consequently, one of the challenges of this study was to identify, in the existing statistical nomenclatures, the best match for a meaningful and reasonably reliable coverage of the gas appliances sector. This chapter thus provides, in its last two sections, an explanation of the official statistics nomenclatures and the way they were used in this study to carry out the analysis of the gas appliances sector.

4.2 Definition

For the purposes of this study and with regards to the current and future scope of the Council Directive 90/396/EEC[3] on appliances burning gaseous fuels (GAD), as amended by the Council Directive 93/68/EEC[4], we consider that the GAS covers both manufacturing and downstream services. By downstream services we refer to services, services related to the introduction of gas appliances on the market, warranty services, spare parts as well as the role of authorities in approving, inspecting and installing appliances. Thus we distinguish two principal sub-sectors for analysis:

- the manufacture of physical GAS products (GAS-M) and
- the supply of downstream GAS services (GAS-S).

Scope of the gas appliances directive GAD)

The GAD covers mainly common consumer and commercial products, including fittings. Appliances specifically designed for use in industrial processes carried out on industrial premises are excluded. Article 1 of the GAD provides a clear indicator of what falls under its scope. The directive applies[5] to:

[3] OJ L 196 of 26 July 1990, page 15.
[4] OJ L 220 of 30 August 1993, page 1.
[5] In addition to Article I of the GAD, the guidance sheet Guidance A 1 of June 2003 is used as reference.

- appliances burning gaseous fuels used for cooking, space heating, hot water production, refrigeration, washing (including ironing) or lighting. Where applicable, normal water temperature does not exceed 105ºC (i.e. water temperature can exceed 105 ºC for a short period). Forced draught burners and heating bodies to be equipped with such burners fall also under the directive's scope.
- safety, controlling or regulating devices and sub-assemblies, referred to as "fittings". Sub-assemblies are understood as separately marketed for trade use and designed to be incorporated into an appliance burning gaseous fuels or assembled to constitute such an appliance.

Gaseous fuel refers to any fuel in a gaseous state at 15ºC under a pressure of 1 bar. A normal use of an appliance refers to, *inter alia*, a normal variation in the gas quality and a normal fluctuation in the supply pressure. Appliances especially designed for use in industrial processes within industrial compounds are excluded from the GAD scope.

Guidance sheets are being established and agreed in the framework of the Commission's Working Group Gas Appliances[6] (WG-GA) in order to ensure a coherent application of the GAD. However, the guidance sheets are neither a legally binding interpretation of the GAD nor do they formally commit authorities or notified bodies. These guidance sheets[7] provide further details on the agreed scope of the GAD and provide an illustrative list of appliances and components for the above defined categories.

The Guidance sheet A1 of June 2003 gives an indication as to which appliances and components are considered as covered under the GAD:

> "Discussion: the GAD gives product categories, which are within the scope, but does not contain a list of specific products covered.
> However, in order to facilitate judgement whether an individual product is covered by the Directive, an illustrative list has been drawn up by all parties concerned (…).
> Note: Attention is drawn to the fact that the term fitting as used by industry is generally broader than the term fitting defined in the Directive.
> Conclusion: see the following list which is non-exhaustive and will be amended as necessary. As example and for clarification, a list of certain exception is also shown in each section."

The sheet proceeds to give an illustrative list of gas appliances for the identified categories, namely cooking, space heating, hot water production, refrigeration, washing and lighting, and what is understood by fittings (See Table 4.1, Table 4.2, Table 4.3, Table 4.4, Table 4.5, Table 4.6 and Table 4.7).

[6] The working group is composed of Member States representatives, European federations, the Gas Appliances Directive Advisory Committee (GADAC), Notified Bodies Gas Appliances (NB-GA), the European Committee for Standardization (CEN) and chaired by a representative of the Commission services.

[7] The guidance sheets are available on DG Enterprise and Industry website at the following link: http://ec.europa.eu/enterprise/gas_appliances/guidances.htm

Table 4.1 List of gas appliances under GAD per category: cooking

Appliances : Cooking
hotplate
cooker
barbecue/grill
baking oven (also in-shop style)
oven (also in-shop style)
range
steamer
bain marie
hot cupboard
boiling table
grill
griddle
toaster
fryer
brat pan
coffee machine (even if the water temperature in a short period exceeds 105ºC)
wok cooker
humidifiers (based on the way heat is generated, the appliance is also used for heating)
Exception:
Factory baking oven

Table 4.2 List of gas appliances under GAD per category: heating

Appliances: Heating (space heating*)
Forced draught burner (FDB)
Heating body (to be equipped with FDB)
Gas fire
Convector heater
Decorative fuel effect appliance
Catalytic heater
Air heater with or without ducting
Overhead plaque type radiant heater
Overhead radiant tube heater
Patio heater
Boiler (including district heating)
Heat pumps (absorption and compression)
Green house heater
Humidifiers (see under cooking)
Co-generation appliances
Fuel cells (where the primary function is heating)
Exceptions:
Blow lamp
Cutting/brazing equipment
Laboratory burner
incinerator
Greenhouse heater for industrial use

* As specified in Guidance Sheet A2 of June 2003.

Table 4.3 List of gas appliances under GAD per category: hot water production

Appliances: Hot water production
instantaneous water heaters
storage water heaters
circulator
combination boiler
swimming pool heaters
boiling pan
bulk water boiler
cafe boiler (even if the water temperature in a short period exceeds 105ºC)
Exceptions:
Appliances with normal water temperature over 105ºC.

Table 4.4 List of gas appliances under GAD per category: refrigeration

Appliances: Refrigeration
refrigerator
chillers
deep-freezer
air conditioning

Table 4.5 List of gas appliances under GAD per category: washing

Appliances: Washing
wash boiler
washing machine
drying cabinet
tumble dryer
dish washing machine
ironing machine
Exceptions:
Industrial laundry

Table 4.6 List of gas appliances under GAD per category: lighting

Appliances: Lighting
gas lamp
lighting appliances

Table 4.7 List of fittings under GAD

Fittings
Appliance governor
Multifunctional control
Solenoid valve
Flame supervision device
Burner control system
Ball valve
Gas cock
Low pressure cut-off valve
Gas tap
thermostat
Safety overheat thermostat
Flue thermostat
Pressure sensing device
filter
igniters

Methodological implications for research and analysis

The aim of the system introduced by the GAD is to provide access to the Community market for appliances and fittings in so far as the gas safety of these products is concerned. Consequently, the categorization introduced for the GAD is based on the end-use of the products. However the approach in available statistical data is rather market based. A market approach distinguishes between heating and cooling markets, as well as between domestic and commercial markets, with further segmentations, but tends not to distinguish between energy sources. The linkages between appliances and fittings as defined in the GAD and the available statistical data is thus not straightforward for at least three reasons: statistical categories do not systematically differentiate between energy sources for the products covered; they may be too broadly defined for the purpose at hand; and some appliances may not be covered by statistical data.

The following sections present our understanding of the sub-sectors and the statistical approach chosen to analyse the gas appliances sector given the above mentioned limitations. A close match of the definition of the sector and the official nomenclature, as it is possible for other industry, could not be reached, as linkages between the GAD scope and the available data are not clear cut.

4.3 Overview of sub-sectors

This overview provides a presentation of the sector's market. From this point of view a distinction between gas and non-gas appliance is not possible. However there is an important advantage that other appliances that use electricity or other feedstock are taken into consideration and not excluded. Gas appliances and others are in competition with each other. There are certain factors which have the potential that final clients shift their demand from gas appliances to others, such as technology, energy efficiency, consumer preferences etc. Within the analysis of the gas appliances sector's competitiveness these developments are investigated.

With regard to the market environment it makes sense to merge the different products under consideration into two bigger sectors, heating, ventilation and air conditioning on the one hand and domestic appliances on the other. The differences in the distribution channels, the customers and the suppliers are noteworthy (see: Chapter 6.3.1, 6.3.2).[8]

4.3.1 Heating, ventilation and air conditioning (HVAC)

The appliances falling under the scope of GAD and referred to in this section (heating and water heaters) are described in the categories heating (see Table 4.2) and hot water production (see Table 4.3). In addition, the air conditioning and chiller appliances as listed in the category refrigeration under GAD (see Table 4.4) are also referred to below (cooling).

[8] There are some product groups which do not suit to neither of the subsectors constructed, such as portable GAs and commercial applications. However, these groups are scattered within the GAS and elude a sound investigation.

Heating

The European heat markets are national and local. In other words, they lack integration and are not harmonised. Thus aggregated information at European level is scarce[9]. Low temperature heat demand[10] is mainly composed of space heating and domestic hot water supply in the residential, commercial, public sectors and industrial buildings. The way space heating demands are met vary from country to country, with some dominated by the use of natural gas in local boilers and others with district heating systems. In the Mediterranean area, heat demands are relatively low and so space heating is not highly organised[11].

European, national and local actors operate in the heat market. International actors dominate the heating equipment supply. Local actors are present on the biomass supply market or run urban district heating systems. Mergers and acquisitions have negatively affected the role of national actors. Actors cover a wide range of activities: fuel, electricity and heating equipment supply, equipment installation, district heating systems and so on. The European heating equipment market is dominated by five major suppliers: BBT Thermotechnik (Germany), Vaillant (Germany), Viessman (Germany), Baxi (UK) and Ariston Thermo Group (The Italian Group changed its name in 2009[12] from MTS Merloni TermoSanitari). These companies held 60% of the "EU-32"[13] market for heating equipment (commercial and domestic boilers and other equipments) in the mid-2000s[14].

There is another market segment for heating that comprises appliances for the heating of individual rooms. Besides indoor heating there are portable heaters, such as patio heaters, infrared tube heaters etc. While indoor heating is based on either convection or infrared, nearly all of the portable heaters use infrared radiation. These products face specific barriers to trade in the Single Market.

Water heaters

A water heater is defined as an appliance designed to provide hot sanitary water. It may, but not necessarily so, be designed to also provide space heating (as in the case of the combination boiler, that produces both heat and hot water) or other functions as well. The Eco-Design of Water Heaters study[15] found some 18 principles for categorisation of water heaters in the existing EU product and building standards. This shows the technical diversity and various features of water heating equipment in the EU. One of the possible categorisation is per fuel type: gas, electric, solar-assisted, heat pump, oil, coal and biomass water heaters. The structure of the supply side is similar to heating. Most of the manufactures produce both of these products. The European market for water heaters

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9 S. Werner, The new European heating index, Chalmers university of Technology, Göteberg, Sweden, 10th international Symposium on District Heating and Cooling, September 3-5, 2006.

10 High and medium temperatures are mainly used in industry processes for e.g. melting, evaporating and drying.

11 Euroheat & Power, The European Heat Market, Ecoheatcool Work package 1, 2006.

12 http://www.mtsgroup.com/ENG/news/_doc/news.cfm?id_news=7402&archivio=0

13 EU27 as well as Croatia, Turkey, Iceland, Norway and Switzerland.

14 Euroheat & Power, The European Heat Market, Ecoheatcool Work package 1, 2006.

15 Van Holsteijn en Kemma BV (VHK), Preparatory study on Eco-design of Water heaters, Task 1 Report, 30 September 2007.

represents a total value of € 4-5 bn (manufacturing selling prices, 2005) for 17 million units a year. About 15% of the total value relates to combination boilers[16].

Cooling

According to the Ecoheatcool study[17], which covers service[18] and residential buildings, cooling is a relatively new and expanding market in the "EU-32"[19], where a large part of the demand is not due to climatic conditions. Space cooling is dominated by building bound cooling systems, produced either centrally or locally. Central air conditioners are divided in two categories: the packaged air conditioning equipment and central plant air conditioning equipment (larger systems usually based on chillers). Local air conditioning refers to room air conditioner (RAC)[20]. In addition, district cooling provides for a small share of space cooling demand. In the EU-15, chillers represented over 50% of installed capacity in the service sector in 1999-2000. The remainder was almost equally divided between packaged equipment and RAC. However this trend is changing fast as packaged equipment had a 70% share in sales in 2005-2006, at the expense of chillers.

A number of global original equipment manufacturers (OEMs[21]) dominate the space cooling market. They operate through their national or regional offices, and work with local installation, operation and maintenance partners to offer the level of services required to be competitive. As in the heating sector, the role of national actors has been negatively affected by mergers and acquisition of international actors. The dominant business model in Europe is the selling of cooling equipment to the end user, who also buys the energy necessary to generate the cooling. Dominant players are from Japan, Korea and Thailand such as Daikin, Mitsubishi, Toyota and Samsung. The chiller market is dominated by Carrier, Trane, Quay and York, but companies such as Ciat, Lennox and Clivet keep a certain grip on their home markets. Market growth has been particularly strong in Southern Europe, mainly due to higher standard of living and comfort requirements. Growth in central Europe has been due to developments in the service sector (office buildings)[22].

4.3.2 Domestic appliances

Refrigerators and freezers

A refrigerator is a mechanical appliance for the storage and preservation of perishable food. Depending on the storage temperature provided by the appliance, the equipment is classified as a refrigerator (temperature superior to 0ºC) or a freezer (temperature below 0ºC). An appliance can provide both temperatures in separate compartments and is referred to as refrigerator-freezer. Cold generation is provided via vapour compression (motor-driven compressor) or gas absorption (absorption process using heat as energy

[16] Holsteijn en Kemma BV (VHK), Preparatory study on Eco-design of Water heaters, Executive summary, 30 September 2007.

[17] Euroheat & Power, The European Cold Market, Ecoheatcool Work package 2, 2006.

[18] Public buildings (health care, education, administration buildings etc.), and commercial sector (retail, office, hotel, leisure etc.).

[19] EU27 as well as Croatia, Turkey, Iceland, Norway and Switzerland.

[20] Air conditioning systems with cooling capacity under 12kW.

[21] OEMs refers to manufacturers who resell another company's product (part or whole) under their own name and branding. The term is misleading as OEMs are not the original manufacturers; they are the customizers.

[22] Euroheat & Power, The European Cold Market, Ecoheatcool Work package 2, 2006.

source). The latter technology is present in only a minority of products in domestic refrigerators and freezers[23]. A wide range of products belong to the commercial refrigerators and freezers category, such as refrigerator display and service cabinets, vending machines or ice-cream freezers[24]. Under the GAD, the refrigerator and deep-freezer appliances fall under the category refrigeration (see Table 4.4).

The refrigeration sector is split between domestic and commercial refrigerators and freezers. In the EU-27, an estimated 23.3 million units of domestic refrigeration appliances were produced in 2005, of which around 18 million refrigerators and refrigerators-freezers and 5.3 million freezers. In the same year, Turkey produced almost 6 million refrigeration units[25]. Italy is in the lead with over 7 million units, followed by Spain (over 2 million), Hungary, Germany, Poland and Denmark. As for the commercial refrigeration sector, the EU-25 total production value is roughly estimated at € 3.3 bn for around 2.86 million units produced in 2005. Italy is in the lead (circa €1.2bn), followed by France (over € 400 million), Germany and Spain[26]. Main importers in the EU-25 are France, the UK and Germany, and the main exporter is Italy.

Cooking

Heat demand for cooking is relatively small, compared with space heating and hot water production. Appliances for the preparation of food, coking, baking and roasting, are run by electricity, gas and in some cases by solid fuels. Gas appliances for such usages falling under the GAD scope are listed in Table 4.1 under the cooking category.

Traditionally gas appliances were widespread in European kitchens. Its advantages as compared to electrical appliances were energy efficiency and short preparation times. But technological progress has narrowed the gap. The most recent technology, induction cooking, has at least wiped out the advantages of gas cookers. However, there is a big market for gas cookers and it will not disappear in the years to come. Gas cookers are widespread in southern Europe and in the new Member States. There are several factors that stimulate the demand. There is a broad supply of low-end, cheap gas cookers. Even appliances without safety shut-down are marketed. Furthermore, in some countries the electric grid is not suited to sufficiently power dwellings. In particular in Southern European countries many dwellings are equipped with electric power supply of not more than 5kW. Above all in these countries specific appliances are marketed, stove-tops run by gas and electric baking ovens.

It is of note that in many regions with a poorly-developed electricity grid, not sufficient to meet the needs of modern households, the density of the gas grid is also low. As a result gas cookers are often run by gas bottles and cylinders in some Southern and Eastern European countries.

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[23] ISIS, Domestic Refrigerators and Freezers, Final report, Lot 13, December 2007.

[24] Bio Intelligence Service, Commercial refrigerators and freezers, Final Report, Lot12, December 2007.

[25] These figures are considered to be underestimated. See ISIS, Domestic Refrigerators and Freezers, Final report, Lot 13, December 2007, p. 135-136.

[26] Data availability for the production breakdown per country is considered incomplete. See Bio Intelligence Service, Commercial refrigerators and freezers, Final Report, Lot12, December 2007, p. 96.

Lighting

Gas appliances for lighting falling under the scope of GAD are listed in Table 4.6. The heyday of gas lighting was at the end of the 19th century. It was not only widespread in the streets of big cities, but also in dwellings. It was displaced during the early 20th century. At first the substitution by electric lights took place in dwellings, some street lighting run by gas survived until the 21st century. Berlin was one of the last capitals in Europe which shut down gas street lighting.

In remote areas, far from access to the electric grid and for outdoor applications, such as camping, sports and other leisure time activities, gas lighting has survived. The advantage of gas lies in technical possibilities to store sufficient energy in bottles and cylinders to run gas lighting for a long time. However, progress in battery and accumulator technologies (lithium-ion) as well as in electric lighting (light-emitting diodes (LED) suggests that former advantages will shrink in the coming years. Moreover the dissemination of solar cells will contribute to electrify houses in remote areas.

Washing

Appliances falling under the washing category in the GAD cover also drying and ironing as listed in Table 4.5. These appliances are run by gas for heating and drying, but the movement of fabrics and clothes is done be electric motors. Therefore design and production is costly. Installation, maintenance and repair are more complex than for appliances run exclusively by electricity. These gas appliances are of minor importance in the market. Usually they are not installed in private households. To a certain extent there are installations in commercial premises.

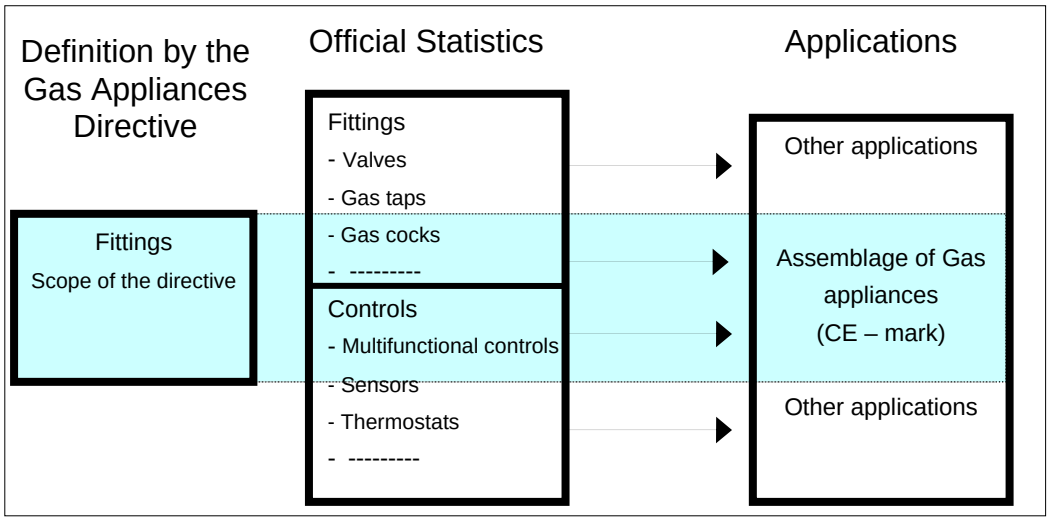
4.3.3 Fittings

The definition of fittings for gas appliances turned out to be the biggest obstacle for a quantitative assessment of the production of and market for these products. Fittings for gas appliances contain two subsectors. One comprises taps, gas cocks etc. In the general linguistic usage only these products are understood as fittings. They are applied in process technologies for the fabrication of a variety of products, such as chemicals, food, energy etc. Only a portion of these fittings is used for heating and hot water production. Only a subset of these fittings is devoted to the production of gas appliances. This last defined subgroup comprises fittings which fall under the GAD (see Table 4.7 for a full listing of fittings under GAD) and are certified together with gas appliances.

The same fittings are not in the scope of the GAD if they are applied for gas installations. The market for these fittings has not yet been harmonized in any way comparable with the market for gas appliances. The accreditation of fittings for gas installation differs from Member States to Member State. As a result of the high access barriers the market is fragmented.

The second subsector of fittings for gas appliances comprises sensors, controls, actuators etc. In the general linguistic usage these products are not understood as fittings. Once more the nomenclature does not provide sufficient information to differentiate between these products used for the production of gas appliances.

Figure 4.1 General classification of fittings for gas appliances



Source: Ifo Institute for Economic Research.

In below section the word "fittings" means fittings for gas appliances as they are defined by the GAD. Usually the manufacturers of gas appliances do not produce fittings for their own assembly of final products. In particular the big players in the market procure them from specialized suppliers that customize them according to their needs.

The control is a core component of heating systems. Its core functions are the control of the combustion process and the safety monitoring system. These features are complex high-tech areas and innovation is R&D intensive. Therefore, not all of the companies are working in this area. In particular smaller firms focus on specific parts or components necessary for the functioning of a complete control system, such as sensors, valves etc. There are big manufacturers for controls in the market, Siemens (D), Honeywell (US), with R&D and production in the Netherlands, JohnsonControls (US) with subsidiaries in Germany and SIT La Precisia (IT).

Typically controls are OEM products and procured by the boiler manufacturers for the assemblage of final products. There are a few boiler manufacturers which have invested in the development of complete controls. However most of the boiler manufacturers pursue their own philosophy on peripheral control features such as the user interface. They try to differentiate themselves from the competition by designing control interfaces which can easily be understood and serves as a unique selling feature.

Traditionally controls have been off-the-shelf products. But technological progress which has contributed much to the growing energy efficiency of boilers has led to more complex controls with additional features, with ambient temperature sensors, flame- and gas quality monitoring etc. Moreover the use of renewable energy requires the combination of different feedstock and more heat circuits are integrated. The boiler manufacturers pursue different design strategies for heating and hot water production systems. This evolution has raised the need for more and more specific controls designed to the boiler manufacturers' requirements. Thus a trend of customizing controls has been observed for years.

4.4 The application of statistics

The scope of the GA Sector (GAS) – as defined by the GA-Directive (GAD) – entails some difficulties for the identification of the sector in the official statistics (as already mentioned in the proposal). In the following, the construction of the database for GAS-M and non-GAS-M is shortly described. The non-GAS-M sector has been defined for comparison reasons. The relative evolution of appliances run by gas, as compared to appliances run by other feedstock or electricity, was suggested as an indicator for the performance of the GAS. This procedure derives its justification from the fact that markets are closely related and – to a certain extent – the same driving factors can be applied for the explanation of the market evolution.

The representation of the GAS-M in official statistics is restricted by the NACE classification. At 4-digit level, GAS-M cannot be clearly distinguished from appliances with other feedstock. For that reason, we applied the following procedure: for production and trade figures, the nomenclatures PRODCOM and CN-Code have been applied respectively and at 8-digit level, it provides some information on output and on international trade which – for some product groups – gives a clear-cut distinction between GA and non-GA. However, for those product groups where this isn't possible, some assumptions are made.

It was decided to define two statistical sectors for the comparison of GAS-M and non-GAS-M product groups which contain GA and those which contain appliances run by gas and by other feedstock are merged and used as a proxy for GAS. Product groups which contain GA which are run by other feedstock than gas and those which contain GA and non-GA are merged and used as a proxy for non-GAS.

The structural analysis of the sector, which has to be carried out in course of the project, can only be done on the 4-digit level. This means that the GAS-M cannot be identified in any satisfying manner. However, the analysis of the supply side has confirmed the assumption made in the proposal. The majority of the companies work in markets for GA and non-GA. This means that it can be assumed that the structure and economic performance of the supply side defined by a sector GAS-M plus non-GAS-M which is represented in the statistics, is valid also for GAS.

The various sources of data used for the analysis presented in this report are the Eurostat Prodcom and Comext data, as well as market estimates data procured by ifo.

Prodcom database

The Prodcom database allows for analysis of the developments in production of the GAS-M and non-GAS. The database describes the EU-27 countries, over the period 1995 to 2007. The Prodcom data has limitations. Many data points within the dataset are either unknown, or estimated or confidential and therefore not available. Initial time series analysis of the data showed that the results of such an analysis were not sensible or useful. In order to be able to present data on the developments in the sector, the Prodcom dataset has been intra- and extrapolated, based on the available data.

Market database

The market research data procured by Ifo describes the market volumes of gas and electrical appliances for countries. The countries include Eastern European and EU-27 countries, stretching from 2004 till 2013. The database allows for analysis of the developments in market size and can act as a proxy for demand developments in the various countries. The outcome of the analysis and calculated figures are available for publication. The forecast is based on macro-economic medium-term trend prognoses, demographic developments, construction works and the supply of energy. They were made before the current financial turmoil and the global slowdown reached its current state. This must be kept in mind if one discusses the growth perspectives given by the data. However this database is of use if one thinks of structural developments and changes between GA and non-GA. For the purpose of Task 5 the database will be adjusted to the more recent economic development and forecasts.

Comext database

The developments in trade and competition are analysed by using the Eurostat Comext data. The data provides statistics for the EU-27 countries, the BRIC countries, US and Japan, over the period 1995 till 2007. The data will allow for intra EU trade analysis, and extra EU trade analysis. The analysis will provide an indication for intra EU competition. Furthermore, the data will provide insight into the importance of global competition for the EU-27 GA sector.

Annex D contains the concordance tables for NACE, PRODCOM and CN. The definitions of GAS-M and non-GAS-M are also provided. Product groups, which have been assigned to both of the sectors, are marked in blue.

4.5 Statistical approach to sector and subsectors

Apart from the broader definition of the GA market, it is essential for the data analysis to identify the subsectors within the GA sector. The first part of the data analysis is based on Prodcom data. Table 4.8 provides the statistical definition of the GAS, Table 4.9 provides the statistical definition of the reference category, non-GA. This category will allow for benchmarking of production developments. All EU-27 countries are covered by the statistics.

The time series start in 1995, but as stated above, extra- and interpolations has been applied to fill the gaps in the data. There are several difficulties with properly defining the GA sector within the Prodcom data. The overarching sub-sector division applied is: Heating, Ventilation & Air Conditioning products (HVAC) for GA and non GA products and Domestic Appliances. Especially in the case of HVAC, none of the Prodcom categories differentiate between power sources. Hence, the development of this subsector should be seen as a proxy for the developments of gas powered hot water production.

Table 4.8 Statistical definition GA, Prodcom database

PRODCOM CODE	Definition
GA HVAC:	
29122417	Glandless impeller pumps for heating systems and warm water supply
29721233	Iron or steel gas domestic appliances with an exhaust outlet (including heaters, grates, fires and braziers, for both gas and other fuels[27]; excluding cooking appliances and plate warmers)
29721235	Iron/steel gas domestic appliances (including heaters, grates, fires and braziers, for both gas and other fuels[28] radiators; excluding cooking appliances and plate warmers, those with an exhaust outlet)
29721300	Air heaters/hot air distributors
28221200	Boilers for central heating other than those of HS 8402
28221300	Parts of boilers for central heating
GA domestic appliances	
29721113	Iron/steel gas domestic cooking appliances and plate warmers, with an oven (including those with subsidiary boilers for central heating, separate ovens for both gas and other fuels)
29721115	Iron or steel gas domestic cooking appliances and plate warmers (including those with subsidiary boilers for central heating, for both gas and other fuels[29]; excluding those with ovens)
29722000	Iron/steel parts for iron/steel stoves, ranges, grates, cookers, barbecues, brazes, gas-rings, plate warmers and similar non-electric domestic appliances for gas, liquid/solid fuels
31502300	Non-electrical lamps and lighting fittings

Table 4.9 Statistical definition non-GA, Prodcom database

PRODCOM 2007 code	PRODCOM 2007 description
Non GA HVAC	
29.12.24.17	Glandless impeller pumps for heating systems and warm water supply
29.71.14.00	Electric blankets
29.71.26.30	Electric storage heating radiators
29.71.26.53	Electric radiators (excluding storage heating apparatus, convection heaters)
29.71.26.55	Electric convection heaters
29.71.26.57	Electric heaters or fires with built-in fans (excluding convection heaters)
29.71.26.90	Other electric space heaters
29.72.12.53	Iron or steel liquid fuel domestic appliances with an exhaust outlet (including heaters, grates, fires and braziers; excluding cooking appliances and plate warmers)
29.72.12.55	Iron or steel liquid fuel domestic appliances (including heaters, grates, fires and braziers, radiators; excluding cooking appliances and plate warmers, those with an

[27] It is assumed that the "other fuels" component in Prodcom category 29721233 is negligible.
[28] It is assumed that the "other fuels" component in Prodcom category 29721235 is negligible.
[29] It is assumed that the "other fuels" component in Prodcom category 29721115 is negligible.

PRODCOM 2007 code	PRODCOM 2007 description
	exhaust outlet)
29.72.12.70	Iron or steel solid fuel domestic appliances (including heaters, grates, fires and braziers; excluding cooking appliances and plate warmers)
28.22.12.00	Boilers for central heating other than those of HS 8402
28.22.13.00	Parts of boilers for central heating
29.71.24.30	Domestic electric coffee or tea makers (including percolators)
29.71.25.50	Electric water heaters (including storage water heaters) (excluding instantaneous)
29.71.25.70	Electric immersion heaters (including portable immersion heaters for liquids, usually with a handle or a hook)
Non GA domestic appliances	
29.71.24.50	Domestic electric toasters (including toaster ovens for toasting bread, potatoes or other small items)
29.71.24.93	Deep fat fryers
29.71.24.97	Other domestic electro-thermic appliances
29.71.28.10	Domestic electric cookers with at least an oven and a hob (including combined gas-electric appliances)
29.71.28.33	Domestic electric hobs for building-in
29.71.28.35	Domestic electric cooking plates, boiling rings and hobs (excluding hobs for building-in)
29.71.28.50	Domestic electric grills and roasters
29.71.28.70	Domestic electric ovens for building-in
29.71.28.90	Domestic electric ovens (excluding those for building-in, microwave ovens)
29.72.11.30	Iron or steel liquid fuel domestic cooking appliances and plate warmers (including those with subsidiary boilers for central heating)
29.72.11.50	Iron or steel solid fuel domestic cooking appliances and plate warmers (including those with subsidiary boilers for central heating)
29.72.20.00	Iron/steel parts for iron/steel stoves, ranges, grates, cookers, barbecues, brazers, gas-rings, plate warmers and similar non-electric domestic appliances for gas, liquid/solid fuels
29.71.11.10	Combined refrigerators-freezers, with separate external doors
29.71.11.33	Household-type refrigerators (including compression-type, electrical absorption-type) (excluding built-in)
29.71.11.35	Compression-type built-in refrigerators
29.71.11.50	Chest freezers of a capacity <= 800 litres
29.71.11.70	Upright freezers of a capacity <=900 litres
29.71.12.00	Household dishwashing machines
29.71.13.30	Fully-automatic washing machines of a dry linen capacity <=10 kg (including machines which both wash and dry)
29.71.13.50	Non-automatic washing machines of a dry linen capacity <= 10 kg (including machines which both wash and dry)
29.71.13.70	Drying machines of a dry linen capacity <= 10 kg
31.50.11.00	Sealed beam lamp units
31.50.12.93	Tungsten halogen filament lamps, for a voltage > 100 V (excluding ultraviolet and infra-red lamps, for motorcycles and motor vehicles)

PRODCOM 2007 code	PRODCOM 2007 description
31.50.12.95	Tungsten halogen filament lamps for a voltage <= 100 V (excluding ultraviolet and infrared lamps, for motorcycles and motor vehicles)
31.50.13.00	Filament lamps of a power =< 200W and for a voltage > 100V including reflector lamps excluding ultraviolet and infrared lamps, tungsten halogen filament lamps - sealed beam lamp units
31.50.14.93	Filament lamps for voltage >100V excluding ultraviolet and infrared lamps, tungsten halogen filament lamps; power <= 200W, for motorcycles and vehicles; sealed beam lamp units
31.50.14.95	Filament lamps for voltage <= 100V excluding ultraviolet and infrared lamps, tungsten halogen filament lamps; power <= 200W, for motorcycles and vehicles; sealed beam lamp units
31.50.15.10	Fluorescent hot cathode discharge lamps, with double ended cap (excluding ultraviolet lamps)
31.50.15.30	Fluorescent hot cathode discharge lamps (excluding ultraviolet lamps, with double ended cap)
31.50.15.53	Mercury vapour discharge lamps (excluding ultraviolet lamps, dual lamps)
31.50.15.56	Sodium vapour discharge lamps other than ultraviolet lamps
31.50.15.59	Discharge lamps (excluding fluorescent hot cathode lamps, dual lamps, mercury or sodium vapour lamps, ultraviolet lamps)
31.50.15.59	Discharge lamps (excluding fluorescent hot cathode lamps, dual lamps, mercury or sodium vapour lamps, ultraviolet lamps)
31.50.21.00	Portable electric lamps worked by dry batteries, accumulators or magnetos (excluding for cycles or motor vehicles)
31.50.22.00	Electric table, desk, bedside or floor-standing lamps
31.50.25.30	Chandeliers and other electric ceiling or wall lighting fittings (excluding those used for lighting public open spaces or thoroughfares)
31.50.32.00	Lighting sets for Christmas trees

The classification used in the market data is described in Table 4.10. The data describes market volumes of appliances split up in countries, sector types (i.e. heating, ventilation and air-conditioning, major domestic appliances and small domestic appliances) categories and subcategories. The timeframe described by the data is 2004 until 2007, followed by predictions for the years 2008 until 2013. The database provides statistics for EU-27 and Eastern European countries.

Table 4.10 Statistical definition GA, market dataset

Sector	Sub-Sector	Sub-Market	Energy source
HVAC (Heating, Ventilation and Air-conditioning products)	Air treatment & heating	Air conditioning	Electric appliances
		Air treatment, others	Electric appliances
		Heating	Electric appliances
			GA
	Water heating & treatment	Water heating	Electric appliances
			GA
Sector	**Sub-Sector**	**Sub-Market**	**Energy source**
MDA (Major Domestic Appliances)	Cooking	Cookers / ovens	Electric appliances
			GA
		Hobs	Electric appliances
			GA
		Hoods	Electric appliances
		Microwaves	Electric appliances
	Cooling	Freezers	Electric appliances
		Refrigerators	Electric appliances
	Laundry	Dryers	Electric appliances
		Washing machines	Electric appliances
	Dishwashing	Dishwashers	Electric appliances
Sector	**Sub-Sector**	**Sub-Market**	**Energy source**
SDA (Small Domestic Appliances)	Beverage preparation	Beverage preparation, others	Electric appliances
		Coffee / espresso preparation	Electric appliances
	Food preparation	Food processing	Electric appliances
		Ready-to-eat cooking	Electric appliances
	Garment care	Ironing	Electric appliances
	Health, Beauty & Wellness	Beauty	Electric appliances
		Health	Electric appliances
		Wellness	Electric appliances
	Indoor cleaning	Indoor cleaning, others	Electric appliances
		Vacuum cleaners	Electric appliances

5 Key characteristics of the European gas appliances sector

5.1 Introduction

This chapter describes the main characteristics of the gas appliances sector in Europe. It provides an overview of the size and developments in the GAS, including the production size, the labour force and demand for gas appliances, as well as the industry structure, the role of SMEs and companies' behaviour. This chapter also gives an insight into the role of notified bodies within the eleven Member States that were selected for the fieldwork (Czech Republic, Denmark, France, Germany, Italy, Netherlands, Poland, Slovakia, Slovenia, Spain and United Kingdom). Finally, the gas appliances sector of eleven selected EU Member States is analysed in more details, based on the data available and findings from the stakeholders' consultation. Regarding the geographical scope of this chapter, sections 5.2 and 5.3 focus on the differences in the EU-27, while section 5.4 relies on data for the EU-25 and the eleven selected Member States only[30]. No quantitative data is available for a full coverage of the EEA as well as Switzerland and Turkey, as data for Iceland, Norway and Lichtenstein is missing.

The data analysis results show that the demand for both HVAC and domestic appliances has grown since 1995 at a steady pace. The GAS-M employs around 500, 000 people or 1.46% of total EU-27 manufacturing work force, with a productivity per employee higher in the EU-15 countries. Germany, the UK, Italy and France have the most important workforce (in ranking order) in the GAS. However Denmark, followed by Slovakia and the Czech Republic have the biggest manufacturing industry employment share. Regarding production volumes in monetary terms, these four countries altogether represented almost three quarters of production since 1995, with Germany going from the first to the third position by 2007, and Italy from third to first, France keeping its fourth position over the period. Germany has the largest share of large enterprises (106), while Italy is distinguished by a particularly high share of companies with less than 250 employees (9, 576). However relative to GDP, the GAS-M is of particular importance to Slovakia, representing over 0.9% of GDP, followed by Poland and Italy with over 0.25% of GDP. For Germany, France and the UK, the GAS-M represents less than 0.1% of GDP. The EU-27 intra-trade is growing, with a large trade surplus from the new Member States, the EU-12 towards the EU-15 countries. Interestingly, Germany, Italy, the Netherlands and Slovakia are net exporters of GA within the EU, while the UK and

[30] The use of these two different sets of data is due to the fact that no data for the EU-27 is publicly available as far as industry and size distribution of firms is concerned.

France are net importers. In addition, only Lithuania, Romania and Slovakia, together with the Netherlands, present a certain export specialisation in GA.

The manufacturing strategies pursued by GAS-M companies are diverse. Some firms pursue a high in-house production strategy while others focus on assembling and have outsourced large parts of the production process. This can be due to a company's history. For instance integrated conglomerates and groups with a stake in metal processing industries often command a wide range of product areas and make use of their extensive network of affiliated firms and production sites for the manufacture of gas appliances. However it appears that the regional distribution of production in integrated conglomerates and groups does not differ substantially from the regional distribution of companies that prefer outsourcing most of the production process and focus on assembling. As for GA components, such as controls, burners and heat exchangers, few companies manufacture these parts themselves. Specialized manufacturers who are on the leading edge of product and process technology dominate the market. They exploit economies-of-scale and deliver components to most of the GA manufacturers. It appears that for some type of parts and components procured from European suppliers, the country of production is not known as European companies have different production location in and outside the EU.

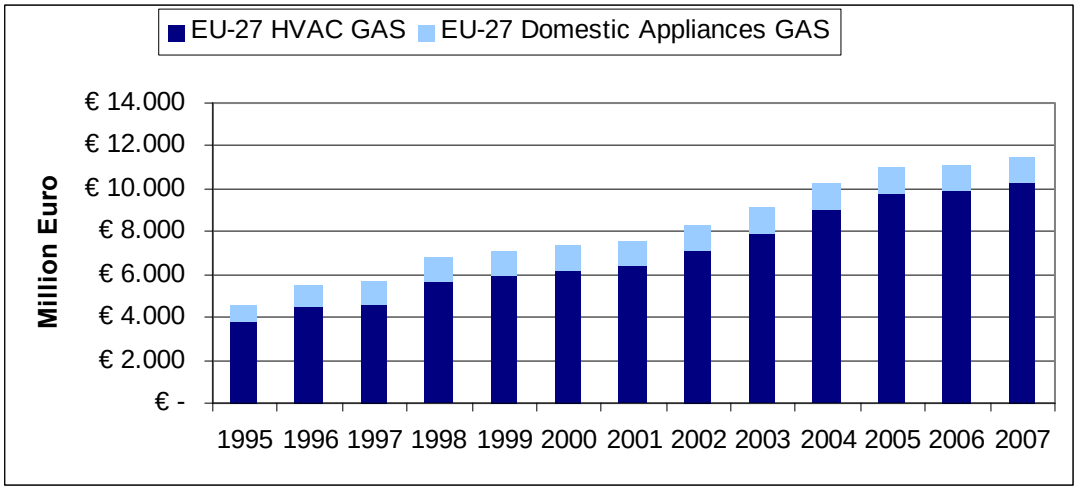
The coverage of the role of the notified bodies for the eleven selected Member States show diverse links and processes between the stakeholders involved that is the State, the notifying and notified bodies, the companies and the international bodies such as the CEN. This is mainly due to each country's institutional and industrial history, which have followed different paths and pace of developments.

5.2 Importance of the sector

5.2.1 Output

In this section the development of the GAS in the EU-27 market is analyzed with Eurostat Prodcom data. It has to be stressed that the data have been processed in order to provide an overview of the produced and demanded volumes rather than presenting exact production figures in term of units produced and demanded. Insufficient data records do not allow for making precise statements on actual figures as a variety of different data and sector definitions exists. However, the findings presented below display a comprehensive picture of the proportionate developments in the GA and the appliance sector. First, the share of the GA subsectors in the EU-27 is analysed. Figure 5.1 and Table 5.1 show the developments in the GAS as statistically identified in this study. The figures and tables show that the sector grew steadily from 1995 onwards, to a total production value of nearly Euro 12 Billion in 2007. HVAC accounts for the majority of GAS-M production. Table 5.1 further shows that HVAC and domestic appliances have both contributed to the growth of the GAS. In particular the growth of the HVAC subsector is notable, doubling over a 12 year time span. HVAC grew at an average annual rate of 8.6 percent, whereas domestic appliances grew at an average annual rate of 3.8 percent in the period between 1995 and 2007. Table 5.1 further provides the share of EU-12 countries in total EU-27 production. The share of EU-12 production increased to 8.1 percent of total production in the above mentioned period of time.

Figure 5.1 Production value per identified GA subsector (in Million EUR)



Source: Eurostat; Prodcom database

Table 5.1 Indexed development of GA production in EU-27, 1995-2007 (current prices)

Sub sector	Year												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
HVAC	100	118	120	149	156	161	168	185	208	236	255	260	268
Domestic Appliances	100	132	141	144	143	154	151	154	156	156	156	156	156

Average annual growth rate in %		
	1995 - 2001	1995 - 2007
HVAC	9.0%	8.6%
Domestic Appliances	7.7%	3.8%

Production share of EU-12							
	2001	2002	2003	2004	2005	2006	2007
EU-12 / EU-27	2.1%	4.3%	5.1%	5.2%	3.8%	6.5%	8.1%

Source: Eurostat; Prodcom database

5.2.2 Employment

Difficulties were met trying to retrieve reliable employment data. The analysis below is based on the Structural Business Indicator survey by Eurostat. Unfortunately there were no time series data available, due to lack of consistency in the data definition. Table 5.2 provides indicators based on data for the year 2005. The outcomes have been checked for consistency compared to other years where possible. Table 5.2 shows that the total EU-27 GAS-M employment size is estimated at around 476 thousand employees or 1.46 percent of total manufacturing employment. The EU-15 area employs approximately 360

thousand people, equalling 1.2 percent of the total manufacturing workforce. There is a notable difference in the production per employee, which is much higher in the EU-15 area than in the EU-27 area. This indicates a productivity gap between EU-15 and EU-12. This may be the result of more labour intensive production processes in the EU-12, and a lower added value of the production and lower wages.

Table 5.2 Employment indicators for EU-27 and EU-15

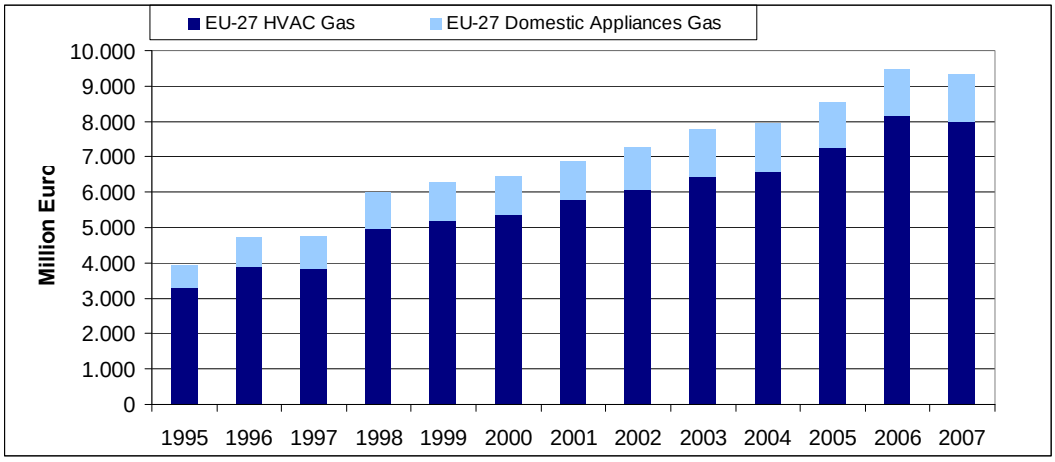
Appliances	Number of employees of GAS-M	Share of total number of employees in manufacturing industries	Turnover per employee
	2005	2005	2005
EU-27	476,243	1.46%	149,400
EU-15	360,262	1.20%	165,200

Source: Eurostat; Prodcom database

5.2.3 Demand

As an indication for market developments in the GAS-M in recent years, Figure 5.2 and Table 5.3 provide an overview of the market development based on Prodcom data. Production was adapted by adding imports and subtracting exports to provide insights in the demand for GA in the EU. Overall demand in the EU-27 grew from 1995 to 2007. However, annual growth rates varied in magnitude. In the years 1997 and 2007 for instance the demand for HVAC decreased slightly. On average the HVAC sector grew 7.7 percent per annum, whereas the domestic appliances sector grew 6.4 percent per annum from 1997 to 2007. From 1995 till 2001, the HVAC sector grew 9.9 percent per annum, and the domestic appliances sector grew by 8.9 percent per annum. In the period from 2001 till 2007 the demand for HVAC and domestic gas appliances within the EU-27 grew at an average annual rate of 5.5 and 3.9 percent respectively. In 2007 the total demand for GA HVAC within the EU-27 decreased slightly compared to 2006.

Figure 5.2 Market demand in the EU-27, (in million Euros)



Source: Eurostat; Prodcom database

The demand of EU-12 as a share of EU-27 demand has increased from 2001 onwards. This shows that developments in production in EU-12 countries are not merely production for export, but also for the domestic market. The figures also show an overall increase in EU-27 demand.

Table 5.3 Market demand indexed at 1995 levels

Sub sector	Year												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
HVAC	100	118	116	151	158	163	176	184	195	201	220	248	242
Domestic appliances	100	132	145	160	167	173	167	186	211	214	202	204	210

Average annual demand growth rate in %			
	1995 - 2001	2001 - 2007	1995 - 2007
HVAC	9.9%	5.5%	7.7%
Domestic appliances	8.9%	3.9%	6.4%

Market share of EU-12							
	2001	2002	2003	2004	2005	2006	2007
EU-12 / EU-27	0.7%	4.0%	6.8%	7.5%	7.4%	4.3%	6.3%

Source: Eurostat; Prodcom database

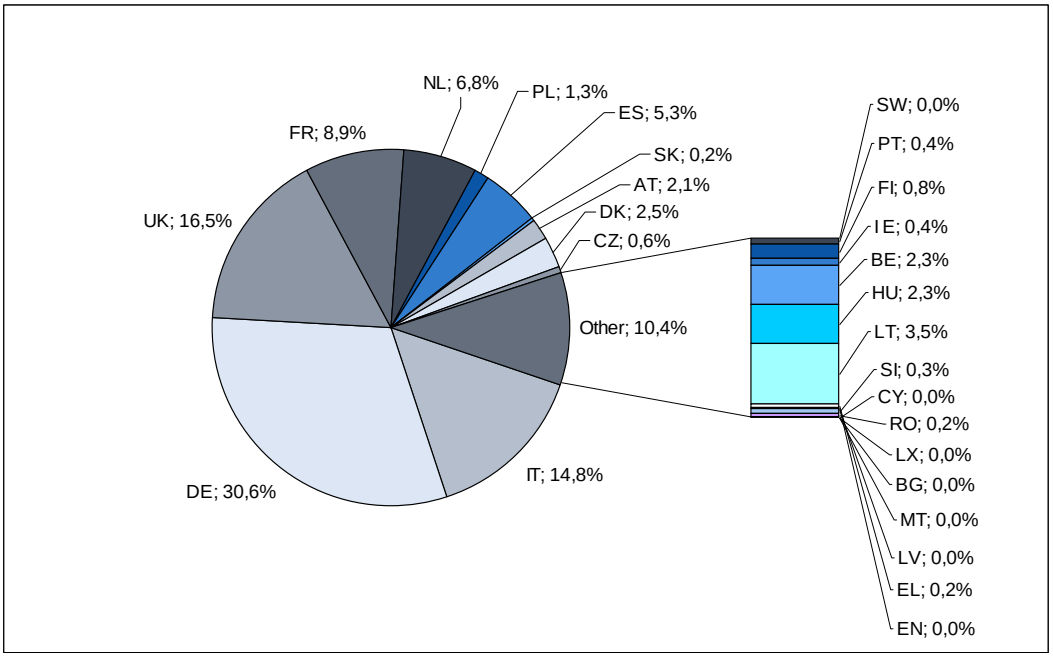
5.3 Production, employment, demand and trade within EU

5.3.1 Production share EU-27 output per country

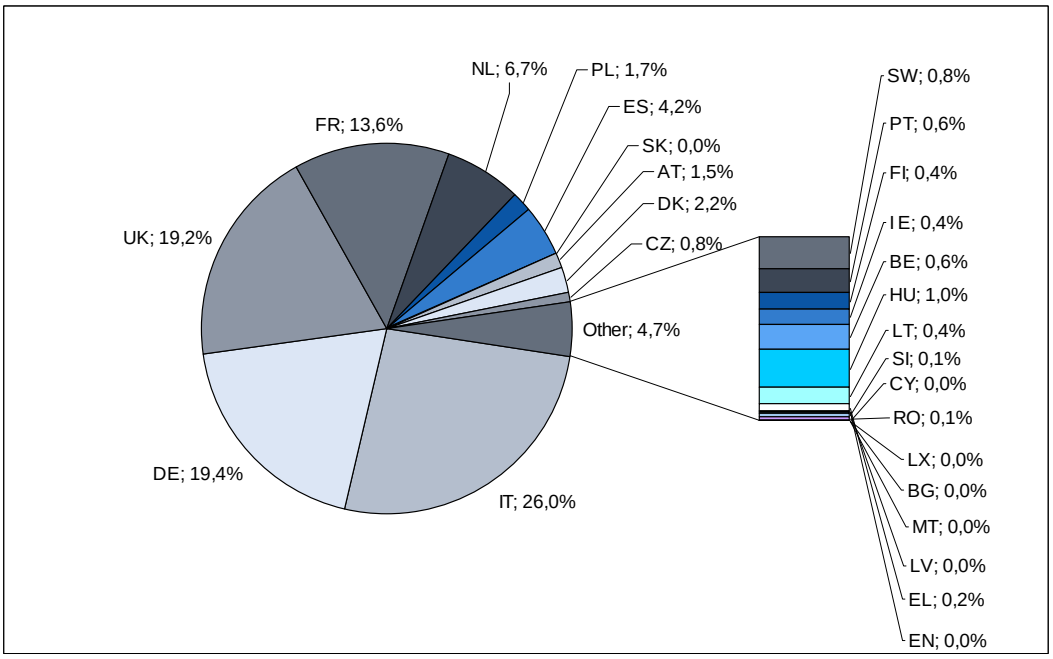
Figure 5.3 and table 5.4 show the production share of GA per country within the EU-27 in 1995, 2001 and 2007. The data display the development in each country's production share of GA indexed at the overall EU-27 GA production. The figures show the GA production share of all EU-27 countries. Figure 5.3 depicts that Italy was the main producer in 2001 with a production share of 26 percent. In 2007 it had increased to 28.8 percent. From 1995 onwards, Italy surpassed UK and Germany in terms of production share and became the largest producing country within the EU-27. The UK and Germany follow with production shares of 15.7 percent and 15.3 percent respectively. The UK's share fluctuates within a 15 to 20 percent bandwidth. Germany shows a steady decline in production share since 1995. Further review of the data has revealed that Germany's production has not grown, whereas the other nations have shown significant growth. France (12.3 percent in 2007) has managed to double its production share since 1995. The Netherlands remains at a steady level of approximately 7 percent. Further the Spanish production share declined, and the production share of new member countries such as Poland and Slovakia rose.

Figure 5.3 Per country share of total EU-27 GA production for 1995, 2001 and 2007

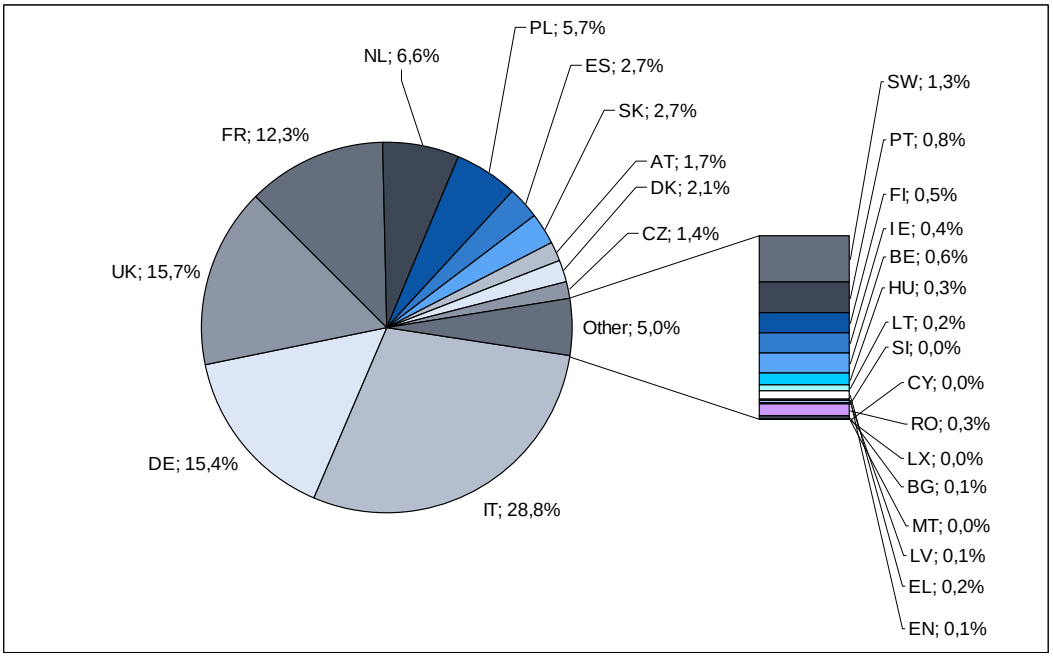
1995



2001



2007



Source: Eurostat; Prodcom database

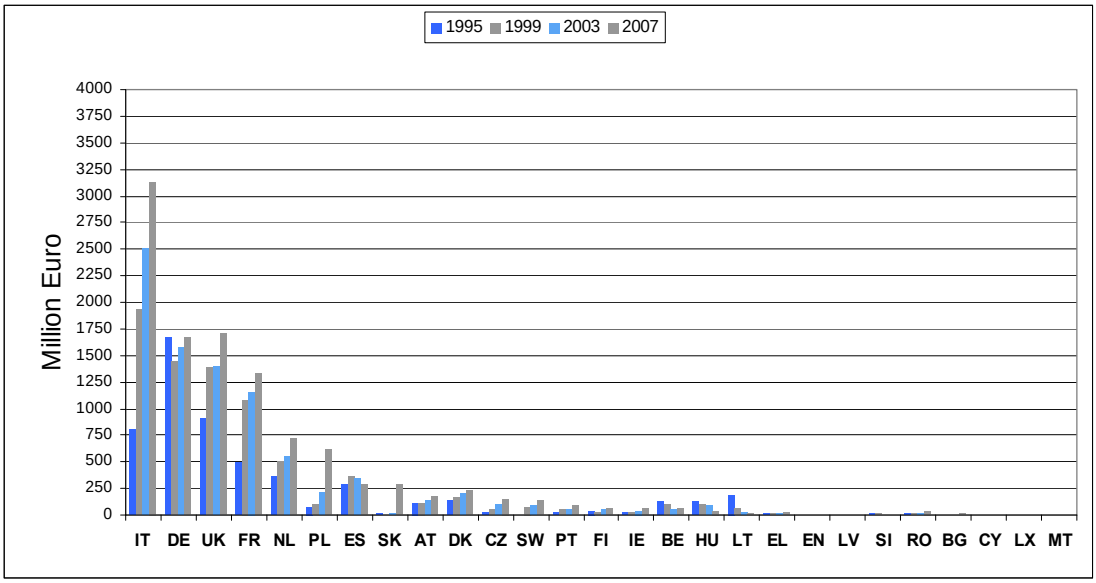
Table 5.4 Average annual production share of GA per country in 1995, 2001 and 2007

	Production share, Current prices		
Country	1995	2001	2007
IT	14.8%	26.0%	28.8%
DE	30.6%	19.4%	15.4%
UK	16.5%	19.2%	15.7%
FR	8.9%	13.6%	12.3%
NL	6.8%	6.7%	6.6%
PL	1.3%	1.7%	5.7%
ES	5.3%	4.2%	2.7%
SK	0.2%	0.0%	2.7%
AT	2.1%	1.5%	1.7%
DK	2.5%	2.2%	2.1%
CZ	0.6%	0.8%	1.4%
SW	0.0%	0.8%	1.3%
PT	0.4%	0.6%	0.8%
FI	0.8%	0.4%	0.5%
IE	0.4%	0.4%	0.5%
BE	2.3%	0.6%	0.6%
HU	2.3%	1.0%	0.3%
LT	3.5%	0.4%	0.2%
EL	0.2%	0.2%	0.2%
EN	0.0%	0.0%	0.1%
LV	0.0%	0.0%	0.1%
SI	0.3%	0.1%	0.0%
BG	0.2%	0.1%	0.3%
CY	0.0%	0.0%	0.0%
EU-15	91.6%	95.8%	89.2%
EU-12	9.2%	4.4%	12.1%

Source: Eurostat; Prodcom database

In order to proof these findings from the above figure and table, Figure 5.4 presents the developments of total value produced in the GA sector. One can easily relate the above findings on overall production share to the actual produced value. It becomes obvious that an increased production share for Italy goes hand-in-hand with an increase in value produced. The same applies for the UK, German, Slovakian and Spanish cases.

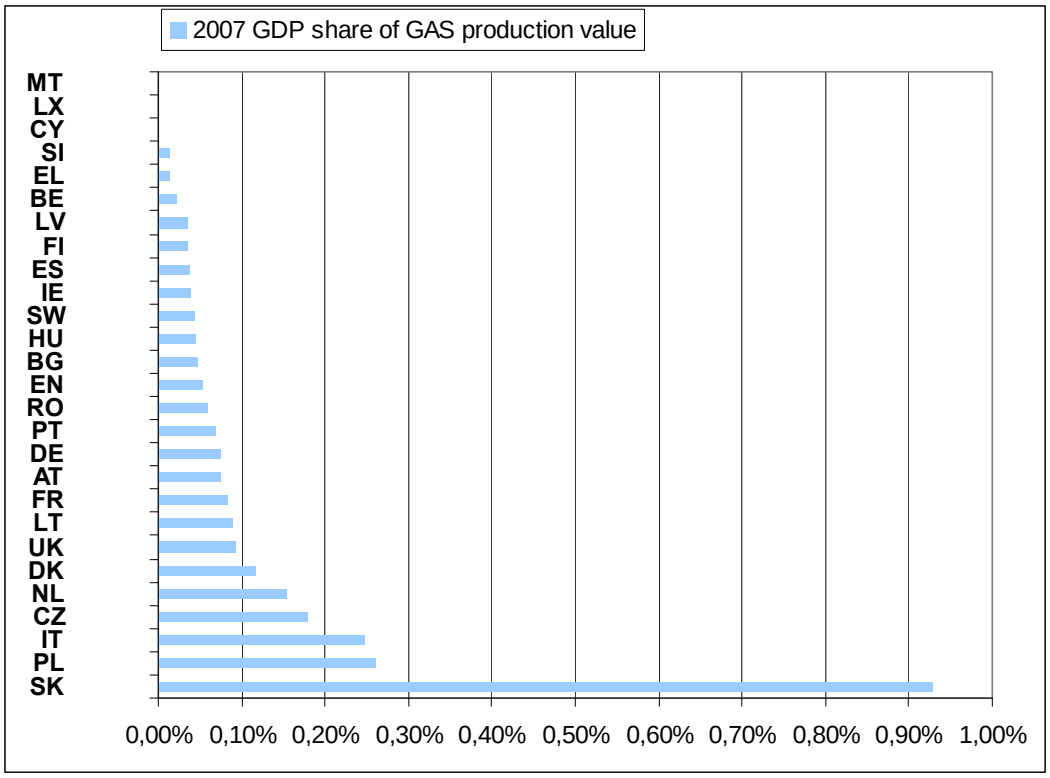
Figure 5.4 GA production per country in million Euros at current prices for 1995, 1999, 2003 and 2007



Source: Eurostat; Prodcom database

Figure 5.5 provides the overview of the GDP (Eurostat) share of GAS-M production values per country. Annex A provides the complete overview. Overall GA related production values per country have been summed up and compared to the GDP per country. The results show the importance of the GA sector for each country. In Slovakia, the share of GA production in GDP is 0.9 percent. Both Italy and Poland have a GA share of GDP of 0.25 percent. Czech Republic and Netherlands show a GDP share of GA of 0.15 percent. These figures show that for these countries GA production is relatively important for their overall economic development.

Figure 5.5 GDP share of GA production values for 2007



Source: Eurostat; Prodcom database

Table 5.5 provides the developments in GDP shares of GAS-M production per country. Countries are ranked by their GDP GAS-M share in 2007. When looking at the relative importance of the sector's developments in terms of GDP's value since 1995, it can be seen that for Slovakia, Poland and Italy, the sector's importance has increased from 1995 to 2007. In addition, when comparing the GDP GAS-M shares to the shares of the EU-27 Member States' production of GA, it can be seen that the GAS-M is not necessarily of big importance for large producers like Germany and the UK.

Table 5.5 GDP share of GA production values, average annual development over time.

	1995	2001	2007
SK	0.07%	0.00%	0.93%
PL	0.05%	0.07%	0.26%
IT	0.07%	0.17%	0.25%
CZ	0.05%	0.10%	0.18%
NL	0.11%	0.13%	0.15%
DK	0.09%	0.10%	0.12%
UK	0.07%	0.10%	0.09%
LT	1.89%	0.25%	0.09%
FR	0.04%	0.07%	0.08%
AT	0.06%	0.06%	0.08%
DE	0.09%	0.07%	0.08%
PT	0.02%	0.04%	0.07%
RO	0.02%	0.02%	0.06%
EN	0.03%	0.03%	0.05%
BG	-	-	0.05%
HU	0.29%	0.15%	0.05%
SW	0.00%	0.03%	0.04%
IE	0.03%	0.03%	0.04%
ES	0.06%	0.05%	0.04%
FI	0.04%	0.03%	0.04%
LV	0.02%	0.02%	0.04%
BE	0.06%	0.02%	0.02%
EL	0.01%	0.01%	0.01%
SI	0.09%	0.04%	0.01%
CY	-	-	-
LX	-	-	-
MT	-	-	-
EU-27	0.07%	0.09%	0.10%
EU-15	0.07%	0.09%	0.10%

Source: Eurostat; Prodcom database

5.3.2 Employment

The employment developments per country in 2005 are depicted for eleven selected member states in Table 5.6. The size of employment is pictured below. The table depicts the importance of GAS-M employment as a share of total employment. The share of total GAS-M employees is highest in Denmark and Slovakia, at 2.54 and 2.08 percent respectively. The share of employment in the largest producing nation, Italy, is almost at EU-27 average, at 1.40 percent. Germany's GAS-M employment is at 1.69 percent. The GAS-M employment is relatively less important for Spain and Slovenia. When compared to the turnover per employee, the highest ranking nations in 2005 were Netherlands, Italy and France. Comparatively low turnover per employee was generated in Slovenia, Poland and Slovakia in 2005.

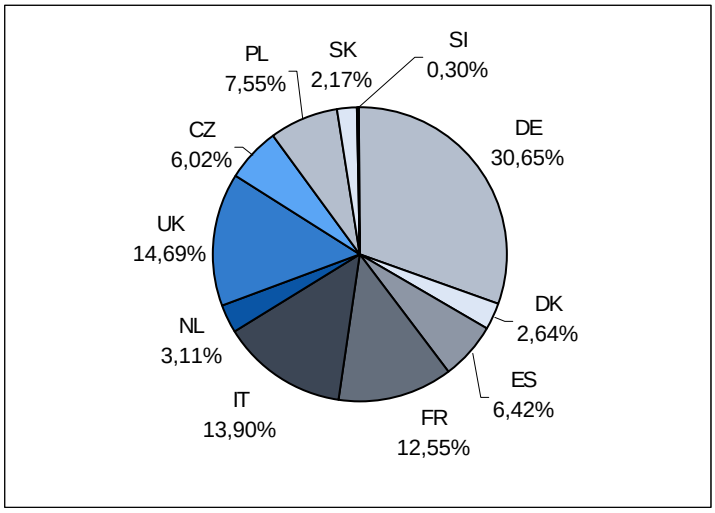
Table 5.6 Employment indicators for the selected Member States

Countries	Number of employees of GAS-M 2005	Turnover per employee (€1000s) 2005	Share of employees in total manufacturing industries (%) 2005
EU-27	476,243	149.4	1,46
EU-15	360,262	165.2	1,2
DE	118,338	184.2	1,69
DK	10,193	132.2	2,54
ES	24,788	146.0	1,01
FR	48,475	202.4	1,32
IT	53,683	208.3	1,40
NL	11,995	229.8	1,65
UK	56,732	155.6	1,81
CZ	23,228	-	1,93
PL	29,168	63.6	1,30
SK	8,385	62.1	2,08
SI	1,158	79.1	0,52

Source: Eurostat

The GAS-M related employment share of the eleven selected EU countries is provided in Figure 5.6. Germany has the largest labour force, followed by Italy, France and the UK. Although Germany has a much larger labour force in the GAS-M than the UK and Italy, both countries have surpassed Germany in terms of production size. One might argue that the German GAS-M sector is much more focused on the entire production cycle, while the Italian and UK GAS-M sectors are predominantly focussing on assembly only. The latter may result in high production output, but relatively low employment and a low manufacturing penetration.

Figure 5.6 Employment shares



Source: Eurostat; Prodcom database

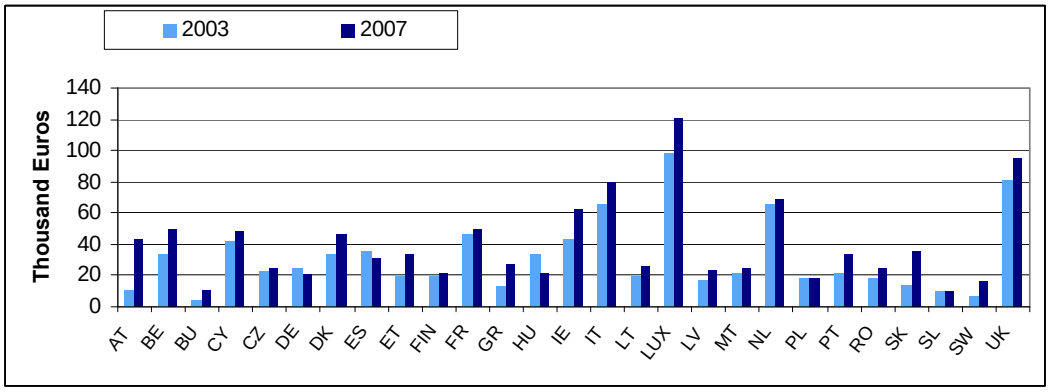
As an additional remark it has to be stated that no quantitative information on value added has been available for the EU-15, EU-12 and the selected member states. This indicator may have been even more useful regarding a conclusion about the interrelation of labour intensity and productivity.

5.3.3 Demand by Member State

The demand per household is displayed in Figure 5.7. The number of households for the years 2003 and 2007 in the EU-27 Member States was derived from a Eurostat database. Constraints were faced in the cases of Denmark Ireland and Sweden. For Denmark the 2006 household numbers had to be taken as no 2007 figures were available. The household figures for Sweden and Ireland were taken from national statistics as these were not listed in the Eurostat database. The data analysis of household demand is constrained by the fact that market demand is defined as production plus imports minus exports. The figures are thus used as a rough estimation and aim to give a picture of the situation within realistic ranges.

In the majority of countries, the demand per households for GAS-M increased when comparing the 2003 and 2007 figures. This was not the case in Germany, Spain and Hungary where demand per household slightly decreased. However German companies were able to compensate sluggish domestic demand by exports. The demand was highest in Luxembourg and the UK, followed by Italy and the Netherlands. Remarkable increases in household demand can be observed in Austria, Sweden and Slovakia where demand per household more than doubled between 2003 and 2007.

Figure 5.7 Market demand per household in the EU-27 Member States in thousand Euros at current prices



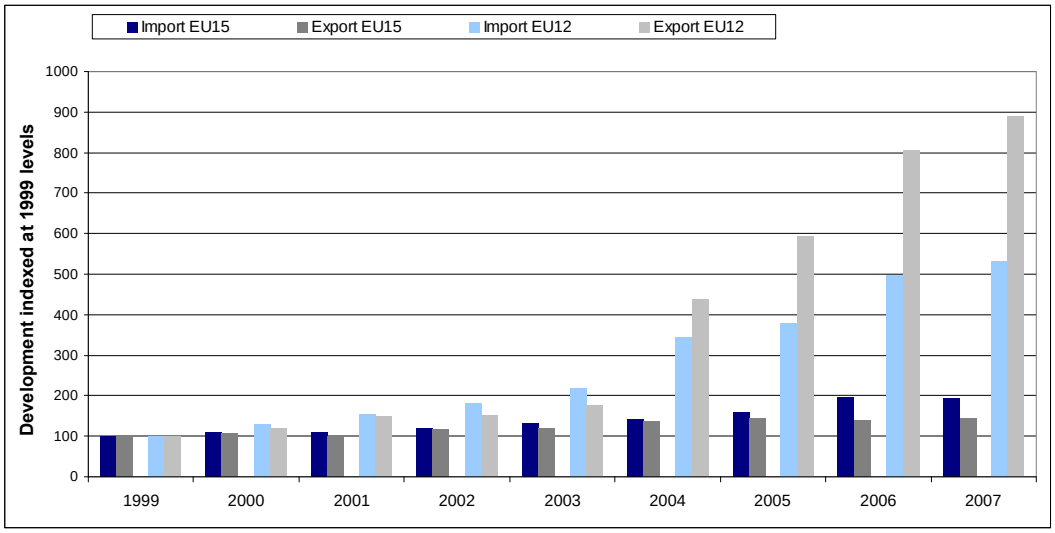
Source: Eurostat; Prodcom database.

5.3.4 Intra EU trade in GA

Figure 5.8 provides an overview of how the exports and imports of GA products have developed in recent years. The figures show that the new EU-12 countries are in the process of catching-up with the EU-15. In particular, Lithuania and Latvia showed rapid growth in exports in recent years. The EU15 area showed an average annual growth of exports of 4 percent and 7.6 percent for imports. The EU-12 countries experienced an annual export growth of 27.5 percent and an import growth of 20.42 percent from 1999 to 2007. The EU-12 area's trade in GA products grew very rapidly. Developments in import

figures are depicted. In the EU-15 (old Member States) area Finland and Sweden showed signs of strong growth. Bulgaria and Romania experienced rapid growth in import, indicating that their market demand grew rapidly. These figures are to some extent in line with the expected market growth for these countries.

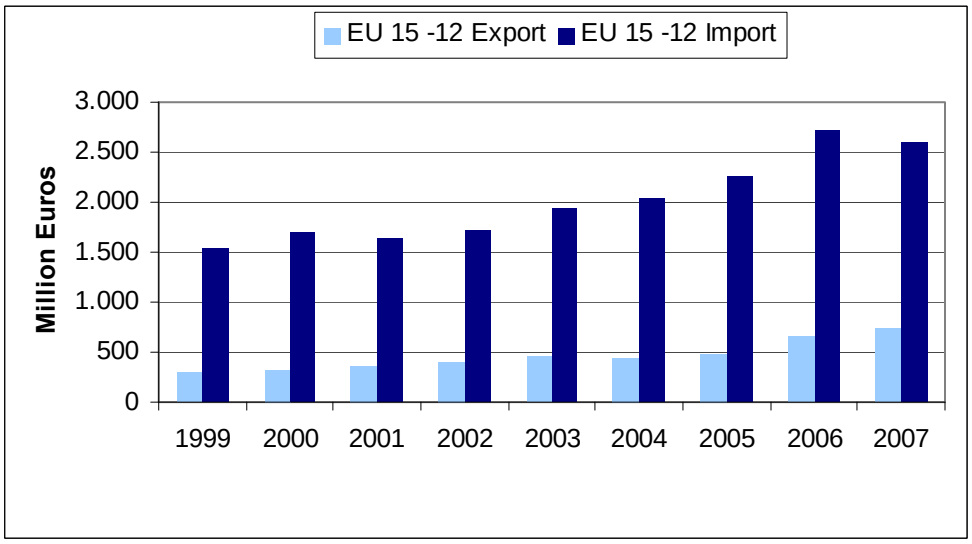
Figure 5.8 Intra EU-27 trade between old and new Member States



Source: Eurostat; Comex database. The base year is 1999, i.e. the index is 100 in 1999.

Figure 5.9 provides an overview of trade flows between the EU-15 area and the EU-12 area. From the figure, it can be derived that overall trade between EU-15 and EU-12 increased. The EU-12 had a large trade surplus towards the EU-15 area as the integration of the new Member States in the pan-European production networks made progress.

Figure 5.9 Intra EU-27 trade between old and new Member States



Source: Eurostat; Comex database.

Table 5.7 gives an overview of the export specialization of the EU-27 countries. The indicator measures the GAS-M export structure of a country against the GAS-M export structure of the EU-27 countries. In other words, the export product mix (GAS, as a share

of total appliances export) of one country is compared with the export product mix of all countries. A GAS-M industry in a country possesses an export specialisation rate of over 1 when the branch concerned attains a higher export share at a national level than at a multinational level. A share of less than 1 means that the branch's export share at national level is below the average for all countries. This measure is based on the idea that the product mix of all countries reflects international demand, and that the deviations in the product mix of an individual country are attributable to competitive strengths or weaknesses.

Table 5.7 Export specialisation in intra EU trade, 1999 to 2007

	1999	2000	2001	2002	2003	2004	2005	2006	2007
EU-15									
AT	1.1	1.2	1.6	1.4	1.7	1.8	2.1	1.9	1.3
BE	0.6	0.5	0.4	0.4	0.4	0.4	0.3	0.4	0.4
DK	0.5	0.5	0.6	0.6	0.7	0.8	0.7	0.7	0.7
FIN	0.6	0.6	0.6	0.6	0.7	0.6	0.8	1.5	1.5
FR	1.1	1.0	1.1	1.0	0.9	1.0	1.0	1.1	1.1
DE	1.1	1.1	1.0	1.1	1.1	1.1	1.2	1.1	1.2
EL	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2
IE	1.1	1.1	1.0	1.0	1.1	1.3	1.4	1.7	1.8
IT	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
LUX	1.4	1.7	1.2	0.9	0.8	0.8	0.6	0.7	0.4
NL	1.9	2.1	1.9	1.9	1.7	1.4	1.4	1.6	1.7
PT	1.6	1.4	1.3	1.2	1.2	1.0	1.8	1.7	1.5
ES	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.5	0.5
SW	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.4	0.4
UK	0.7	0.5	0.7	1.0	0.9	0.9	0.9	0.9	1.0
EU-12									
BU	0.4	0.4	0.2	0.3	0.2	0.2	0.2	0.2	0.2
CY	1.4	1.2	0.5	1.0	0.1	0.4	0.1	0.2	0.2
CZ	1.9	1.7	1.8	1.5	1.5	1.2	1.1	1.3	1.0
ET	3.0	2.5	2.4	1.6	1.4	1.2	1.2	1.1	1.1
HU	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.3	0.3
LT	0.5	1.2	1.5	1.5	1.5	1.8	2.1	2.3	2.4
LV	0.4	0.5	0.7	0.7	0.6	0.7	0.8	0.3	0.6
MT	0.6	0.2	0.0	0.0	0.8	0.0	0.0	0.4	0.0
PL						0.7	0.6	0.5	0.5
RO	2.0	2.1	2.6	2.6	2.2	1.6	1.3	1.2	1.2
SK						0.9	1.5	1.9	2.2
SL	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.3

Source: Eurostat; Comex database.

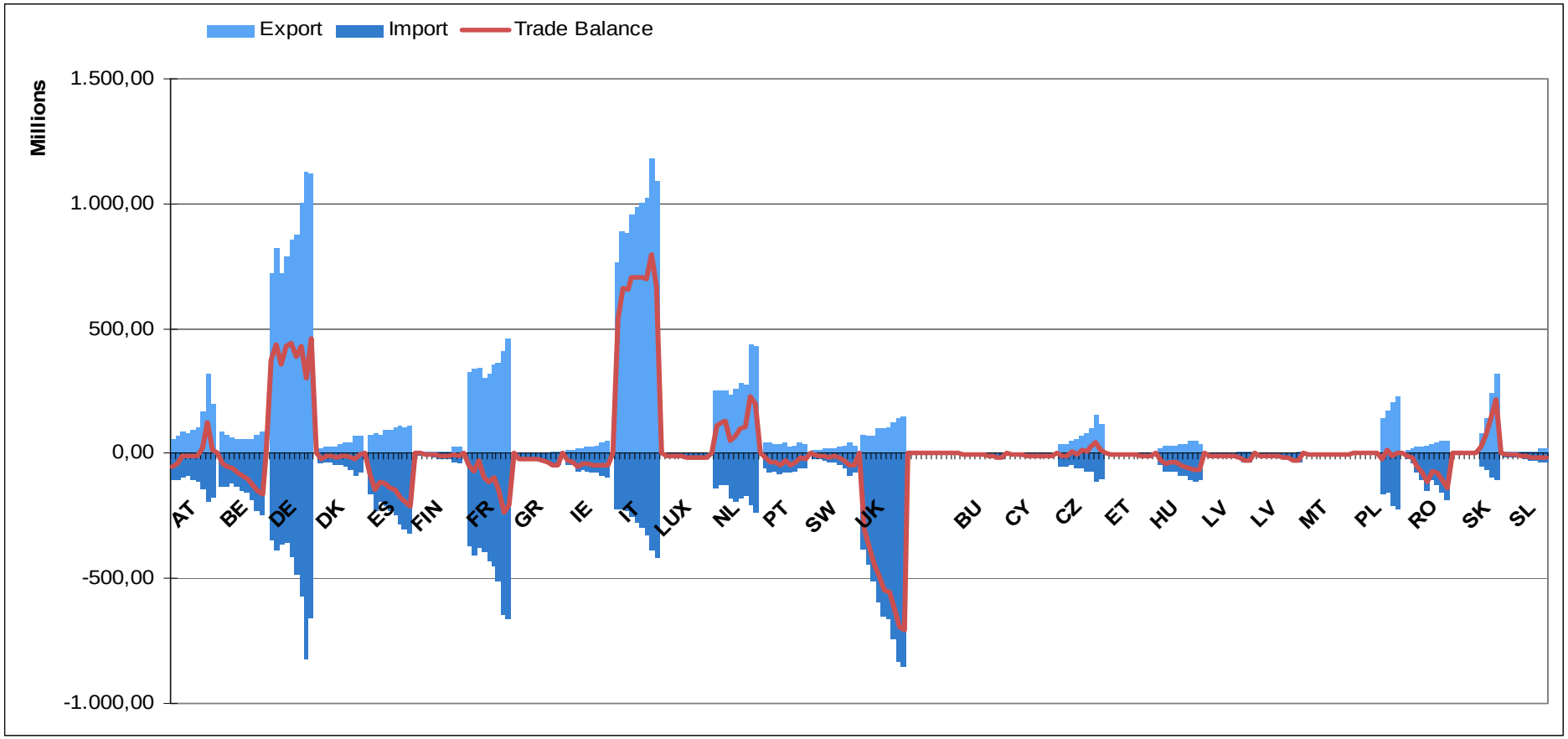
Looking at Table 5.7, it is remarkable that of the top 5 producers only the Netherlands is export specialized towards GAS. A quantitative finding that is supported by results from field work which revealed that the Dutch GA sector strives to further explore the European market. Italy, Germany, and France show only a slight specialization towards

GAS. The UK figures indicate that it is relatively less specialized than the reference category.

The EU-27 figures show that although GA exports grew substantially, this is not due to a particular specialization of the entire EU-12 area. Lithuania, Romania ad Slovakia appear to have specialized in GAS, but large producers like Poland exhibit a relative preference for other appliances. That is, Poland's export mix consists of relatively more non-GAS-M exports, compared to the EU-27.

Trade in GA products within the EU provides insight in how the market sizes and production figures are related. Figure 5.10 shows the trade balance of a given country, with other EU-27 countries. Germany, Italy, the Netherlands and Slovakia are net exporters within the EU. This is in line with the trend observed in the production figures. Remarkable is that large producers such as the UK and France are net importers of GA. Their production is insufficient to meet their own market's demand.

Figure 5.10 Intra EU trade GA balance per country 1999-2007 (millions Euros)



Source: Eurostat; Comex database

5.4 Industry structure and size distribution of firms

In this section the development of the GAS-M structure and the distribution of firms in the EU-25 market as well as eleven selected countries is analyzed on the basis of Eurostat structural business statistics. Due to a lack of publicly available data this section presents data for the EU-25 only (instead of EU-27 data), the EU-15 and the eleven selected Member States. In addition, reliable and useful data is available for the years 2005 and 2006 only. In order to identify data related to small and medium sized enterprises different lines of the industry had to be analysed. The presented data has been derived by focussing on the 25 percent production share of gas appliances. This production share has been derived from the Prodcom data, as introduced at the beginning of this report. This data, for the years 2005 and 2006, shows that gas appliances made up approximately 25 percent of total appliance production. Therewith it is plausible to take the 25 percent production share as a proxy for employment and SME companies. Finally, in order to get an overview of the industry structure, the distribution of employees and the output generated, firms have been classified within the two categories available at Eurostat. One category includes small companies with less than 250 employees; the other one comprises firms which have employed more than 250 persons. For each of these two categories the following three parameters have been analysed:

- The total number of firms;
- The total number of employees;
- The production per employee.

As regard to the production per employee however, the analysis below is valid for the industry as a whole, and not for the GAS-M in particular, as a differentiation is not possible given the nature of the data. It nevertheless gives an interesting insight into the differentiation between small and large firms. With regard to the analysis of the GAS-M and non-GAS, the assumption is admissible that there are no major structural differences between both sectors, because the majority of the companies are active in both sectors and the market environment is quite similar.

Table 5.8 provides an overview of the industry structure in 2006, the number of people employed as well as the productivity per employee, covering the EU-15 and the EU-25.

Table 5.8 Industry structure in the EU-25 and EU-15 in 2006

	EU-15		EU-25	
	2006	compared to 2005 change rate in %	2006	compared to 2005 change rate in %
Number of firms <250	24781	-1.08%	31417	-1.02%
Number of firms >250	321	-1.48%	412	1.29%
Number of employees <250	274990	-4.18%	323556	-3.60%
Number of employees >250	239645	-1.24%	303450	0.22%
Production per employee<250* (1000 €)	147,7	5.23%	132,0	5.05%
Production per employee >250*(1000 €)	196,4	9.28%	168,4	8.51%

Source: Eurostat Structural business statistics

When analysing above table, the following developments can be identified for small firms with less than 250 employees;

- The overall number of firms slightly decreased in 2006 compared to 2005 numbers in the EU-15 and the EU-25;
- The number of employees in these firms decreased remarkably in 2006, compared to 2005 levels;
- Besides the decreasing number of people employed the production per employee increased to quite some extent within the EU-15 and the EU-25 in 2006, again compared to 2005 levels.

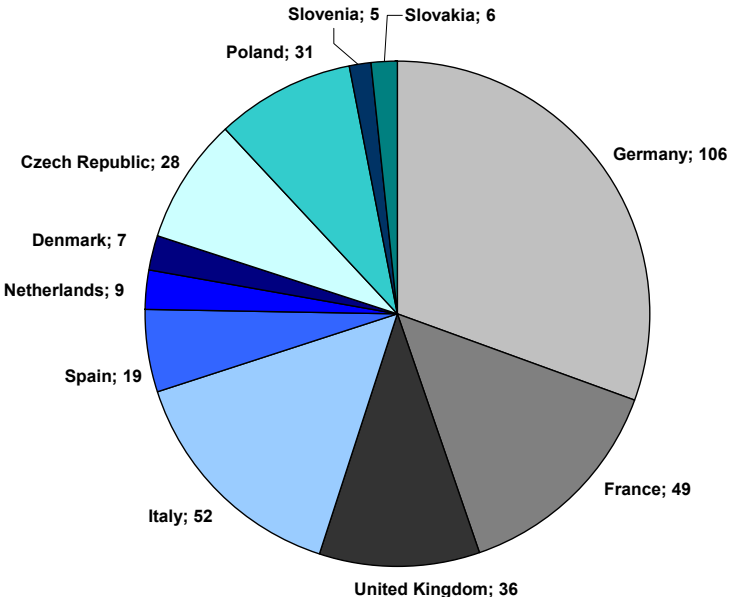
The analysis for companies with more than 250 employees calls for a differentiation between the EU-15 and the EU-25.

- The number of firms in 2006, compared to 2005, slightly decreased in the EU-15 but increased to some extent in the EU-25;
- Similar is the picture as far as the total number of employees is concerned. Lower numbers are observed for the EU-15 while total employment figures for the EU-25 increased in 2006.
- Even more striking is the increase in production per employee in the EU-15 and the EU-25 for the firms with more than 250 employees. The production per employee increased substantially in 2006, compared to 2005.

The analysis of the eleven selected European countries – that were under investigation during the fieldwork - has been conducted by determining the same parameters as described above. The distribution of small firms and companies with more than 250 employees differs substantially and is displayed in Figure 5.11.

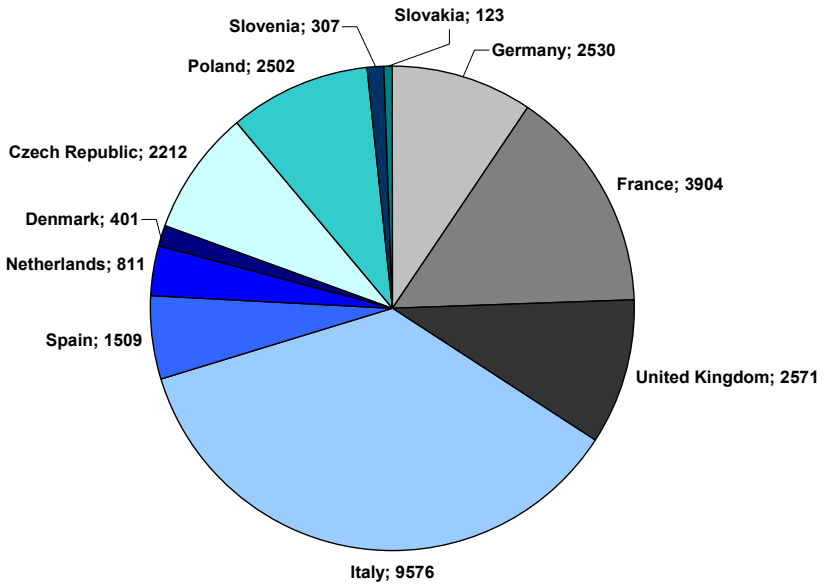
As far as companies with less than 250 employees are concerned, an overall estimated number of 26322 firms existed within the eleven selected countries in 2006. Striking is the large number of firms under this category which can be found in Italy. Considering all companies with more than 250 employees in 2006, a total of 340 companies have been identified. By far the largest number of these firms was located in Germany followed by Italy, France, and the United Kingdom (in descending order).

Figure 5.11 Number of companies with more than 250 employees in selected countries in 2006



Source: Eurostat structural business statistics

Figure 5.12 Number of companies with less than 250 employees in selected countries in 2006



Source: Eurostat structural business statistics

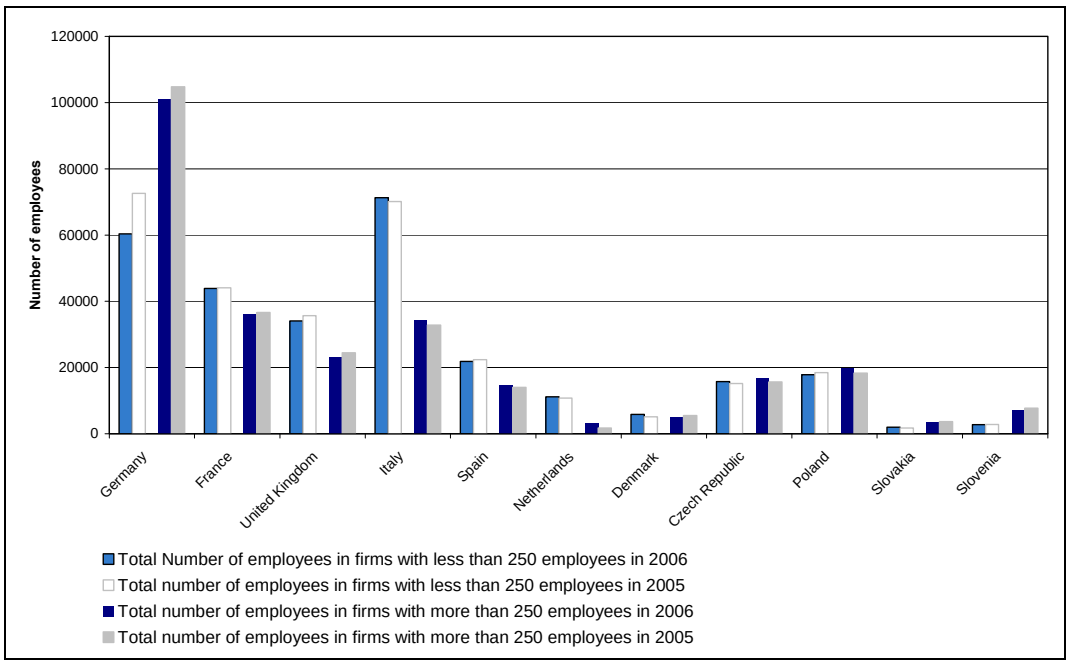
It is of further interest to know how many people were employed within the depicted companies in the selected countries. The most recent data displays the employment statistics from 2006 with some comparable data also available for 2005. Although the comparison period of a two-year stage is too short to depict long-term developments, certain employment trends in the GAS-M can be identified. The table below displays the

level of employment in 2006 and also indicates the employment rates from 2005 in order to provide a basis for comparison.

Once again referring to the companies with less than 250 employees, the above made statement for the EU-15 and EU-25 can be echoed. In most countries, despite Italy, The Netherlands, Denmark, Czech Republic and Slovenia, which have seen slight increases in employment, the overall number of people employed in these firms was lower in 2006 than in 2005.

Although the overall number of people employed by companies with more than 250 employees increased in Italy, the Netherlands, Spain, Czech Republic and Poland in 2006 compared to 2005, the overall number of employees in the selected ten countries decreased in the period under review.

Figure 5.13 Total number of employees within selected firms and countries in 2006 and 2005

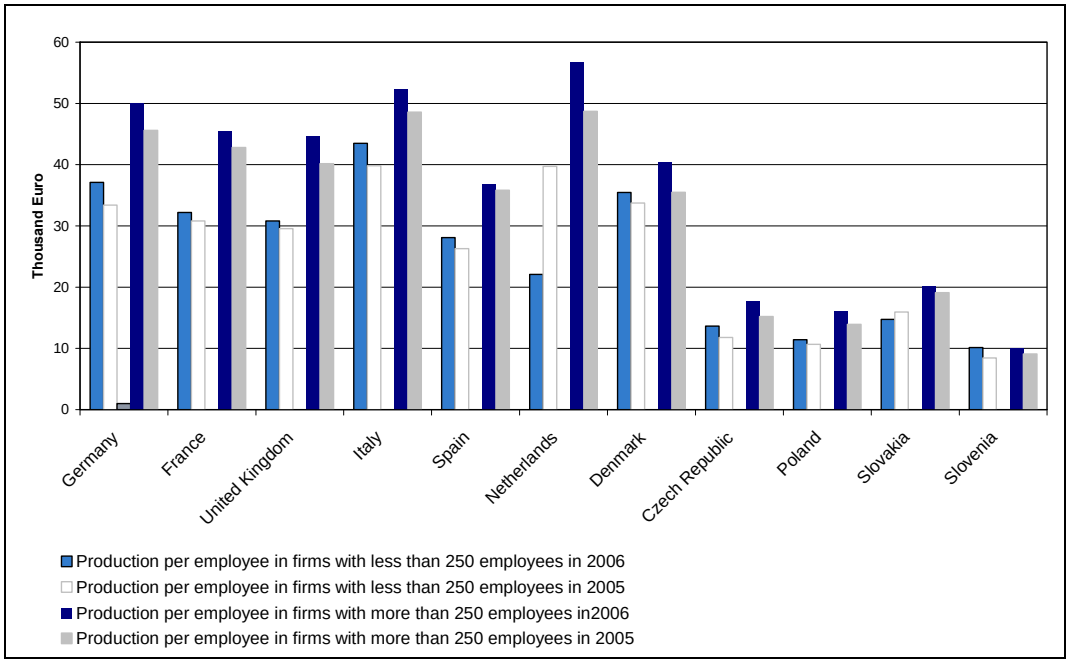


Source: Eurostat structural business statistics

In order to detect the productivity of the GAS-M industry sector in the selected countries, the production per employee has been calculated for the two categories of firms, using the production value and total number of employees. Again, the below table displays the findings for 2006 and indicates the 2005 data.

What has been stated for the EU-15 and EU-25 as a whole can be repeated for the eleven selected countries; the overall productivity increased in both company categories. Nevertheless, two exceptions have been identified throughout the country specific analysis. Companies from The Netherlands with less than 250 employees have experienced a remarkable decrease in production per employee in 2006 compared to 2005. The same, although not having experienced a decrease of similar magnitude as The Netherlands, holds for Slovenia.

Figure 5.14 Production per employee within selected countries in 2006 and 2005



Source: Eurostat structural business statistics

5.5 Companies' behaviour

This subchapter provides a summary of the description of companies' behaviour in Subchapter 5.6. It starts with predominant market strategies pursued by companies and differentiates between the big ones of the sector and the smaller ones, as well as between companies from the new and the old Member States.

5.5.1 Tendencies in market strategies

HVAC

Most prominent representatives of the sector are those bigger manufacturing companies that pursue strategies that are close to "profit impact of market shares" (PIMS). The companies try to gain higher market shares than their competitors and get a lead by the exploitation of economies-of-scale. The standardisation of products and the reduction of costs in the manufacturing process by large-batch production using learning effects are high on the agenda. In the subsector HVAC this strategic orientation is not that obvious because noteworthy discrepancies between the markets in the Member States remain. This is above all caused by particularities in distribution systems and consumer preferences. Therefore, the acquisition of competitors does not lead to the extinction of brands and products. The intangible market value of a bought firm is created by its brand's awareness and reputation and it is used to take over its market share. An immediate exploitation of scale effects in the market would endanger the long-term effects of mergers and acquisitions. The exploitation of scale effects starts in production by standardisation of products and a restructuring of manufacturing networks.

These market strategies are above all observed with the final product manufacturers of HVAC but they are also applied by specialized manufacturers of key components for gas appliances, burners, heat-exchangers etc. In these market segments in the value chain of HVAC consumer preferences are to a lesser extent of importance and scale effects can be raised much easier and quicker.

The stake of European manufacturers in overseas markets has remained limited. This is true for the US, the Japanese and the Chinese market, in spite of the investment carried out by some firms. Only in the non-EU markets of the former Eastern bloc European manufacturers – above all from the new Member States – command noteworthy market shares. For production the situation is quite similar. There are locations in overseas countries. Facilities are predominantly run in China and Turkey. There are locations in the Americas and other Asian countries too, but they are of minor importance.

These market share strategies of the big HVAC manufacturers lead to an adjustment of the European market. Moreover the European players have invested overseas. But their footing in these markets is not that high that noteworthy economies of scale can be raised. Investments are dedicated to use additional growth potentials, for instance in the US, and to create global production networks to improve cost competitiveness. The most pronounced global players in the subsector HVAC are the Danish pump manufacturers with high market shares worldwide.

There are other big manufacturers in HVAC, at around 1,000 to 2,000 employees that put much emphasis on technologies. They are on the leading edge with innovative products and try to maintain competitive pressure. They are permanently challenged by market leaders who are eager to catch up by imitation and can provide cheaper products. In coming years a technological leap forward with heat-pumps, fuel-cells and sterling engines is expected. It will be a challenge for these technologically oriented companies to raise sufficient resources to develop products based on new concepts. The bigger players applying market share strategies are already about to acquire small firms with that know-how.

Small firms in the markets for final products are focusing in niches. They design systems for specific applications and are customizing their products to the clients' needs. These are services that can hardly be offered by big firms. Such strategies prove successful in particular in markets with clients who ask for technological advanced and environmentally friendly products and are willing to pay a price premium for such systems. Germany is an important market which provides some opportunities for SMEs in this market segment. However, there is also similar demand in other Member States. Cross-border activities require co-operations in distribution and related services. Co-operations with adequate foreign trade representatives and engineering companies are usually applied channels.

The companies from the new Member States experienced tough competition from their competitors from Western Europe that are leading in terms of technology and marketing abilities. This has induced a structural change. Many firms have been taken over or became subcontractors, specializing in metal parts and components. They face tough competition from bigger Western European companies who are also active in these areas

that build there competitive edge on production technology, can trust in economies-of-scale and high performance components in their Western European locations, but they also invest in the new Member States for the production of parts and components. An equilibrium has not yet been achieved and the major disadvantage of the subcontracting companies from the new Member States lies in poor access to financial markets. The intra-European division of labour is therefore expected to evolve further.

Those companies that managed to remain independent in the new Member States and manufacture final products exploit their trade linkages to the former Eastern bloc and expand their business outside the EU. The opening up of Western European market has proved to be difficult for these companies. There are only few possibilities to get access to the distribution channels and the products do not meet western requirements. However, some form of upgrading technology takes place in these firms. The manufacturers of final products from the new Member States have invested in newly designed condensing boilers and are upgrading the product quality by the procurement of key components from Western European manufacturers. However, they miss opportunities to exploit scale effects in a market environment that with regard to the predominant serial production provide important advantages in competition. Their main asset is their good reputation in the Central and Eastern European markets. They know the consumers' needs best and build on their traditional distribution channels. The main challenge there are currently facing is competing with the more prestigious Western European brand names. Against this backdrop they are working hard on upgrading their products.

Domestic and portable appliances

Globalization of the domestic appliances markets is far more advanced than for HVAC. All of the big players command noteworthy market shares in Europe, the Americas and Asia. This can be explained by the market environment. Domestic appliances are highly standardized products that are directly sold to the consumer. Many of the products are plug-in appliances and do not require qualified installation, maintenance and repair. In HVAC the situation is a bit different. There is also a noteworthy manufacture of mass products, however, batch sizes are smaller and many of the products have to be installed by qualified personnel. Distribution via retail trade is the exception. This has an impact on companies' global orientation. Europe has remained the by far dominant location for production and the European market is decisive for the success of these companies in the market for GA that fall under the scope of the GAD.

The big global players of domestic appliances run production facilities all over the world. Additional they procure products from specialized manufacturer who produce appliance due to their clients' design and trading goods. As in HVAC it is necessary to use numerous brands in line with their regional awareness and reputation. Moreover, there are differences in regional habits and preferences. For instance US-consumers have a high preference for bulky appliances whereas the Japanese and Europeans prefer technologically sophisticated products.

There are some players in the European domestic appliances market that command brands with high consumer retention by awareness and reputation. The value of the brand might be supported by high quality or regional identification. These firms follow their precursors' strategies in globalization to maintain their position in the market. The

predominant activity is the cross-border expansion of their production network and global sourcing.

In the new Member States numerous medium-sized manufacturers of domestic appliances exist. They were privatized during the transition period and have not been acquired by Western companies. They heavily trust in their regional client base and their traditional distribution channels in Central and Eastern Europe. They face competitive pressure from two sides, the West European companies with their attractive brands and sophisticated products and competitors from Turkey or the Far East that supply, above all, low-end appliances. The latter competitors have an edge in labour costs and deliver very competitively priced products. Companies from the new Member States pursue different strategic options to meet this challenge. However, their ability to allocate resources to develop more sophisticated products or to exploit cost-saving potentials is limited. The situation is precarious above all with stoves and ovens. Traditionally, China is strong in this kind of gas appliances due to traditional Chinese cooking habits. Exports to the EU have strongly increased in the recent past.

5.5.2 Research strategies

R&D has become an important issue for the GAS. Growing requirements on energy efficiency and CO_2 abatement require new concepts and public schemes contribute to stimulate these activities. The activities are dispersed and national co-operations prevail. This has been perceived as a disadvantage in particular with the stringent Japanese policies that interlink research activities for HVAC with support for extensive field tests coming close to market introduction.

The sector comprises start ups and other small companies driven by advanced technologies, such as for heat pumps and fuel cells. With growing maturation of these technologies these firms increasingly attract the attention of the big players in the market. Currently a consolidation takes place and indicates that the marketability is perceived as a forthcoming reality in the medium-term.

Some overseas co-operations in R&D of European HVAC manufacturers were identified, in particular in areas where non-EU players are on the leading edge. Dominant are activities together with Japanese firms. Their lead in prime drives and small air conditioning is above all of importance. There are also co-operations with US and Canadian companies. In the latter case the focus is above all on fuel cells and related high tech components. In these technologies US companies get a stimulus from the aerospace and defence industries.

5.5.3 Procurement strategies

The manufacturing strategies pursued by companies of the GAS-M are different. There are firms with a high in-house production depth whereas others focus on the assemblage and have outsourced much of the production process. To a certain extent this different behaviour can be explained by a company's legacy. Integrated conglomerates and groups with a stake in metal industries often command a wide range of product areas. They link in affiliated firms and production sites for the manufacture of gas appliances. This does

not mean that there is only one production location or a few locations in a certain area. This might have been the case in past days. Today even companies with a high in-house production exploit the advantages of the international division of labour. However, these firms prefer the manufacture of intermediary products in own production facilities abroad in regions with comparative advantages. Therefore the regional distribution of the production network of integrated conglomerates and groups in principal does not differ from the regional distribution of companies that prefer outsourcing instead of won production.

The production of GA requires certain key components, such as controls, burners and heat exchangers. There are few companies in the market that manufacture these parts for their own needs, but total supply is dominated by specialized manufacturers who are on the leading edge of product and process technology. They manufacture these components in big quantities and exploit economies-of-scale and deliver it to most of the GA-manufacturers.

For some kinds of parts and components that are procured from European suppliers the GA-manufacturers do not know the country of production. This is the case for European brands purchased from European companies with different production location in and outside the EU. This must be taken into account when reading the following paragraphs.

Controls

The market for controls is dominated by a few big manufacturers, Siemens (D), Honeywell (US), with R&D and production in the Netherlands, JohnsonControls (US) with subsidiaries in Germany and SIT La Precisia (It), a specialist in the market for gas appliances.

The control is a key element of heating systems. Its core functions are the control of the combustion process and the safety monitoring system. These features are complex high-tech areas and innovation is R&D intensive. Typically controls are OEM products and procured by the manufacturers of GA for the assemblage of final products. There are only few manufacturers which have invested in the development of own complete controls.

Typically controls are OEM products and procured by the boiler manufacturers due to their requirements. They contain the core functions for the control of the combustion process and safety. However most of the boiler manufacturers pursue their own philosophy on peripheral control features such as the operator interface. There are different approaches and the design of a man-machine dialogue system which can easily be understood serves as a unique selling feature.

Electronic components and indicator units

The growing requirement for an efficient and environmentally friendly use of gas, the growing variety of gas quality and the use of different feedstock for heating and hot water production has led to more complex combustion processes and highly sophisticated GA. As a consequence, more electronic parts, such as probe heads and sensors are contained in the appliances. Cable harnesses are used to link in all components with the control, the actors etc.

Many of these small electronic parts are standardised products and manufactured in large quantities. In this area global sourcing is an issue for the purchasing departments of the GA-manufacturers. Although many of these parts are procured primarily from Germany, France and Italy, imports from China and other Asian countries have become important during this decade.

Other parts such as cable harnesses are customized. Although they are serial products long delivery times and logistic efforts aggravate global sourcing. The production of these parts is outsourced to southern European countries and the new Member States, in particular on the Balkans. Even Northern Africa is a region of origin. This regional sourcing pattern is similar to the automotive industry.

Indicator units, such as manometer, thermometers etc. are procured from low-wage countries. There are some suppliers in Poland, Bulgaria and Romania, small units, spin-offs of the former state-owned conglomerates.

Burners and primary heat exchangers

The combustion process is carried out by the burner. Its technology is of key importance for an efficient and environmentally friendly burning of the feedstock. Most of the bigger companies of the GAS manufacture burners in-house. However, there are companies specializing in the supply of these components. They do not only manufacture these intermediary products, they are also active in R&D. There are long-term co-operations with their clients in the development of new burners and optimizing the combustion process together with primary heat exchangers. Such close relationships are of particular importance for the development of high performance GA, such as latest generation condensing boilers.

The procurement of burners and heat exchangers is more usual among the SMEs than among the OEM-manufacturers of the GAS. They trust in specialized manufacturers and focus more on system integration and the supply of appliances with the infeed of different kind of feedstock and renewables. Some of the independent OEM-companies of the new Member States (not affiliated to companies from the old Member States) procure burners and heat exchangers from specialized manufacturers.

Other parts and components

The market for pumps is dominated by two manufacturers who equip most of the OEM-manufacturers of the GAS, Grundfoss of Denmark and Wilo of Germany. For servodrives and actuators there exist numerous European companies. However Asian products are also marketed in Europe.

Other parts and components, such as taps, valves, cocks, recuperators etc., are procured from a broad range of manufacturers who traditionally are located in Southern European countries like Portugal, Italy and Spain. With the accession of the new Member States new suppliers tapped into the Single Market. Slovakia has become an attractive location for production and some companies reported investment activities.

Small internal combustion engines are the state of the art drives for micro-cogeneration systems (µCHP). Such engines are manufactured in high numbers in Japan and have been adapted to the use in µCHP. Many European manufacturers of GA import such engines as components for their own µCHP.

5.6 Selected 11 Member States analysis

A detailed investigation in the GAS was carried out for countries that are of special interest due to their size or particularities of the supply side. The four big Member States, Germany, France Italy and the United Kingdom have been selected. The Netherlands turned out to be the sixth biggest country as measured by the production of GA. Denmark is an important supplier of intermediary goods, such as pumps, actuators etc. and hosts the headquarters of two global players in this market. Additionally it was decided to analyse the situation of the GAS in the new Member States in detail. By their size Poland and the Czech Republic have to be considered. Slovenia was selected because it hosts the biggest manufacturer of domestic appliances of the new Member States and has a long-standing experience in the distribution of its products in Western markets. Slovakia was the last country to be selected. Statistical analysis revealed that the GAS is of outstanding importance for Slovakia. This sector has the highest share of the GDP among all Member States. The country has become a powerhouse for the manufacturing of GA.

5.6.1 Czech Republic

The Czech GA sector has shown rapid growth from 1995 till 2007, at 14.1 percent growth per year in absolute terms, and 10.7 percent growth per year in real terms. Growth rates were strong during the 1995-2001 period (8.9 percent per year in real terms), and even higher during the 2001-2007 period (12.5 percent per year in real terms). The Czech Republic is the eleventh biggest producer in real terms accountable for 1.2 percent of total EU the market production. The GAS-M production share of the GDP increased to 0.18 percent in 2007. The Czech GAS-M employment is 31 thousand.

The demand for GAS-M has increased since 2001. In terms of demand, the Czech Republic is not a major player however. The Czech Republic has a small trade surplus, and is export specialised in GAS.

5.6.2 Denmark

The Danish GA sector has shown slow growth between 1995 and 2007, at 4.3 percent growth per year in absolute terms, and 0.6 percent growth per year in real terms. Total production declined between 1995 and 2001 (-0.1 percent per year in real terms), and saw some growth during the 2001-2007 period (1.4 percent per year in real terms). Denmark is the tenth largest producer in real terms at 1.7 percent of EU market production. The GAS-M production share of the GDP increased to 0.12 percent in 2007. The Danish GAS-M employment is 11 thousand.

Market trends and companies' behaviour

The demand for GAS-M has increased since 1995. However, in terms of total GA demand, Denmark is only a minor country. The country has a small trade surplus, but is not export specialised in GAS. However, two important companies with global manufacturing and distribution networks are located in Denmark. They have specialized in standardized parts and components for the assemblage of GA. Quality and state of technology is among the most advanced. The companies' behaviour is typical for the Danish economy. There are several other manufacturers in this small, high wage country that are global players in specific market segments. High tech, standardized products and efficient production processes enable these companies to stay in an internationally contested market.

Manufacturers of HVAC

Danfoss is a family-owned, globally active company. It runs about 70 factories in 25 countries. The company is well-known for its thermostats, but it manufactures a broad range of fittings for appliances among them GA, such as heat exchangers, ball valves, pressure and flow controllers, safety valves and electronic controls. In 2007, the net turnover was DKK 27,127 million.

With an annual production of 10 million pump units, Grundfos is one of the world's leading pump manufacturers, covering approximately 50 per cent of the world market for these pumps. In addition to pumps, Grundfos manufactures electric motors for the pumps and has a considerable production of electric motors for separate marketing. Furthermore, Grundfos develops and sells state-of-the-art electronics for pump controls and pump systems. The Grundfos Group is represented by 58 companies in 43 countries. In addition, Grundfos products are marketed by distributors in a large number of countries. Grundfos was established in 1945 by the late Poul Due Jensen. The Poul Due Jensen Foundation was established as a self-governing institution in 1975. Today, the foundation owns about 85 per cent and the founder's family the remaining 15 per cent of shares in Grundfos Holding AG. The aim of the foundation is to consolidate and expand the economic basis of the Grundfos Group. The capital and the profits of the foundation are to be utilised solely for the aim of the foundation that is the profits are to be re-invested in the Grundfos companies. Grundfos Holding AG is the majority shareholder in all Grundfos companies. There are approx. 18,000 employees worldwide of which 5,000 work in Denmark. In 2007 the net turnover was DKK 16,814 million.

5.6.3 France

Overview of the French GAS

The French GA sector has shown steady growth from 1995 till 2007, at 8.8 percent growth per year in absolute terms, and 7.6 percent growth per year in real terms. The growth mainly took place during the 1995-2001 period (13.5 percent per year in real terms), and stagnated during the 2001-2007 period. At 14.4 percent of EU market production, France is the fourth largest producer in the EU. The GAS-M production share of the GDP has increased in France, to 0.08 percent in 2007. France's GAS-M employment is 81 thousand. Demand for GA has increased sine 1995. France is now the third biggest EU market and has a trade surplus, but is not particularly specialised in GA export.

Market trends and companies' behaviour

Regarding the stock of gas boilers, 3 millions are from 1996-2000, 2.5 millions from 2001-2005, 2 millions from 1991-1995, and half a million from before 1990. Boilers operating with low temperatures were introduced from the year 2000 onwards, condensation boilers from 2004 onwards and the combination of condensation boiler and solar thermal from 2006 onwards. The market for heat pumps is also developing. Condensation boilers are currently a common choice for new installations. Three main factors affected the developments of these technologies: efforts from European manufacturers to expand into the French market; tax rebate (credit) schemes from the years 2004/2005; and building regulation, for new buildings (RT 2000, RT 2005 and the forthcoming RT 2012) and for existing buildings (RT 2007). Micro-cogeneration units are expected to be marketed in the near future.

Most gas appliances manufacturers are SMEs. There are only a few large companies in this field. Manufacturers of large diffusion appliances (domestic cookers, leisure appliances, boilers and water-heaters) are mostly trying to cover most of the European market with a large product offer even if some manufacturers might have particular market approaches with specific products. Small manufacturers of specific gas appliances (professional cookers, leisure appliances etc.) may often have a limited market (national or limited to bordering countries) and are generally focused on a limited set of products.

Parts and components of gas appliances come from the domestic and EU-15 markets. In addition, sourcing for commercial and domestic water heaters and boilers include the candidate countries (Croatia, Former Yugoslav Republic of Macedonia and Turkey). Sourcing for domestic cooking and heaters as well as leisure appliances also include the new Member States (EU-12). Furthermore, the sourcing area also includes non-EU countries for domestic heaters, leisure appliances (Asia) and professional cooking (Asia, USA). Sourcing strategies are mainly based on labour costs, which have led to a shift of manufacturing to Eastern Europe, as well as lower quality and safety levels, according to the stakeholders.

Manufacturers of HVAC

De Dietrich Thermique, leader on the condensation boiler market, offers a wide range of space heating solutions, based on fossil fuels, solar and heat pumps. The company has a total of 2, 000 employees (in France and abroad) and a turnover of over €400 millions. De Dietrich Thermique has five production sites, of which one is located in The Netherlands (condensation boilers). In 2004, De Dietrich Thermique and Remeha joined forces with the ambition to become one of the top five European heating manufacturers. The group sold over 250, 000 boilers in 2007, of which two thirds were condensation boilers. The group is present in over 50 countries and has either a sale or representation office in Germany, Poland, Spain, Ukraine, China and Russia.

The company Saunier Duval which is over 100 years old and is now a brand of the Vaillant Group, is the number in the French heating and hot water appliances market. Its French production site supplies around 400, 000 wall boilers and 65, 000 water heaters per year. The company started to be active on the international market in the 1970s, setting up subsidiaries in Belgium, the UK, Romania, etc. In 2001, after being part of the

English group Hepworth PLC, Saunier Duval joins the Vaillant Group and now offers both the Saunier Duval and Vaillant brands. Saunier Duval now operates in France, Italy, Spain, Belgium, Poland, Hungary, Ukraine and China.

The Swedish company Enertech limited is present in France via Zaegel Held France and Bentone[31] France (burners, part of Enetech AB Sverige).

Manufacturers of domestic appliances

FagorBrandt is the number one in the French market for electric household equipment, with 17.5% of market share and €903 million of turnover in 2007. The company has 4, 100 employees globally and 5 production sites, of which one is located in Italy. The production site located in Orléans, France, produces among others kitchen ranges (stove) and ovens. The group's brands are Fagor, De Dietrich (both pan-European brands), Brandt, Vedette, Sauter (French market) and Ocean Singiorgio (Italy).

5.6.4 Germany

Overview of the German GAS

Calculated in current prices, the average German GAS-M production stagnated between 1995 and 2007. In real terms, it decline at an average annual rate of 1.6 percent. The decline was strongest during the 1995-2001 period (-2.1 percent per year in real terms). This development was induced by the slump of the construction activity after the end of the unification boom. During the 2001-2007 period production declined at -1.0 percent on average in real terms. Germany is the second largest producers in real terms with a share of 16.8 percent of the total EU-27 production. The GAS-M production share of the GDP has decreased in Germany, to 0.08 percent in 2007. The German GAS-M employment is estimated at 177 thousand.

Most of the production sites are located in areas with a focus on metal working industries, in North-Rhine Westphalia and in Baden-Württemberg.

Market trends and companies behaviour

The demand for GA in Germany decreased substantially from 1995 to 2007. Compared to 1995, the demand decreased by approximately 39 percent. The largest drop occurred from 2006 to 2007, when demand decreased by 30 percent in one year. However, in terms of demand, Germany is the fourth largest market in the EU-27. In addition, the export rate more than doubled between 1995 and 2007. The country has a large trade surplus, and the GAS-M is further specialising towards export.

German GAS-M firms are among the biggest in Europe. Their brand names are well-known to consumers, because many of them are manufacturers of final products. Many of these companies pursue market strategies aimed at becoming pan-European players, at least in the more important markets. They appear to benefit from high consumer awareness regarding climate change and energy efficiency issues in their domestic

[31] Bentone is Enertech AB's burner division, with around 360 employees and a turnover of about 66 million Euros. Bentone's annual production is about 140, 000 burners, making it the second biggest manufacturer in Europe in terms of volume. Bentone exports 95 % of its burners' production worldwide in over 55 markets.

market. This provides some impetus for the development of innovative products. Moreover, the GAS-S comprises firms with qualified staff which helps them to develop and introduce advanced and complex products. There are also partnerships in the distribution and services area related to GA that can easily be used for field-testing and customized applications.

There are also SMEs that exploit opportunities in market niches. They are normally specialising in certain products. Many of these companies benefit from the final clients' awareness of climate change and from demand for customized systems adapted to the needs of individual clients.

Manufacturers of HVAC

The German GAS-M comprises some of the biggest European players in the market. Since the late eighties they pursue European growth strategies by the acquisition of smaller competitors. A predominant objective was the purchase of market shares. They acquired brands with high consumer preferences above all in other Member States to better meet specific market requirements. As a result, these players own portfolios that comprise around 5 to 10 different brands. There are numerous smaller players in the market most of them pursue unique features to succeed in competition with their bigger competitors.

Two of these bigger players, Bosch Thermotechnik and Buderus, merged only in 2004 and became the BBT Bosch Thermotechnik GmbH, a limited company, affiliated to the Bosch group one of the biggest industrial conglomerates in Germany, with stakes in many manufacturing industries. BBT owns production sites in many European countries, in Germany, France, Sweden, the Netherlands, Portugal and the Czech Republic. Further manufacturing facilities exist in Turkey and the USA.

The Viessmann group is another of the big leading, family owned manufacturers of HVAC with around 8,600 employees. Its European plants are located in Germany, France, Poland, Hungary, Austria and Switzerland. There are also overseas production sites in Canada and China. The company offers heating equipment for all types of fuel and output ranges from 1.5 kW to 20 MW. It has acquired small competitors that manufacture heating systems using renewables as a feedstock (Mawera (AT (2006) biomass), SATAG (CH, heat pumps), KWT (CH, geothermie, cooling, heat pumps), ess (DE, µCHP)). This is part of a well-known strategy of big firms to acquire technologies by taking over niche manufacturers and start-ups.

The Vaillant Group is the third big German manufacturer of HVAC. It is family owned with almost 12,400 employees. Vaillant is the most important brand. However there is a total of eight technology brands AWB, Bulex (BE), Glow-worm (UK), Hermann (IT), Protherm, Saunier Duval (F, 2001) and Demirdöküm (TUR, 2007). In 2007 the company started production in China.

Wolf GmbH was a spin-off of a big diversified German industrial group with around 130 employees. In 2006 it was taken over by the Swiss Centrotec Sustainable AG, a company specializing in the area of HVAC with a broad range of affiliated companies in

Switzerland, Italy, Germany and the UK. In 2008 the German Kuntschar+Schlüter was acquired, a manufacturer of µCHP to complement the supply of Wolf.

Hoval is a medium-sized company with headquarter in Liechtenstein. It employs around 1,000 employees with production sites in Germany and Austria. The company offers a broad range of HVAC products. However, it is absent from mass markets and focuses on high-quality air conditioning and heating, efficient and multi-feedstock heating systems and the engineering of big customized HVAC systems. Such strategies are typical for smaller firms of the GAS-M that offer OEM-products. They strive for market niches to utilize the advantages of SMEs that are based on flexibility and customization.

Numerous SMEs exist in Germany. Some of them are spin-offs from industrial conglomerates such as MHG Heiztechnik GmbH in course of unbundling strategies that started during the 1980s and have not yet come to an end. This company is owned by the managing partners and a venture capital company. Other companies, such as Weishaupt GmbH (a manufacturer of burners and boilers with a noteworthy stake in the German market), Capito GmbH (small manufacturers with specialized systems) have a longstanding tradition as family-owned firms. Nowadays some of these firms have been brought into holding companies owned by private entrepreneurs and investors.

Manufacturers of domestic appliances

The market for domestic appliances differs from the market for HVAC. Although most of supply is serial products in both market segments. Most of the domestic appliances are sold over the counter and do not pose high requirements as regards installation and easily fit into the living area of buildings. There are only few possibilities to exploit unique product features and specific services. This has an impact on the structure of the supply side and small firms are of minor importance only.

BSH was founded in 1967 as a joint venture between Robert Bosch GmbH, Stuttgart, and Siemens AG, Munich. It has become one of the biggest players in the global domestic appliances market with a worldwide total employment of around 40,000, of which 14,000 in Germany. Global sales in 2007 reached nearly 9 billion EUR. It is of note that most of the output is not in GA. Cookers and baking ovens are the only products among domestic appliances with an appreciable share of appliances run by gas. The joint venture serves the exploitation of economies-of-scale not only in production. However, if it comes to marketing beside the brands Siemens and Bosch other brands and strategies are used to attract different groups of consumers and regional differences in behaviour and culture. The company trusts in Germany as a production location although production facilities have been established worldwide. Most recent activities are investments in Turkey, Russia and China where capacities have been built up not only to serve the domestic markets but also for export to other markets.

The company Miele is one of the few family-held manufacturers in domestic appliances. It is a premium product manufacturer with most of its production in Germany. New capacities have been established in Hungary and in China. Of the global employment of 16,000, 11,000 jobs are located in Germany. Global production networks have become of importance only recently. The primary objective is to tap into the bigger remote markets, but more and more own imports will gain importance. The brand has a good global

reputation and serves the upper market segment not only in Europe but in the US, Japan, Korea and China.

Liebherr is a family hold industrial conglomerate with headquarter in Switzerland. It is well-known for construction machinery but also has a stake in domestic appliances. However, GA are manufactured only for electric refrigerators.

There are some smaller German brands in the market. AEG has bee acquired by Electrolux. In recent years the production in Germany was shut down. Bauknecht is one of the few German brands that have managed to remain independent.

5.6.5 Italy

Overview of the Italian GAS

The Italian GA sector has shown rapid growth from 1995 till 2007, at 12.0 percent growth per year in absolute terms, and 9.2 percent growth per year in real terms. The growth mainly took place during the 1995-2001 period (14.1 percent per year in real terms), and saw some moderation during the 2001-2007 period. Italy is largest producer in real terms at 27.1 percent of EU the market production. The GAS-M production share of the GDP has increased in the Italy, to 0.25 percent in 2007. The Italian GAS-M employment is 103 thousand.

Market trends and companies behaviour

The demand for GAS-M has increased since 1995. In terms of demand, Italy is now the second largest EU market. Italy has a trade surplus, but is not explicitly export specialised in GAS. However, the Italian manufacturers command a strong position not only in final products but also in key components. Burners, heat exchangers and controls are manufactured in big quantities and sold to other manufacturers. This gives the companies an edge in an environment with growing competition from low wage countries and the new Member States. Most of the companies are located in the north of Italy.

Manufacturers of HVAC

Ariston Thermo Group is a mainly family owned company with € 1.2 billion sales in 2008. 14% of sales go to the domestic market, 49% to west Europe, 19% to Eastern Europe and 13% to Asia. In March 2009 the company changed its name from MTS to Ariston Thermo Group. Ariston considers itself the worldwide No. 1 in water heating and No. 4 in Europe in heating with 19 production sites in ten countries and distribution facilities in over 150 countries. The company's three divisions are Heating Comfort, Boilers and components. Ariston spends 3.8% of its total sales for R&D and sees one strategic focus in new technologies like solar systems and heat pumps. The company is one of the important manufacturers of burners. In recent years the company took over Elco, another manufacturer of burners with a noteworthy stake in Germany.

Baltur S.p.A. is a family owned Italian HVAC manufacturer. The product program comprises burners, boilers/thermal units, warm-water heaters, warm air heaters, fan coils and air conditioning appliances.

Ferroli S.p.A is a full-range manufacturer with two million boilers sold in Europe and 1700 Employees. The company comprises four divisions: heating, air conditioning, whirlpool tubs and multi-functioning showers and electric motors.

Giannoni is one of the big manufacturers of burners in Europe. It sees itself as a leader in the production of wall-mounted boiler components. In fact it offers a wide range of components able to satisfy all new technical requirements of modern central heating systems.

Immergas S.p.A. is the leading producer of gas boilers for the Italian market and is also increasingly active in international markets. Presently, Immergas has eight branches in Europe and is represented in 30 countries incl. China. The products manufactured are boilers, water heaters, solar systems, storage tanks and radiators. The headquarters are located in Brescello. The main production facility where many different types of boilers are produced is also located there. The Immergas production department has 15 production lines. Immergas production capacity is about 1,500 boilers per day, or 300,000 boilers per year, with the possibility to exceed 500,000 pieces produced to meet special market demand. The headquarter hosts more than 700 staff.

Riello is a company that is specializing in the area of burners, presumably one of the biggest in Europe. The majority of its products are not under the scope of the GAD, because big industrial installations are one of the firm's most important business areas. Besides a big plant, Riello also runs a R&D facility in Italy and claims to be on the leading edge of technology.

Manufacturers of domestic appliances

The De'Longhi Group is controlled by De'Longhi S.p.A, a company with its registered office in Treviso whose shares are listed on the Italian stock exchange. The Household division operates in the domestic appliances market with products for air cooling and treatment, heating, food preparation and cooking, domestic cleaning and ironing. The products are distributed mainly through the retail channel under the De'Longhi, Kenwood and Ariete trademarks. The Professional division operates in the markets for large thermo-cooling systems (Climaveneta and RC Group), water filled radiators (DL Radiators) and fixed air-conditioning units for the professional channel (Climaveneta Home System). In 2008 the company achieved revenues of € 1.5 billion. The regional structure of sales is as follows: Italy 19.6%, other European countries 56.6%, NAFTA 6.5% and rest of world 17.3%. The Household Division realised about 75% of total sales.

Indesit Company S.p.A. perceives itself as Europe's second and the world's fifth biggest manufacturer of household appliances. The group posted sales of over €3.1 billion in 2008, with a production of approximately 15 million appliances. The company has three product lines: Cooling, Washing and Drying, and Cooking. The Group runs 18 factories, located in Italy, Poland, UK, CIS, Turkey and China. Own commercial branches are in 24 countries worldwide. The group employs over 17,000 people. Indesit, Hotpoint-Ariston and Scholtès are the company's main brands.

5.6.6 Netherlands

Overview of the Dutch GAS

The Dutch GA sector has shown steady growth from 1995 until 2007, at 5.6 percent growth per year in absolute terms, and 2.6 percent growth per year in real terms. The growth mainly took place during the 1995-2001 period (3.6 percent per year in real terms), and saw some stagnation during the 2001-2007 period. The Netherlands is the fifth largest producer, at 5.9 percent of EU the market production. The GAS-M production share of the GDP has increased in the Netherlands, to 0.15 percent in 2007. The Dutch GAS-M employment is 13 thousand. In terms of demand for GAS, it has increased since 1995: the Netherlands is now the sixth EU market. The Netherlands has a trade surplus, and is specialised in GA export.

Market trends and companies behaviour

The Dutch GAS-M is a very dynamic and competitive market. In 2008, as many as 453.000 boilers were sold in the Netherlands, of which approximately 90% are to be seen as gas appliances. Considering the fact that the Netherlands are a relatively small country with a population of ca. 16.5 million and ca. 6.5 millions dwellings (of which 1.5 million have access to city heating and therefore do not rely on gas), the gas appliance market has to be seen as very active and the replacement rate of gas heating systems is very high. The Dutch market for boilers is characterized by rather small heating systems (10 -30 kWh) with a much shorter durability than bigger heating installations, as for example used in many German households. In comparison, within the neighbouring country Germany, with almost five times as many inhabitants, only about 850.000 boilers were sold in the same period of time.

The competition in the Dutch market is quite high, with many international companies competing. Due to this high degree of competition the prices have been declining and margins are rather low. Whereas the unit prices remain more or less stable, but additional services and equipment such as fittings are offered with discounts.

The current financial crisis has not yet affected the Dutch boiler (gas appliance) industry and the industry remains confident that the economic recession is not going to affect the sector heavily. Even though the overall prices slightly decreased, the number of boilers sold increased by 3% in 2008. Furthermore, ca. 3.5 million dwellings in The Netherlands are owned by private housing cooperatives which have to follow an energy efficiency programme introduced by the Dutch government and therefore invest further into new boiler and gas appliance technologies. As a result, approximately 80% of the boilers were sold for retrofitting purposes in 2008. In addition, a governmental energy efficiency programme with the overall value of € 320 million may also give a boost to the gas appliances industry. However, a slight decrease may be observed in the private sector as owners may act more cautious concerning investments and new building projects may be postponed

The mentioned energy efficiency programmes are accompanied by new technological developments. Producers of gas boilers in The Netherlands have entered new fields of technology and strive for sustainable heating systems with a higher radiant energy and better performance. Systems such as heat pumps, solar thermal systems, CHP-systems

and in the future fuel cells, ought to open a new market for the producers of boilers and gas appliances. These mentioned systems are not expected to replace gas boilers but diversify the range of products and business.

Manufacturers of HVAC

The De Dietrich Remeha Group has been introduced as a French/Dutch company in section 5.8.3. The firm includes the brands De Dietrich and Oertli and sales revenues are around € 600 million per annum. The group employs approximately 2300 people across various production and assembly sites in the Netherlands and France. As mentioned in the section on France, one site is located in the Netherlands and four in France. The firm has a diversified product portfolio and offers appliances ranging from gas heating, over solar thermal devices and micro CHP to fuel cells. Further, the firm is active in the R&D and innovation and is an important player in the European market.

ATAG Verwarming Nederland B.V. which is based in the Dutch town of Lichtenvoorde forms part of the ATAG Verwarming Group which is also present in the UK, Germany, Belgium and Italy. The firm is specialised in the production and delivery of high-efficiency technology for central heating and hot water. The product portfolio of ATAG Verwarming includes condensing systems as well as system and combination boilers for the domestic and commercial markets.

Manufacturers of domestic appliances

A Dutch company which also produces and sells domestic appliances, including gas appliances is the above mentioned ATAG Nederland B.V. The company is the result of a merger of the three Dutch firms ETNA, ATAG and Pelgrim in 2000. Before the merger, the individual firms were present on the Dutch market for up to 150 years, in the case of ETNA. The company employs 380 employees in the Netherlands and is also present in a variety of EU countries and Israel. The company focuses on the production of domestic appliances, especially kitchen appliances such as cookers, ovens and heaters.

5.6.7 Poland

Overview of the Polish GAS

The Polish GA sector has shown steady growth from 1995 till 2007, at 19.6 percent per year in absolute terms, and 16.1 percent per year in real terms. Some growth took place during the 1995-2001 period (7.4 percent per year in real terms), but during the 2001-2007 period the GA sector grew explosively, at 25.5 percent per year. Poland is sixth largest producer with 5.3 percent of EU market production. The GAS-M production share of the GDP has increased in Poland, to 0.26 percent in 2007. The Polish GAS-M employment is 37 thousand. The demand for GA has increased sine 2001. Poland has a trade surplus, but is not specialised in GA export.

Market trends and companies' behaviour

The number of households connected to the grid increased from 6.5 millions in the beginning of the 1990s to 7 millions in mid 2000. Future growth is expected to be slower due to a population decline, to around 7.35 millions connected households by the late 2010s. The off-grid gas market is mainly composed of bottled LPG. The gas tank market is small.

Over half of the domestic gas cookers are from the first half of the 1990s, with 20% from the second half and around 10% from the beginning of the 2000s. Around 60% of domestic water heaters date back to the mid-1990s and earlier, 30% to the second half of the 1990s and around 10% to the 2000s. As for domestic boilers, 80% of the stock is from the 1990s, and around 15% from the beginning of the 2000s.

The share of domestic gas cooker in Poland is estimated at around 85% today, compared with around 99% at the beginning of the 1990s. Gas cookers are usually replaced by electrical appliances. At present, an estimated half of boilers are gas boilers, as was the case at the beginning of the 1990s. The gas boiler share grew to 60% around the year 2000 and dropped again. Other boilers are mainly run on coal (from circa 38% to 48%) and the remaining 2% on oil. Factors that may explain these fluctuations are the price differences between coal and gas and cost advantages of electrical boilers over gas boilers in certain situations, such as for 2 or 3 member households.

The number of condensing boilers slowly increased over the last 10 years. Other technologies, such as micro-CHP, fuel cells or heat pumps, are as yet not present in Poland. High costs together with a strong tradition of gas use explain this lack of new technological developments. In addition, there is currently a lack of government schemes to support the gas appliances market. About 20 to 30 years ago, local programmes to stimulate the switch from coal boilers and water heaters to gas feedstock were implemented but fell short of the expected results.

Manufacturers based in Poland seek to cover the entire EU market, as has been the case in the past. Most companies entering the Polish markets have certifications from other EU Member States. Polish SMEs mainly produce leisure appliances for the national market. The leisure appliances market is a niche market. Some cross-border trade may occur, as is for instance the case with Ukraine. SMEs predominantly use available distribution channels.

Domestic cooker, water heaters and boilers manufacturers source parts and components domestically. In addition, cooker manufacturers also get supplies from candidate countries (Croatia, Former republic of Macedonia, Turkey), and water heater and boiler manufacturers from the EU-15 (old Member States). The sourcing strategy takes into account the demand for cheaper and simpler products and the need for product certification. Manufacturers mainly buy from European specialised companies.

Manufacturers of HVAC

No information has been found on large HVAC producers in Poland. However, large German producers, among them the Viessmann group, which also produces in Poland, have national distribution offices in the country.

Manufacturers of domestic appliances

Among the 440 domestic appliance companies operating in Poland, Amica is the largest Polish producer of domestic appliance articles and sells approx. 40% of its production on foreign markets. Amica exports a substantial share of its products to other EU Member States. Especially countries such as Germany, Eastern and South Eastern European

countries, Russia and Scandinavia are important markets for Amica appliances. The company also entered the UK and French markets. Amica has four production facilities in Poland where cookers, hobs, refrigeration products and washing machines are produced and assembled. Both built in and freestanding cooking and refrigeration products are part of the product portfolio.

Furthermore, some of the key players of the world's leading domestic appliances manufacturers have located their factories in Poland. Among those companies which have production facilities in Poland are BSH Bosch und Siemens Hausgeraete GmbH, Indesit Company, Whirlpool, LG, Electrolux and The Fagor Electrodomesticos Group.

5.6.8 Slovakia

Overview of the Slovakian GAS

The Slovakian GAS-M and Slovakian SMEs in particular have shown an increase in turnover of approximately 7% when comparing the 2006 to 2005 turnover figures. While the number of people employed by the sector decreased, the productivity per employee increased. The Slovakian GAS-M production share of overall EU GAS-M production has increased from 0.2% in 1995 to 2.7% in 2007. This increase is also reflected in domestic figures. The GDP share of GAS-M production values in Slovakia has increased from 0.07% in 1995 to 0.93% in 2007. With the GAS-M GDP share being close to 1.0% it presents the highest percentage in this category amongst all EU-27 Member States.

Market trends and companies' behaviour

As depicted above and in previous chapters, the Slovakian GAS-M is experiencing solid growth. Besides the large share of exports, the domestic demand has also increased. As far as the domestic use of HVAC and gas appliances is concerned, national statistics from the Slovak Energy Agency revealed that the market share of gas boilers for heating was 68% in 2003, whereas the market share of gas appliances for hot water was only about 20%.

One market trend in Slovakia, which has already been observed in other selected Member States, is the trend towards energy efficiency and the use of renewable energy sources. A special field of attention is the efficient use of energy. Especially as far as households are concerned contradictory developments are observed by the industry. Better housing conditions (increased living area and new flats) as well as an increased comfort and utilisation of more appliances has increased the use of energy. In Slovakia, the labelling of domestic appliances has started in 2002 in order to improve the public awareness of energy efficient appliances. In addition, Slovakia is part of the so-called ACCESS project which aims to increase the utilisation of solar, thermal and biomass energy within households (also in Bulgaria, the Czech Republic, Hungary and Romania)

Manufacturers of HVAC and domestic appliances

The most significant companies operating in the field of manufacturing, distribution and sale of gas facilities and appliances in Slovakia are ATTACK KZT, Procom, GeminoX, Quadroflex and Thermona Slovakia. These companies have a stake in HVAC. Ardo is one of the few Slovakian companies in the area of domestic appliances. It offers a broad range of gas cookers.

Besides these Slovakian companies, major European companies such as Buderus, Vaillant, Junkers and Viessmann are also manufacturing, distributing and selling gas facilities and appliances in Slovakia. The development of the company Protherm that had a long-term relationship to companies from Western Europe can serve as an example for the broader market developments in Slovakia. In 1995 the company started co-operations with Hepworth and Saunier Duval and in 2003 it became an integrated part of the Vaillant Group and was later merged with the Czech subsidiary of Vaillant.

Protherm mainly produces boilers and gas water heaters. Protherm has gained almost a 50% share in the Slovak market. It exports its products into 24 countries in Europe, Asia and Africa. The most important markets lie in the new Member States and in Eastern Europe. The production capacity had reached 100.000 units per year in 2002, of which 83% were exported (which is coherent with the overall positive trade balance for Slovakia presented in section 5.3.4). By 2008 the production capacity had more than doubled and an output of more than 200.000 units is expected.

The Italian Immergas has tapped into the Eastern European market in the beginning of this decade and runs a subsidiary in Slovakia. Only recently the management decided to relocate production to Slovakia.

5.6.9 Slovenia

The Slovenian GA sector has shown a decline of -11.6 percent per year in absolute terms and -13.5 percent growth per year in real terms from 1995 to 2007. The decline started during the 1995-2001 period (-12.7 percent per year in real terms), and accelerated during the 2001-2007 period (-14.3 percent per year in real terms). Slovenia is one of the smallest producers in real terms at 0 percent of EU market production. The GAS-M production share of the GDP has decreased in the Slovenia, to 0.01 percent in 2007. The Slovenian GAS-M employment is estimated at 5 thousand.

Market trends and companies' behaviour

The demand for GA has decreased since 2001. In terms of demand, Slovenia is not a large player. Slovenia has a small trade deficit, and is not export specialised in GAS. The country has a long-standing tradition in the exports of domestic appliances. The brand name Gorenje is well-known in Europe. However, Slovenia has never been a low-wage country as compared to other countries in the region. The production location suffers from high labour costs, the highest among the new Member States. The big manufacturer is challenged by emerging competitors, above all from Turkey by companies, such as Arcelik, and Beko. However the country is not only the location of one of the big manufacturers of domestic appliances. There are research facilities dedicated to the development and the design of advanced products. Even one of the big German manufacturers runs a research facility in Slovenia.

Manufacturers of domestic appliances

The core business of the Slovenian *Gorenje, d.d.* is production and sales of large domestic appliances (79%). Other divisions are Home interior (4%) and Trade and services (17%). The parent company Gorenje d.d. has 83 subsidiaries, thereof 59 abroad. 90% of sales are exported, of which 56% goes into the EU, 39 to Eastern Europe and 5% in other

countries. The European market share is 4%. The company is represented in 70 countries worldwide, mostly in Europe. 80% of sales occur under own brand name, the remainder is manufactured for big trading companies with own trade marks. Revenues in 2008 were € 1.3 billion, achieved by about 11,400 employees. Gorenje shares are traded on the Ljubljana stock Exchange.

5.6.10 Spain

Overview of the Spanish GAS

The Spanish GA sector has shown a decline from 1995 till 2007, at 0.2 percent growth per year in absolute terms, but a 2.2 percent decline per year in real terms. The sector grew slightly during the 1995-2001 period (0.6 percent per year in real terms), but during the 2001-2007 period the GA sector declined, at 4.9 percent per year. Spain is seventh largest producer responsible for 2.6 percent of EU the market production. The GAS-M production share of the GDP has decreased in Spain, to 0.04 percent in 2007. The Spanish GAS-M employment is 36 thousand. The demand for GA has increased since 2001. Spain has a GA trade deficit, and is not specialised in GAS-M export.

Market trends and companies' behaviour

The below presented market trends for the Spanish market have been derived from an Interview with Mr. Leiva of the company Repsol Butano, a firm that is part of the Repsol group specializing in delivering portable LPG gas units to Spanish households. The company is furthermore active in the production of fittings, installation and maintenance of gas appliances.

Within the Spanish market, the most important products sold for domestic use are gas bottles, boilers, propane tanks and products and fittings for condensation, heating and refrigeration products. Furthermore, some industrial equipment is sold which only has a relatively small share in the total business of Respsol Butano. Repsol's LPG products are usually used in smaller, domestic, appliances.

The clearly defined sectors which are served by Repsol Butano are:

- Domestic: kitchens, heaters, heating devices, lighting and refrigeration.
- Industrial: soft soldering, flame cutting, thermic treatments, agricultural heating, etc.
- Automation: lift trucks etc.

As far as market growth is concerned, new products for refrigeration are believed to become a promising sector of the Spanish market.

A lot of research is done in technological developments for the LPG and natural gas supply, regarding distribution, sales and end-use, both in the household and commercial and industrial sectors.
Research and development generally focuses on three lines;

- Quality improvement of gas (LPG and natural gas) as well as installations – including technical support for installations and gas appliances;
- New applications for LPG and natural gas, especially in the area of air conditioning which aim to increase energy efficiency and decrease GHG emissions
- Distribution of products

Repsol Butano does not deliver LPG or gas via an installed grid on a large scale. The firm has furthermore no independent net of stores but a network of agencies that distribute the products in each Spanish region. The line of distribution includes phone orders and local home sales agencies which follow a fixed route to ensure that their local area is supplied. The last option does not require an order in advance. The home sales agencies are acting independent of Repsol Butano and are associated to the firm via long-term contracts determining the product prices.

In Spain, as a southern European country, the competition is defined by products especially in use for cooling and heating, whereas the market for cooling and refrigeration products is becoming increasingly important. The biggest threat in the area of domestic household appliances are electrical devices replacing LPG- and butane-fired appliances. However, there is no strong competition in the particular market of portable LPG- and Butane products.

The biggest handicap is a missing coherent legislation and labeling which clearly defines standards and product characteristics. The legislation varies according to the autonomous regions and additional laws or rules exist. It is almost necessary to check with the representative of the Ministry of Industry in each region to ascertain which specifications each regional law prescribes. The legislative labyrinth makes effective and efficient market activities as well as further growth rather difficult.

Manufacturers of HVAC

Roca Heating became part of the above mentioned Baxi Group in 2005. Roca Heating is the market leader in residential heating equipment in Spain and Portugal. While the headquarters of Roca Heating are based in Barcelona, the company has a large distribution network across Spain and Portugal. Furthermore, the firm provides installation and assistance services throughout the two mentioned countries.

As far as the product portfolio is concerned, Roca Heating benefited from becoming a member of the Baxi Group. The company now offers a very diverse range of products. Besides the traditional gas heating appliances, solar and photovoltaic systems and appliances play an important role in the product portfolio. The company also invests into R&D and has set up various joint ventures with Spanish gas associations (e.g. Sedigas) and research institutions to further develop mirco-generation technologies for domestic use.

Manufacturers of domestic appliances

The Fagor Electrodomésticos Group is the 5th biggest European electric household equipment group (including gas appliances for cooking), number one in Spain and also in France as FagorBrandt. The Fagor group is run by the Mondragon Corporación Cooperativa and is one of the fastest growing businesses in Spain.

The Fagor Group, with its headquarters based in Spain, is also the fifth largest appliances manufacturer in Europe. The Fagor group, with its worldwide market presence has a highly diversified product portfolio ranging from induction cooking appliances over semiconductors and castings for the automobile industry to numerical control systems and cookware. Fagor exists since 1954 and is currently present in 100 countries. The firm has

employed more than 12,000 people in 16 production and assembly facilities in 17 countries on 3 continents.

5.6.11 United Kingdom

Overview of the British GAS

The UK GA sector has shown steady growth from 1995 till 2007, at 5.5 percent growth per year in absolute terms, and 3.6 percent growth per year in real terms. The growth mainly took place during the 1995-2001 period (8.9 percent per year in real terms), and saw some stagnation during the 2001-2007 period. The UK is second largest producer in real terms at 15.7 percent of EU the market production. The GAS-M production share of the GDP has increased in the UK, to 0.09 percent in 2007. The UK GAS-M employment is 60 thousand. Domestic demand for GA has increased since 1995. The UK is now the largest EU market. The UK has a trade deficit, and is not specialised in GA export.

Market trends and companies' behaviour

In the UK, about 84% of households are connected to the gas grid, or around 22 millions of homes. Gas grid expansion has been slow over the last 10 years and growth is expected to remain so for the next 5 years as the UK has a mature gas market. Where there is no connection to the gas grid other sources of energy are used such as oil and electricity. LPG is comparatively expensive and an increase in the use of LPG in households is therefore not expected.

There are currently around 21 million households' gas boilers supplied by the grid, compared to roughly 12 million before the 1990s, 17.6 million in 2000 and 19 million by 2005. In 2005, there were around 12.5 million domestic gas cookers (hobs and free-standing cookers) and 11.7 million gas fires. In 2005, there were 1.25 millions gas-fired water heaters, of which around 70% were combination boilers. Around 400, 000 boilers were solely water heaters, and roughly 800, 000 were instant water heaters (both single and multiple). Around 70% of boilers sold in the UK are also manufactured in the UK[32].

There has been a steady growth in the boiler market as more and more houses were equipped with central heating. Condensing boilers' share of sold boilers in the UK grew rapidly over the years 2000, from 11% in 2002 to 98% on 2008, for 1.59 millions boilers sold that year. Over 5 millions condensing boilers are now installed in the UK. This rapid growth was first due to government financial incentives in the late 1990s and in the beginning of the 2000s. About a quarter of the market growth is due to these first measures. In 2005, regulation required new boilers to be condensing boilers. The growth for households' cookers and gas fires has been steady.

A new technology that could eventually replace the condensing boiler is expected to be the micro CHP, in 3 to 4 years time, depending on production costs and potential government financial incentives. The introduction of this new technology is expected to follow the same progressive path as the condensing boiler.

[32] However, manufacturing can cover different levels of manufacturing and assembling, a clear idea of which is difficult to obtain.

Another (partial) alternative to water heating is the introduction of thermal solar water heating systems. There are now about 20, 000 new installations a year combining the renewable energy with a traditional boiler system. Thermal solar energy can provide for up to 50 to 60% of the domestic water heating demand of a standard household over a year. The UK government provides financial incentives to offset much of the capital costs as part of a wider objective to increase the use of renewable energy in the UK.

The introduction of heat pumps in the domestic space heating and hot water market is regarded as a way to lower carbon emissions and contribute to the national renewable energy target, in particular in off-grid areas, as the pay back is more favourable. However, there are two potential obstacles to the development of the heat pump market. The first is the cost: unless government incentives are to be developed, current measures are not seen as sufficient to really help the market grow. The second is the carbon saving achieved with a heat pump given the current UK energy sources mix compared with a gas condensing boiler. For now the comparison is in favour of the latter, and is likely to remain so as long as there is no important change in the energy mix.

In the UK in addition to financial incentives from the government, there are communication campaigns trying to influence the behaviour of consumers towards more environmental friendly technologies even if the initial investment may be higher than the conventional alternatives and the payback period longer. So far, these campaigns have not yet translated into visible consumer behaviour changes, unless accompany by financial incentives.

Manufacturers of HVAC

The Baxi Group, whose origins dates back in 1866's England, is now one of Europe's leading heating groups, with a strong hold in mature markets such as the UK, Spain, Italy, France, and Germany, as well as in rapidly developing areas such as Russia, Turkey, Central and Eastern European countries, China and the Middle East. The Baxi Group manufactures high efficiency condensing boilers, but also sells mini combined heat and power (CHP) units and a range of domestic biomass and solid fuel boilers, solar and heat pump products. In addition the Group is developing micro-CHP boilers for domestic installations and is investing in a micro-CHP unit, powered by a fuel cell and small enough for domestic use. The Group employs over 4, 200 people across Europe with a turnover exceeding €1 billion. The main shareholders are presently BC Partners and Electra. The Baxi Group brands include Brötje Heizung, Chappée, Heatrae Sadia, Ideal Standard, Potterton and Baxi Calefaccion SLU.

The current company's structure is the result of the merger in November 2000 of Newmond plc (formerly the European Building Products Division of Williams plc) and Baxi Holdings plc. Since then the Group has expanded through acquisitions and joint ventures such as Baymak (Turkey joint venture), CSE (now Baxi Belgium), SenerTec (Combined Heat and Power), European Fuel Cell (fuel cell technology) and Roca Heating in 2005 (Spain and Portugal). In 2002 the Group set up a division, Baxi International, to manage the Group's international sales, marketing and after-sales activities in over 70 countries. Baxi International seeks to develop market knowledge, distribution networks, brand and product range synergies among the Baxi Group's exporting companies,

possesses direct subsidiaries in Russia, China and the Czech Republic, and is represented in Romania and Argentina.

British Ideal Boilers started in Hull, Yorkshire, in 1905, and rapidly became established as a leading manufacturer of domestic boilers. Ideal Boilers is part of the Caradon building group and is now operating on both the UK commercial and domestic heating markets. Following the new Government legislation for domestic boilers of April 2005, Ideal was well place to offer a full range of condensing boilers that met the new requirements. Ideal leads the market for non-domestic boilers and maintains its position as market leading supplier in the commercial and industrial boiler sector. Ideal has also recently launched a new thermal solar solution to its range of offers.

The Swedish company Enertech limited is present in the UK via Nu-Way England, a burner manufacturer.

Manufacturers of domestic appliances

Cannon is a leading UK based producer of gas cookers and gas fires. The company was founded in 1826 in the British West Midlands and is specialised in the manufacturing of household and general ironmongery. Cannon's history of gas cooker production and gas fire production dates back to 1895. In 1935 the Cannon Iron Foundries became a Public Company. In 1989 Cannon, by then also part of the GEC Group became part of the new division called 'General Domestic Appliances'. Cannon was acquired by the Italian Merloni Elettrodomestici group in 2001.

A further well-known producer of domestic gas appliances is the company Britannia (established 1985) which focuses entirely on the production and distribution of cooking appliances.

UK's AGA Rangemaster Group originates back some 300 years ago in the Midlands. The Group has UK factories making cast iron cookers and market leading range cookers, with the well-known brands - 'Great British Cookers' - AGA, Rayburn, Rangemaster and Falcon. The Groups is composed of three companies: AGA, with AGA, Fired Earth and Waterford Stanley businesses; Rangemaster, with Rangemaster (UK), La Cornue (France), Divertimenti (UK), Heartland (Canada) and Marvel (US); and Grange, oldest cabinetmakers in France today. AGA has a turnover of over £100 million and around 1, 300 employees. It is well known for its cast iron range cooker, manufactured in Telford, UK, and has also the Coalbrookdale site. The Aga, Rayburn and Stanley brands together sell more than 20,000 units per annum of cast iron range and heat storage cookers. Rangemaster specialises in range cooking and has a joint turnover of over £125 million and around 1, 300 employees.

Recently the Group decided to focus on its portfolio of consumer brands and sold home fashions business Domain and its food service businesses in 2007. In 2006 the Group acquired Eloma, the German combi-oven manufacturer from Gustatus and Amana Commercial Microwaves from Whirlpool Corporation. Acquisitions in 2005 include Waterford Stanley, the Irish Cast Iron cooker manufacturer, Divertimenti, the London-based high end kitchenware business and Heartland Appliances, the Ontario based cooker and refrigeration operation. In 2004 Rangemaster launched the Falcon brand on the French domestic market, assisted by the acquisition of the leading French cast iron range

cooker manufacturer. The acquisition of Pavailler gives the Group a 70% share of the French bakery market. William's Refrigeration set up a manufacturing and material sourcing base in China.

5.7 Notified bodies and their role in the sector

Since the mid-eighties, the European Union has made substantial efforts to develop technical harmonisation and conformity assessment in order to ensure the free movement of goods and guarantee a high level of protection of public interest. Legislation has included the definition of mandatory essential requirements, the setting up of appropriate conformity assessment procedures and the introduction of CE marking. The so-called New Approach to technical harmonisation and the Global Approach to conformity assessment have given way to some 25 Directives[33] such as the Gas Appliances Directive. Recently a package of measures, the New Legislative Framework for marketing of products, designed to remove the remaining obstacles to the free circulation of products was adopted in the Council on 23rd June 2008. New measures include the reinforcement of the market surveillance systems for industrial products and alignment with import controls in order to strengthen the role and credibility of CE marking. Another expected outcome is an improvement in trade in goods which do not fall under EU-legislation.

Thus the development of standards and conformity assessments has been essential in supporting efforts towards the free circulation of goods. This section briefly describes the role of standards and notified bodies in general, and gives the list of notified bodies per country, established for the GAD. In addition, further details are given for the eleven selected Member States on notified bodies and national standardisation associations.

5.7.1 Role of notified bodies

Notified bodies are responsible for the assessment of the conformity of products against a European standard. Such standards are developed by a European standard organisation in cooperation with stakeholders, among others organised within national standardisation associations. Notified bodies are designated based on their ability to perform specific conformity assessments, and such ability is periodically reviewed. Manufacturers may refer to a notified body of their choice to ensure their products conform to European legislation.

Standards

Standards are documented, voluntary agreements which establish important criteria for products, services and processes. Standards thus aim to ensure that products and services are fit for their purpose and are comparable and compatible. For a standard to be European, it must also be adopted by one of the three European standards organisations and be publicly available. The European Standards Organisations are the CEN (European Committee for Standardisation), Cenelec (European Committee for Electrotechnical

[33] The three pillars of the New and Global approaches are : Council resolutions of 07-05-1985 (new approach to technical harmonization and standards (85/C 136/01), of 21-12-1989 (global approach to conformity assessment (90/C 10/01), and Council Decision 93/465/EEC concerning the modules for the various phases of the conformity assessment procedures and the rules for the affixing and use of the CE conformity marking, which are intended to be used in the technical harmonization directives. Further information can be found at http://ec.europa.eu/enterprise/newapproach/index_en.htm.

Standardisation) and ETSI (European Telecommunications Standards Institute). The CEN deals with all sectors except the electronics and telecommunication sectors, and as such is responsible for the energy sector.

European standards are developed when an industry, market or public need is identified, such as ensuring the interoperability of a product or service, fair competition, the quality and safety of a product or service, or compliance with European legislation on policies such as the single market. Standards support the New Approach directives in that they help translate the directives' key but broad safety requirements into technical solutions. Such standards are called harmonised standards and are said to give a 'presumption of conformity' with the directive for which they have been written.

CE marking

'CE marking' is a community collective trade mark. CE marking applied to a product means that it conforms to all applicable European legislation. Manufacturers have the responsibility to check whether their product falls under the scope of any European Union legislation. CE marking is obligatory for products falling within the scope of a common framework or New Approach Directive, such as the GAD.

Notified bodies

A notified body is a certification, inspection or testing body designated by the notifying authority of an EU Member State to perform the attestation of conformity of products within the scope of a New Approach Directive. Member States may add requirements for the bodies they notify, such as accreditation, participation in European co-operation, or restrictions on subcontracting. Manufacturers can refer to a notified body of their choice which has been named because of the relevant procedure and the product category concerned.

Conformity assessment refers to a number of techniques (testing, inspection and certification/registration) used to determine if a product, system, process (including design) or a person's competence etc. meets a defined specification. The assessment aims at conformity with a given specification, such as a standard issued by a recognised standards body at national, European or international levels (e.g. BNG, CEN, ISO). Conformity assessment may equally be set out as a legislative requirement or be a specification developed within an industrial sector.

More specifically, a product certification[34] may consist of:

- initial testing of a product combined with assessment of its supplier's quality management system;
- in addition to initial testing, testing of samples from the factory and/or the open market may be performed;
- initial testing and surveillance testing;
- testing of a sample product, so-called type testing.

The type of product certification scheme chosen will depend on the level of risk to the consumer as well as other factors and is subject to European regulation. Very low risk

[34] Source: the ISO website at http://www.iso.org/iso/resources/conformity_assessment/mechanisms_for_performing_conformity_assessment.htm.

products may undergo a one-off type test while high risk products may fall into a scheme involving type testing, management system certification with regular product testing from the factory as well as products taken from the outlets for testing.

The Member States, European Free Trade Association (EFTA) countries (European Economic Area (EEA) members) and other countries with which the EC has concluded Mutual Recognition Agreements (MRAs) and Protocols to the Europe Agreements on Conformity Assessment and Acceptance of Industrial Products (PECAs) have designated a lists of notified bodies established per Directive. The table below gives the current list of notified bodies established for the GAD. All notified bodies can work cross-borders.

Table 5.9 List of Notified Bodies established for the GAD

Country	Notified bodies
Austria	**Österreichische Vereinigung Für Das Gas- Und Wasserfach**
Belgium	**Technigaz a.s.b.l.**
Bulgaria	**"ITEM CONSULT" Ltd. - Departament "Conformity Assessment"** **"Velmar Certification" Ltd.** **"ETALON 99" Ltd.**
Czech Republic	**Strojirensky Zkusebni Ustav s.p.**
Denmark	**Danish institute of fire and security technology** **Dansk gasteknisk center a/s**
Estonia	**Tehnokontrollikeskus Oü (Technical Inspection Centre Ltd)**
Finland	**Sgs Fimko OY**
France	**AFNOR Certification SA** **Certigaz SAS**
Germany	**DVGW CERT GmbH** **TÜV SÜD Product Service GmbH** **Fachausschuss Nahrungs- Und Genussmittel Prüf-und Zertifizierungsstelle im BG-PRÜ**
Greece	**EBETAM S.A. (MIRTEC S.A.)** **Hellenic Electronics Equipment Quality Assurance Center SA**
Hungary	**MBVTI Műszaki Biztonsági Vizsgáló és Tanúsító Intézet Kft.**
Ireland	**National Standards Authority of Ireland (NSAI)**
Italy	**IMQ Istituto Italiano Del Marchio Di Qualità S.P.A.** **IRCM Istituto Di Ricerche E Collaudi Masini S.R.L.** **ANCCP - Agenzia Nazionale Certificazione Componenti E Prodotti SRL** **CPM - Istituto Ricerche Prove Ed Analisi SRL** **Istituto Giordano S.P.A.** **Centro Studi Ed Esperienze Antincendi** **KIWA ITALIA S.P.A.** **Flam Gas Laboratories SRL**
Lithuania	**Lietuvos Energetikos Instituto Siluminiu Irengimu Tyrimo Ir Bandymu Laboratorija**
Netherlands	**GASTEC Certification B.V.**
Poland	**URZAD DOZORU TECHNICZNEGO** **Instytut Nafty I Gazu** **Osrodek Badawczo-Rozwojowy Predom-OBR**

Country	Notified bodies
	Centralny Osrodek Chlodnictwa
Portugal	**Centro De Apoio Tecnológico À Indústria Metalomecânica**
Romania	**S.C. ISCIR CERT S.A**
Slovakia	**Technicky skusobny ustav Piestany s.p.** **Technicka inspekcia a.s.**
Slovenia	**TESTING AND CERTIFICATION LABORATORIES - TCL**
Spain	**ECA - Entidad Colaboradora De La Administracion S.A.** **Asociacion Española De Normalizacion Y Certificacion (AENOR)** **LGAI Technological Center, S. A./Applus** **Ingenieria Y Tecnicas De Calidad S.L.**
Sweden	**SP Sveriges Tekniska Forskningsinstitut AB**
Turkey	**Turkish Standards Institute** **Türk Loydu Vakfi Iktisadi Isletmesi** **Meyer Uluslararası Uygunluk Değerlendirme Hizmetleri Limited Şirketi**
United Kingdom	**BSI Product Services** **GL Industrial Services UK Ltd** **LLOYD'S Register Quality Assurance LTD** **SGS United Kingdom Limited** **INTERTEK Testing & Certification LTD**

Source: NANDO website.

A detailed analysis of the role of Notified Bodies in selected Member States is given below (For the selection of these countries see: Chapter 5.6).

5.7.2 Czech Republic

The Engineering Test Institute (Strojírenský zkušební ústav, s. p.) in Brno is a notified body in the system of conformity assessment to governmental decrees and EC directives as 90/396/EC on appliances burning gaseous fuels (see Tab. 1.1.2). It provides to its customers certificates that are necessary for placing their products on the market in the European Union and other countries like the Russian Federation and Ukraine. It co-operates with other notified bodies in EU countries and has entered into bilateral agreements with numerous partner test laboratories concerning the mutual recognition of test results.

The main activities of the Engineering Test Institute comprise

- conformity assessment of products within the Czech Act No. 22/1997 Coll. and according to EU directives on technical requirements of products
- testing and measurement of chosen technical parameters of product
- certification of products for both the domestic and foreign markets
- technical inspection
- certification activities in the field of the quality management system
- calibration of measurement devices.

The institute was established in 1965 by the former Ministry of Engineering as a state enterprise and service organisation. These days it is subordinated to the Ministry of Industry and Trade of the Czech Republic which is the central state authority responsible for technical standardisation, metrology and testing. The subordinate agency of the Ministry of Industry and Trade is the Czech Office for Standards, Metrology and Testing that is in charge of the co-ordination and methodical control and is acting as notifying body of the Engineering Test institute (Table 5.10).

Table 5.10 List of Czech notified body in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
Strojírenský zkušební ústav, s. p.	1015	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body

5.7.3 Denmark

The Danish Safety Technology Authority (Sikkerhedsstyrelsen) was founded on 1 January 2004. Its focus lies on technological safety aspects relevant to fires, accidents and explosions. Its mission is to set the standard in safety technology in Denmark and to participate in European and international activities.

The Danish Safety Technology Authority is a part of the Danish Ministry of Economic and Business Affairs. The authority was founded by merging the relevant parts of several councils and agencies. The merger of these technical tasks has taken place to ensure greater effectiveness.

The Authority:

- has overall responsibility for gas safety in connection with all types of gas installations and plants.
- administers authorisations with respect to electricity, gas, plumbing and sewage.
- administers general product safety, including safety control of baby products and other consumer products.
- conducts the industrial policy and has the general authoritative responsibility for metrology and accreditation.
- is Notifying Body under the GAD

The Danish Institute of Fire and Security Technology is an appointed Notified Body for the GAD, to conduct CE type-certification of gas appliances (see Tab. 1.1.4). It also conducts unit-verification of individual gas appliances and approves quality systems at gas appliance manufacturers.

The second Notified Body for the GAD and the Boiler Directive is the Danish Gas Technology Centre (DGC). The DGC was established by Denmark's natural gas companies in 1988. It is a public limited company with the following circle of owners (share %):

- DONG Gas Distribution A/S (37,5)
- HNG I/S (20)

- Naturgas Midt-Nord I/S (20)
- Energinet.dk (17)
- KE Bygas A/S (4)
- Norsk Gassenter AS (1,5)

DGC is a specialized consulting and development company in the areas of energy and environment technologies. DGC's main focus area is gas utilization. DGC offers consulting services, research and development, laboratory testing, measurement, demonstration projects, and training. (Table 5.11)

Table 5.11 List of Danish Notified Bodies in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
Danish Institute of Fire and Security Technology	0845	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
Danish Gas Technology Center A/S	1506	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body

5.7.4 France

The French association for standardisation AFNOR (Association Française de Normalisation)[35] is a state-approved organisation under the administrative supervision of the Ministry for Industry and has a membership of approximately 3, 000 companies. In the framework of the decree of 26 January 1984, AFNOR heads the standardisation central system, consisting of 31 sector-based standardisation offices, public authorities and 20,000 experts. AFNOR is the French member of CEN (European Committee for Standardization) and ISO (International Organization for Standardization) and responsible for all tasks assigned to France in this respect.

The French gas association AFG (Association Française du Gaz) has the delegation of authority from AFNOR to run the gas standardisation office, BNG[36] (Bureau de Normalisation du Gaz). The BNG is responsible for:

- producing and maintaining French authoritative standards;
- representing and fostering the French industry interests in European and international standards developments;
- collecting information and monitoring technical developments regarding regulations or standards applicable in the field of gas, in all sectors dealing with the processing, transportation, storage, distribution and uses of gas (ministerial decree of December 10, 1997).

[35] AFNOR website: http://www.afnor.org/portail.asp?Lang=English.
[36] BNG website: http://www.afgaz.fr/uk/page.php?rub=services&id=117.

BNG activities are organised in standardization commissions, lead by two General Commissions: one for gas processing, transportation, storage and distribution (BNG-TTSD) and the other for gas uses (BNG-U). Each standardization commission is in charge of a specific area according to the type of product or activity. The commissions' members are representatives of appliance or equipment manufacturers, gas companies, public authorities and consumers.

The overall objective of the standardization commissions is to develop French positions to be upheld in European or international meetings by designated experts and BNG engineers. Commissions are often organised on the basis of the organisational structure of the CEN or ISO technical committees, themselves sector based. Each commission works autonomously with an expert group on one or several standardization project, either developing a norm or monitoring its development.

In addition, BNG acts as the secretariat for the working groups entrusted with standardisation revisions or developments by the CEN or ISO committees. BNG also acts as the secretariat for the European entity covering all the CEN technical committees dealing with gas use, the Forum Gas Utilisation: SFG-U.

BNG thus allows gas industry representatives and professionals to access the various commissions and offers the possibility for them to take part in the development of French, European or international standards. BNG also acts as an information source on French, European and international standards, as well as on the changes and innovations in the standardization. BNG further offers technical comments on a standard or a standard initiative.

AFNOR has a subsidiary called AFNOR Certification. In addition, AFG and AFNOR jointly own a certification company called CERTIGAZ SAS. CERTIGAZ provides certification for all gas related products and services and acts as a notified body for CE marking. It also provides conformity assessment related to gas and other energies, and the development and operation of NF[37] and ATG marking in the field of gas, under the mandate of AFNOR Certification and AFG respectively. CERTIGAZ is a member of BNG and other European standardisation and certification bodies and coordinates a wide network of testing laboratories, auditors and partners to deliver its services. The French notifying authority is the Direction générale de la prévention des risques - Bureau de la sécurité des équipements industriels, part of the Ministry of Industry.

[37] The NF marking is a collective certification marking. Please see http://www.marque-nf.com/pages.asp?ref=quest_ce_que_nf&Lang=English for further details.

Table 5.12 List of French notified bodies in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
AFNOR Certification SA (BNG)	0049	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
CERTIGAZ SAS	1312	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body

Source[38]: List of bodies notified under directive 90/396/EEC.

5.7.5 Germany

In Germany there are three notified bodies in charge of certifying that a new gas appliance envisaged for production, meets the provisions of the GAD (see Table 5.13):

The TÜV SÜD Product Service GmbH is responsible for the examination of camping stoves and other gas fuelled camping equipment. Other gas appliances are certified by the DVGW CERT GmbH.

The TÜV SÜD Product service GmbH is a subsidiary of TÜV SÜD AG. The corporation was established in 1866 by boiler operators as a private-sector regulatory body with the business objective of "protecting man, the environment and property against the adverse effects of technology" in the industrial centres of the German Länder Baden, Württemberg, Bavaria, Hesse and Saxony. Gradually an expansion of areas of activity parallel to technological progress and internationalisation within the EU, in the USA and in the Far East has taken place. The parent entity of the Group is TÜV SÜD e.V, Mannheim. TÜV SÜD e.V. has transferred its share rights in TÜV SÜD AG to the independent shareholders' committee TÜV SÜD Gesellschafterausschuss GbR, in order to ensure that the non-profit status of the registered association TÜV SÜD e.V. according to its standing rules is maintained when fulfilling its duties.

The DVGW CERT GmbH is a specialist certifier for the energy and water sector. DVGW Technical standards and Codes of Practice are integrated in the work of the company. From the beginning DVGW CERT has contributed to the development and regulations as part of the harmonization of the European single market. The DVGW Certification Body – the name under which the DVGW CERT GmbH previously operated – got early accreditation and registration as a Notified Body according to the EC GAD.

DVGW CERT is a subsidiary of DVGW e.V. (German Technical and Scientific Association for gas and water - registered). Since 1859 the non-profit association has been providing technical and scientific support to the German gas and water industry, especially from the perspective of network operators. Today the activities of the DVGW focus on safety, hygiene and environmental protection, taking also efficiency into consideration.

[38] Source for all notified bodies tables: List of bodies notified under directive 90/396/EEC Appliances burning gaseous fuels, available at http://ec.europa.eu/enterprise/newapproach/nando/index.cfm?fuseaction=directive.main (last update done on 09/03/2009).

As a technical standardisation organization, the DVGW supports technological development in its sector. The technical standards of the DVGW lay the foundations for technical self-regulation under the responsibility of the German gas and water industry and run in the European harmonisation of standards. Through its activities, DVGW assists the German administration to fulfil its obligations. The federal legislation outlines general targets for safety and protection and the DVGW undertakes the task of translating the legal guidelines into detailed provisions.

With regard to GAD the "Zentralstelle der Länder für Sicherheitstechnik" (Central Office of the Länder for safety engineering) notifies the German certification bodies. The office is assigned to the "Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (Federal Agency for Occupational Safety and Health" as notifying body, which is subordinated to the Federal Ministry for Labour and Social Affairs.

The test and certification body of the Fachausschuss Nahrungs- und Genußmittel of the Berufsgenossenschaft Nahrungsmittel und Gaststätten is incorporated in the central testing organisation 'BG-PRÜFZERT' of German Statutory Accident Insurance. The body has been active for over 60 years in the field of testing food-processing machines as well as packaging machines for their compliance with safety regulations and has been accredited as a testing body by the Zentralstelle der Länder für Sicherheitstechnik (ZLS). This work is in line with the fundamental prevention mandate of the Berufsgenossenschaften as statutory accident insurance institutions.

Table 5.13: List of German Notified Bodies in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
DVGW CERT GmbH	0085	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
TÜV SÜD Product Service GmbH	0123	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
Prüf-und Zertifizierungsstelle des FACHAUSSCHUsses NAHRUNGS- UND GENUßMITTEL im BG-PRÜFZERT	0556	Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body

5.7.6 Italy

The legal responsibility and the competence for the regulation and supervision of the efficient and safe use of gas rest with of the Ministry of Economic Development and the Ministry of Interior. The Ministry of Economic Development is in charge of the long distance transport of gas. In co-operation with the Italian Authority for Electricity and Gas (AEEG) it is responsible for the domestic utilization of gas. The Ministry of Interior is covering gas distribution in communities up to the gas meter. In co-operation with AEEG it works in the areas of gas quality and safety. Within this legal framework notified bodies execute their operational activities for gas appliances.

The Italian Gas Committee (Comitato Italiano Gas, CIG)) was founded in 1953 to promote safety and efficiency in the use of fuel gases for residential and commercial applications. The initiators were gas producers, gas suppliers and gas appliances manufacturers. In 1960 CIG joined the Italian standardization body (Ente Nazionale Italiano die Unificazione, (UNI)) and thereby became the official Italian body for standardisation in the fuel gas sector. On 29 June 1990 the Council of the European Community adopted Directive 90/396/EEC (Gas appliances directive, GAD) concerning the harmonization of legislation on gas appliances in Member States. The task of preparing European standards, complying with the essential requirements in Appendix 1 of the Directive was entrusted to the European Committee for Standardization (CEN). For Italy CIG in its role as UNI representative was assigned to this task.

For the enforcement of provisions for gas appliances 1962 an agreement between CIG and the Italian Quality Mark Institute (IMQ) was concluded. It gave to the latter the rights:

- to manage the IMQ-UNI-CIG Mark;
- to test the conformity of the appliances to UNI-CIG standards;
- to supervise production conformity to UNI - CIG standards of "mark concessionaires" and
- to intervene against incorrect use of the mark.

In 1971 the Italian Law 1083/71 was put into effect which was dedicated for the safe use of fuel gases in domestic appliances39. In 1975 IMQ was appointed by the Ministry for Commerce and Craft to monitor the application of the law by manufacturers, depots and points of sale for gas appliances and accessories. Thereby IMQ is comprehensively involved in ensuring that the manufacture, trade and installation of gas appliances are carried out according to the regulation.

There are numerous notified bodies in Italy which were appointed by national notifying bodies for testing, certifying and conformity assessment of appliances which fall under the GAD (see Table 5.14). Not all notified bodies are active, some only to a very limited extend and some do not issue certificate.

Table 5.14 List of Italian notified bodies in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
IMQ (Istituto Italiano Del Marchio Di Qualità) S.P.A.	0051	As in Annex II, section 1-5 of the GAD	Type-examination Body Quality Assurance Body
IRCM (Istituto Di Ricerche E Collaudi Masini) S.R.L.	0068	As in Annex II, section 1-5 of the GAD	Type-examination Body Quality Assurance Body
ANCCP (Agenzia Nazionale Certificazione	0302	As in Annex II, section 1-5 of the GAD	Type-examination Body Quality Assurance Body

[39] Official Journal of the Italian Republic, no. 46, 20 December 1971.

Componenti E Prodotti) SRL CPM (Istituto Ricerche Prove Ed Analisi) SRL	0398	As in Annex II, section 1-3 and 5 of the GAD	Type-examination Body Quality Assurance Body
Istituto Giordano S.P.A.	0407	As in Annex II, section 1-5 of the GAD	Type-examination Body Quality Assurance Body
Centro Studi Ed Esperienze Antincendi	0469	As in Annex II, section 1 and 6 of the GAD	Type-examination Body
KIWA ITALIA S.P.A.	0694	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
Flam Gas Laboratories SRL	0705	As in Annex II, section 1-5 of the GAD	Type-examination Body Quality Assurance Body

5.7.7 Netherlands

The Netherlands have two notifying authorities for the GAD: the Food and Consumer Product Safety Authority, VWA (Voedsel en Waren Autoriteit) and SZW/ Arbo/P&G. Gastec Certification (part of Kiwa Gas Technology) was designated as the certification body for appliances and fittings under the GAD in 1992. The NEN is the Dutch standardisation body.

Table 5.15 Dutch notified body in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
GASTEC Certification B.V.	0063	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body

The Food and Consumer Product Safety authority (VWA) was set up on 10 July 2002. The VWA is an independent agency in the Ministry of Agriculture, Nature and Food Quality (LNV) and a delivery agency for the Ministry of Health, Welfare and Sport. The VWA controls the whole production chain, from raw materials and processing aids to end products and consumption. It monitors food and consumer products to safeguard public health and welfare. Three main tasks of the VWA can be identified: supervision, risk assessment and risk communication

Kiwa Gastec Certification is part of the Kiwa Gas technology group, which is an independent certification organization, and covers the following activities:

- Inspection;
- Testing;
- Technology;
- Training;
- Consultancy.

KIWA Gastec is partner of CSA International, a global provider for product testing and certification services.

NEN, an abbreviation for Nederlandse Norm, is the Dutch network for standards and regulations. It was set up in 1916 and today supports the development of national and international standards, promotes the application of standards and is the centre of knowledge for standards.

5.7.8 Poland

Poland's notifying authority is the Department of Economic Regulations at the Ministry of Economy. It designated four notified bodies to cover appliances and fittings falling under the scope of the GAD, as described in the following table.

The main activities of the notified body Centralny Osrodek Chlodnictwa (Refrigeration Research and Development Center) include experimental testing and attestation of selected equipment, certification and technical approvals, as well as the diffusion of scientific-technical and standardization information. Centralny Osrodek Chlodnictwa also does research and development for selected appliances, perform studies, development, design and manufacturing of refrigerating systems, units, and other appliances.

Table 5.16 List of Polish notified bodies in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
Centralny Osrodek Chlodnictwa	1462	As in Annex II, section 1, 5 and 6 of the GAD	Type-examination Body
Instytut Nafty I Gazu	1450	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
Osrodek Badawczo-Rozwojowy Predom-Obr	1451	As in Annex II, section 1- 6 of the GAD	Type-examination Body Quality Assurance Body
Urzad Dozoru Technicznego	1433	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body

Instytut Nafty i Gazu (Oil and Gas Institute) is the second notified body in Poland. The Institute closely cooperates with the oil-exploration and production companies, gas companies and with the other hydrocarbon-related sectors of industry. The institute undertakes projects on behalf of the Polish Oil and Gas Company and the producers of gas appliances, gas equipment, gas apparatus and installations for the gas transmission and distribution grids. The Institute cooperates closely on a number of projects with several research organizations – at home and abroad - including universities and industrial research institutes. Setting standards for the industry is another important function of the Institute, especially related to the oil and gas-fuels quality.

Ośrodek Badawczo-Rozwojowy PREDOM - OBR (PREDOM - OBR Research and Development Center) has been active for forty years and conducts research on the safety, electromagnetic compatibility, energy efficiency, noise, electromagnetic fields influence on people as well as certification and accordance assessment in a variety of fields, including electrical and gas equipment for household use and similar, electrical and gas equipment for trade and catering and components (including electric motors, controllers, transformers, connectors, plugs, sockets, etc.)

The Office of Technical Inspection (UDT) is a Polish inspection body established in order to ensure safety of technical devices and installations. UDT's main tasks are to assess the conformity of technical equipment with relevant regulations and specifications during design, manufacture and service. Responsibilities also include safety and failure analyses as well as distribution of information concerning the problems of technical safety. The Office is a non-profit organization, independent both in its finances and its technical activities.

The Polish national standards body is the Committee for Standardization (PKN), a State Organizational Unit financed by the government. PKN is member of CEN and represents Poland in international standards organizations, participate in their work and fosters national interest abroad regarding standardization. The main responsibilities of this body can be described as follows:

- Assessment of the state of the art and directions of standardization activity,
- Organization and supervision of publishing and dissemination of Polish Standards and other deliverables,
- Approval and withdrawal of Polish Standards and other standardization documents,
- Representation of the Republic of Poland in the international and regional standards organizations, participation in their work and representation of national interest abroad in matters concerning standardization,
- Initiating and organizing work of Technical Committees (KTs),
- Organization and conduct of training, publishing, promotional and informational activities with regard to standardization and related areas,
- Issuing opinions on draft executive acts related to standardization,
- Participation in the national notification system for standards and regulations.

5.7.9 Slovakia

The Notifying Authority in Slovakia is the Slovak Office of Standards, Metrology and Testing. There are two notified bodies for products falling under the GAD in Slovakia, the Technicky skusobny ustav Piestany and the Technicka Inspekcia, as detailed in Table 5.17.

Table 5.17 List of Slovakian Notified Body in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
Technicky skusobny ustav Piestany s.p.	1299	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
Technicka inspekcia a.s.	1354	As in Annex II, section 6	Verification by unit Body

The Technicky skusobny ustav Piestany[40] has a long history that dates back to the 1950s. The Institute was designated as a notified body relative to the GAD in 2004. Today its main services are certification, testing, metrology and other services such as infrared

[40] http://www.tsu.sk/index.php?l=en

inspections and thermo diagnostics or technical standardisation. The Institute cooperates with its counterpart in Germany, Slovenia, Czech Republic, Poland, Ukraine and Belarus Republic on testing and product certification.

The Technicka Inspekcia[41] operates via four regional offices: Bratislava (TIBA), Nitra (TINA), Banská Bystrica (TIBB) and Košice (TIKO). These offices carry out inspection activity in the following areas: pressure, lifting, electrical and gas equipments, machinery and construction documentation. Technicka Inspekcia offers certification services, education and training and conformity assessments.

5.7.10 Slovenia

In Slovenia the Testing and Certification Laboratories (TCL) are the Notified Body with regard to GAD (Tab. 1.1.5). TCL is represented by a group of experts in the field of measurement technology as a scientific discipline.

First testing laboratories were founded in 1970 with the strategy to gain, develop and broaden expert knowledge in the field of:

- Top measurement technology
- Measurement uncertainty
- Traceability
- Repeatability
- Cooperation with foreign institutions

In 1981 the organisation was authorized by the state to issue certificates of conformity for electric household appliances. Close cooperation with industry brought about the foundation of the company TCL Ltd. in 1992, which was then transformed into an institution in 1995. In order to follow the further development and thus also additional requirements connected with product conformity in the world markets, TCL expanded its activity in 1996 to the field of energy efficiency and in 1997 also to the field of domestic cooking appliances burning gas and similar gas appliances for outdoor use. It was the first testing laboratory in Slovenia. In 1997 it acquired the accreditation document (no. L-004) in compliance with SIST EN 45001. In 2002 the accreditation was expanded to SIST EN ISO/IEC 17025. In 2003 the EU commission confirmed TCL as a notified body to establish conformity for the following directives:

- 73/23/EEC (Low voltage directive – LVD) for module A, (art. 8 and 9)
- 90/396/EEC (Gas appliances directive – GAD) for annexes II.1 to II.6.

TCL is notified by the Slovenian Ministry of the Economy.

[41] http://www.tisr.sk/en/

Table 5.18: List of Slovenian Notified Body in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
Testing and Certification Laboratories – TCL	1303	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body

5.7.11 Spain

In Spain the Ministry of Industry and Energy oversees the implementation of the regulatory framework concerning a safe and efficient use of gas. The National Accreditation Entity (Entidad Nacional de Acreditación – ENAC) ensures that the certification and standardization bodies apply internationaly recognized and best practice methods by the means of accreditation in order to ensure international coherence. Following ENAC's accreditation, the Spanish notifying authority Subdirección General de Calidad y Seguridad Industrial recognised four entities as notified bodies for appliances and fittings falling under the GAD scope, as described in the table below.

Table 5.19 List of Spanish notified bodies in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
Asociacion Española De Normalizacion Y Certificacion (AENOR)	0099	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
ECA - Entidad Colaboradora De La Administracion S.A.	0056	As in Annex II, section 1, 2, 5 and 6 of the GAD	Type-examination Body
Ingenieria Y Tecnicas De Calidad S.L.	0844	As in Annex II, section 1, 2, 5 and 6 of the GAD	Type-examination Body
LGAI Technological Center, S. A.	0370	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body

The Spanish association for standardisation and certification (AENOR) is responsible for developing standardisation and certification activities in all industrial and service sectors since 1986 (Royal Decree 1614/1985). AENOR was recognised as a standardisation and certification body in 1995 (Royal Decree 2200/1995 and Industrial Law 21/1992). AENOR also represents Spanish interests at European and international levels. As such AENOR participates in CEN activities[42].

The ECA Bureau Veritas is also a notified body. The two firms ECA Global and Bureau Veritas merged in 2007. The international group is presented in more than 140 countries and is specialized in the inspection, analysis, auditing and certification procedures related to infrastructural systems as well as a variety of industry sectors.

[42] Juan Carlos Lopez-Agui, previously a board member of AENOR, holds the presidency of CEN since January 2007 for a three-year term.

In addition, the company Ingenieria Y Tecnicas De Calidad S.L. has been providing inspection services and quality control all over Spain for the last 20 years. Ingenieria Y Tecnicas De Calidad S.L. has been accredited as an official control organisation (Organsimo de Control) by the ENAC for a variety of products and industry sectors. The services for appliances under the GAD scope include:

- Quality assurance and engineering support
- Product inspection
- Implementation of quality standards
- Implementation and certification of environmental systems

Finally, the firm LGAI Technological Center, S. A. provides a variety of services within many industrial sectors, including the following services related to appliances under the GAD scope:

- Product inspection
- Testing and technical assistance
- Calibration and certification
- Training

5.7.12 United Kingdom

The Secretary of State for Business Enterprise and Regulatory Reform (BERR) has appointed five laboratories/organisations as notified bodies, in accordance with the GAD. The notifying authority is the Department for Business, Enterprise and Regulatory Reform (BERR) - Sustainable Development and Regulation Directorate. The BERR Department publishes the list on its web site[43], as described in Table 5.20. Where the Directive calls for the identification symbol of the notified body to be used with the CE marking, this is represented by a unique distinguishing number for each notified body. Notified bodies, as listed in the following table, provide type-examination of new appliances or fittings and subsequent production monitoring to ensure that the essential requirements of the regulations are met.

[43] http://www.berr.gov.uk/whatwedo/sectors/sustainability/regulations/ecdirect/page47294.html. This list is correct as of 1 August 2008.

Table 5.20 List of UK notified bodies in accordance with the GAD

Name of notified body	Identification number	Procedures	Type of services
GL Industrial Services UK Ltd (formerly Advantica Ltd)	0087	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
BSI Products Services	0086	As in Annex II, section 1-6 of the GAD	Type-examination Body Quality Assurance Body
Intertek Testing & Certification Ltd	0359	As in Annex II, section 1, 2, 5 and 6 of the GAD	Type-examination Body
Lloyd's Register Quality Assurance Limited	0088	As in Annex II, section 3 and 4 of the GAD	Quality Assurance Body
SGS United Kingdom Limited	0120	As in Annex II, section 3 and 4 of the GAD	Quality Assurance Body

BSI Product Services is part of the BSI Group, which provides for:

- the certification of management systems and products;
- product testing;
- private, national and international standards developments;
- training and information on standards and international trade; and
- performance management software solutions.

The company is organised in three divisions: BSI British Standards, BSI Management Systems and BSI Product Services. The latter provides mandatory conformity assessment certifications for CE marking, such as for appliances and fittings falling under the GAD, and caters for voluntary certification schemes.

BSI British Standards is the UK's national standards body[44]. It is a non-profit distributing organization (profits are reinvested into the services it provides). It also works with manufacturing and service industries, businesses, governments and consumers to facilitate the production of British, European and international standards. It represents UK interests in European and international standards organisations. As such it contributes to standards developments within the CEN through its technical committees. BSI is responsible for publishing mandated harmonised standards and any amendments as identically worded British standards[45]. BSI British Standards works closely with the UK government, primarily through the Department for Innovation, University and Skills (DIUS).

[44] BSI was a founder member of the International Organization for Standardization (ISO) in 1946 and of the European equivalent, CEN, and its electro-technical sister organization CENELEC in 1964.

[45] DTI, Guidance Note on the UK Gas Appliances (safety) Regulations (S.I. 1995/1629), URN 07/617, March 2007.

6 Regulatory and framework conditions

6.1 Introduction

The ToR put much emphasis on regulatory and other framework conditions. Therefore in our approach, described in Task 4 of the proposal, these conditions are considered as determinant and explanatory factors for the competitiveness of GAS-M and thus have been taken as a starting point for the analysis. While the development of the sector and its economic performance are regarded as endogenous factors, the impact of the key framework elements on the GAS should be evaluated. This evaluation will provide inputs for the assessment of the sector's competitiveness. In line with the competitiveness concept pursued in this study, the connection of framework elements with the competitiveness grid and a quantitative impact assessment of key drives will lay the foundation for the conclusions on the performance of the sector.

The intuitive review of the framework profile, as designed for all of the competitiveness reports, has led to a framework profile with an initial ranking. It was presented in our proposal. The information gathered during the fieldwork suggests that in particular downstream regulations and long-term energy supply trends play a more prominent role than assumed initially. Table 6.1 contains the revised rankings of the framework profile which will guide the next steps of the study. The most important two framework categories are merged and discussed in Chapter 6.2.

Table 6.1: Ranking of regulatory and framework factors on the GAS's competitiveness

Rank	Regulatory and framework profile
1	Industry specific provisions and downstream regulations
1	Environmental and safety provisions
2	Energy (gas supply characteristics) and environment (efficiency and CO_2 emissions)
2	Physical aspects and infrastructure
2	Energy trends (long-term aspect)
3	Knowledge based development (new sophisticated, efficient technology)
3	Technological change (long-term aspect)
4	Competition policy
4	Labour force and skills (Ability to work with advanced technologies and licensing of installers)
4	Labour market regulation
4	Third market access
5	Access to finance
5	Knowledge (IPR)

The subsequent Chapter 6.3 deals with other framework factors which have been regarded as of importance for the GAS. They are merged into logic groups which have certain characteristics in common. The topic technology will be tackled in Chapter 7.4 and take into account the performance in relation to the innovation in appliances run by other feedstock and electricity. This will serve as a basis for the assessment of the long-term market perspectives of GA. Subchapter 6.3.1 focuses on the distribution channels and discloses major differences between HVAC and domestic appliances. Moreover for HVAC services, such as installation, maintenance and repair are of importance for the final client to derive full advantage from the use of GA as described in Chapter 6.3.2. Subchapter 6.3.3 discusses the access to input markets, the labour market and the access to finance. Both of them are of importance for the further development of the sector. The qualification requirements especially in services grow, above all because o the increasing complexity of the products. In the current global crisis and the meltdown of financial markets companies' funding gets more important. Subchapter 6.3.4 on market access puts foreign market access barriers under consideration. The final chapter 6.4 tackles aspects of the gas supply. This refers not only to private households' access to the grid but also to changes in gas quality caused by the in feed of gas from renewable sources. Long-term trends will be discussed with regard to the strategic outlook in the last chapter.

6.2 Regulatory scheme of the Gas Appliance Sector (GAS)

Until the mid-1980s the abolition of non-tariff barriers within the Single Market was hampered by time-consuming and cumbersome procedures. With regard to the aim of completing the Internal Market until the end of 1992 a new approach to technical harmonization and the use of standards was necessitated.

On 16 July 1984 the Commission adopted a proposal – prepared on the basis of its own conclusions – on standardisation and paved the way for more efficient procedures to abolish barriers to internal trade. Finally the Council Resolution on a new approach to technical harmonization and standards was adopted on 7 May 1985 (Council Resolution (85/C 136/01)).

The Council resolution established a number of fundamental principles for a European standardisation policy:

- the Member States undertake to keep a constant check on the technical regulations which are applied so as to withdraw those which are deemed obsolete or superfluous,
- the Member States ensure the mutual recognition of the results of tests and establish harmonised rules on the operation of certification bodies,
- the Member States agree to early Community consultation where national regulatory proposals or procedures might pose a threat to the smooth operation of the internal market,
- there is a need to extend the "general reference to standards", preferably to European but if necessary national standards, and to define the task of standardisation as the formulation of technical characteristics of products, in particular as regards health protection and safety,
- there is a need to rapidly strengthen the capacity to standardise, preferably at European level and

- the adoption of European standards should be submitted to the European standardisation bodies for approval.

The Council resolution established four fundamental principles for the New Approach:

- legislative harmonisation is limited to essential safety requirements (or other requirements in the general interest) with which products put on the market must conform and can therefore enjoy free movement throughout the Community;
- the task of drawing up technical production specifications is entrusted to organisations competent in industrial standardisation, which take the current stage of technology into account when doing so;
- these technical specifications are not mandatory and maintain their status of voluntary standards;
- the authorities are obliged to recognise that products manufactured in conformity with harmonised standards are presumed to conform to the essential requirements established by the Directive. If the producer does not manufacture in conformity with these standards, he has an obligation to prove that his products conform to the essential requirements.

The concept of harmonized standards plays an outstanding role in the framework of the New Approach Directives. Manufacturers have to ensure the conformity of their products with the essential requirements of the relevant directives. The conformity assessment is facilitated by harmonized standards in the sense that if a product conforms with a harmonised standard, it is presumed to be in conformity with the essential requirements. However, the New Approach does not ban product innovations that are not designed in accordance with harmonized standards. Manufacturers are not obliged to follow the road of harmonised standards to demonstrate the conformity of this product with the essential requirements. They can do it directly by other alternative ways. On 7 May 2003 the Commission issued a Communication to the Council and the European Parliament entitled "Enhancing the Implementation of the New Approach Directives". In its Resolution of 10 November 2003 the Council confirmed the necessity of extending the application of its principles to new areas and recognised the need for a clearer framework for conformity assessment, accreditation and market surveillance. On 13 August 2008 the New Legislative Framework (NLF), the further development of the New Approach for marketing of products, was published in the Official Journal. The framework consists of two complementary pieces of legislation, a Decision and a Regulation.[46]

Decision 768/2008/EC on a common framework for the marketing of products is intended to harmonise specifications regarding definitions, obligations for economic operators, Notified Bodies, conformity assessment procedures, safeguard mechanisms and CE-marking. The Decision addresses legislators and provides a toolbox for use for future legislation. It covers elements already included in existing legislation (e.g. NBs, safeguard clause). Regulation (EC) 765/2008 sets out the requirements for accreditation and market surveillance relating to the marketing of products covers elements not yet included in existing legislation. The Regulation lays down rules on the organisation and operation of accreditation of conformity assessment bodies. It provides a framework for

[46] A third measure of the NLF is Regulation (EC) No 764/2008 laying down procedures relating to the application of certain national technical rules to products lawfully marketed in another Member State.

the market surveillance of products including for controls on products from third countries and lays down general principles of the CE marking. The Regulation is binding and will come into force from 1 January 2010. The provisions of the Decision can be used immediately but to be operational they need to be fed into existing Directives when they are revised. The NLF is a horizontal measure which has the objective of removing the remaining obstacles to free circulation of products and intends an essential improvement for trade in goods between EU Member States.

The *Gas Appliances Directive 90/396/EEC (GAD)* was one of the first directives based on the New Approach and the overall framework conditions for the internal trade of gas appliances (GA) have been improved by this initiative. With regard to GA the Member States are called upon to ensure safety, health and economic use of energy by European law. In order to ensure the functioning of the internal market and the free movement of GA the EU Council in cooperation with the EU Parliament enacted provisions in compliance with Article 95 and Article 194 EC Treaty. The GAD was transposed into national law and has contributed to the free circulation of GA. This EU Directive has proved to be the core legal tool in that product area. However, other European regulations also add to the framework conditions of GA.

To better understand the regulatory framework it is necessary to know that numerous European directives affect the bringing of GA onto the Community market. The Gas Appliance Directive aims at the free circulation of safe gas appliances within the Single Market. Beyond the GAD there are other directives that set requirements on gas appliances. Some of these directives have an impact

- primarily on design and construction of GA dedicated for the European Market.
- Others have an impact above all on the placing of the products on the Single Market and the free circulation.

Expert interviews unveiled that it makes sense to differentiate between both of these interdependencies. The following directives have to be taken into account during construction and design of gas appliances:

- *Electro-Magnetic Compatibility Directive 2004/108/EC (EMC)*
- *Pressure Equipment Directive 97/23/EC (PED)*
- *Low Voltage Directive 2006/95/ECC (LVD)*
- *Restriction of the use of certain Hazardous Substances 2002/95/EC (RoHS)*

However in order to put and keep GA in operation other directives become applicable, in particular:

- *Boiler Efficiency Directive 1992/42/EEC (BED)*
- *Construction Products Directive 1989/106/EEC (CPD)*
- *Energy Performance of Buildings Directive 2002/91EC (EPBD)*
- Energy-Using Products Directive 2005/32/EC(EuP)

Above all the legal framework derived from these directives seems to cause many of the drawbacks to the market access of GA.

A very specific impact on the free circulation of GA is due to the *Waste from Electrical and Electronic Equipment 2002/95/EC (WEEE)*. This Directive applies to the more advanced GA which contain electronics: primarily controls, sensors etc. For such

appliances the provisions of the WEEE have to be applied. This means that before bringing a GA – as far as it is in the scope of the directive - onto a Member State's market, the manufacturer or importer has to set-up a waste management system.

6.2.1 Essential aspects of directives of importance for the GAS

Gas Appliance Directive (GAD)

With regard to GA the "Council Directive of 29 June 1990 on the approximation of the laws of the Member States relating to appliances burning gaseous fuels (90/396/EEC)", the so called *Gas Appliance Directive (GAD)*, was one of the first New Approach directives. The scope of the GAD is restricted to appliances burning gaseous fuels used for cooking, heating, hot water production, refrigeration, lighting and washing, i.e. The GAD covers mainly common consumer and commercial products. So-called fittings are also covered. This term comprises controls, sensors, and other parts and components necessary for an economic and efficient use of gaseous fuel. Appliances specifically designed for the use in industrial processes carried out on industrial premises are excluded.

The essential requirements that an appliance must meet when it is placed on the Community market are laid down in the GAD. The Directive does not indicate how these requirements must be met, thus leaving manufacturers to make decisions about the most appropriate technical solution. This gives room for the emergence of innovative GA which are based on new technologies on the Community market. In order to facilitate market access, harmonized standards (cited in the Official Journal) provide the presumption of conformity with the Directive's essential requirements. Using harmonized standards is voluntary. (For a list of the latest harmonized standards of relevance for GA see Annex B) The GAD has provided a well accepted legal framework which has much contributed to the free circulation of the products in question.

Interviewees reported that – with the exception of Belgium – no formal market surveillance exists. However, similar to other product markets the manufacturers of gas appliances keep an eye on competing products and in case of non-conformity will react immediately. No problems were reported throughout the fieldwork.

The Boiler Efficiency Directive (BED)

The *Boiler Efficiency Directive 92/42/EEC* (BED) aims at the efficiency of new hot-water boilers fired with liquid or gaseous fuels. According to the Directive, boilers must comply with specified efficiency requirements.

Table 6.2 Categorization of boilers by the Boiler Efficiency Directive

Type of boiler	Range of power output	Efficiency at rated output		Efficiency at part load	
	kW	Average boiler-water temperature (in °C)	Efficiency requirement expressed (in %)	Average boiler-water temperature (in °C)	Efficiency requirement expressed (in %)
Standard boilers	4 to 400	70	≥ 84 + 2 logPn	≥ 50	≥ 80 + 3 logPn
Low-temperature boilers [a)]	4 to 400	70	≥ 87,5 + 1,5 logPn	40	≥ 87,5 + 1,5 logPn
Gas condensing boilers	4 to 400	70	≥ 91 + 1 logPn	30 [b)]	≥ 97 + 1 logPn

a) Including condensing boilers using liquid fuels; - b) Temperature of boiler water-supply.

The Directive constitutes an implementing measure within the meaning of Article 15 of Directive 2005/32/EC (6 July 2005) establishing a framework for the setting of eco-design requirements of energy-using products. (see below)

The Construction Products Directive (CPD)

The *Construction Products Directive 89/106/EEC (CPD)* applies to construction products which are used for the permanent incorporation in buildings or civil engineering works. The products must allow construction works to meet the requirements defined in Annex 1 of the Directive,

- Mechanical resistance and stability,
- Safety in case of fire,
- Hygiene, health and the environment,
- Safety in use,
- Protection against noise,
- Energy economy and heat retention,

provided that the works are subject to regulations containing such requirements.

The scope of the CPD has been broadly defined and therefore comprises a wide range of different products. Thus the CPD is very special amongst the New Approach directives because the essential requirements apply to works and not to products. It can even be said that it does not follow the "New Approach" at all. Due to the specific approach of the Directive, its scope is not clear-cut and a grey area exists in which it is questionable if a specific product falls under the CPD or not. However, the already available Harmonized European Standards (hEN) and European Technical Approvals (ETA) concern building products, most of them traded as commodities, which are indisputably within the scope of the Directive.

The CPD acknowledges regional differences in climate, geography, protection levels and way of life (Art. 3.2).[47] For this reason, the CPD allows Member States to set up different requirements of performance for the use of products, in order to reflect these different conditions. As a consequence the objective of the CPD – the free circulation of construction products – is not achieved through the harmonisation of products but through the harmonisation of the methods of evaluating their performance. All European manufacturers use the same methods (harmonised standards) and all Member States recognise them.

For certain construction products neither hEN nor ETA is available. For those construction products national assessment methods are applied. Sometimes even regional or local authorities create their own regimes. In theory, the concept of mutual recognition laid down in the White Paper on Completing the Internal Market, approved by the European Council in 1985, could be used as a tool for the free circulation of construction products.[48] As outlined in the preamble of the CPD, however, the diversity of national standards and marks constitute a high technical barrier to trade for construction products and mutual recognition and does not generally work for construction products.

Energy Performance of Buildings Directive (EPBD)

The *Energy Performance of Buildings Directive 2002/917EC (EPBD)* is based on Article 6 of the EC Treaty. Accordingly, environmental protection has to be integrated into the definition and implementation of Community policies and actions. Article 174 of the Treaty refers to the prudent and rational utilisation of natural resources. It includes natural and liquefied gas, which are, among other fossil fuels, the leading sources of carbon dioxide emissions. The Directive cites Council Directive 93/76/EEC to limit carbon dioxide emissions by improving energy efficiency (SAVE). However, the Council also considers it necessary to have a complementary legal instrument to lay down more concrete actions taking into account potential energy savings and the large differences between Member States' efforts in this field. Yet another argument for the necessity of the EPBD is also provided by the "Green Paper – Towards a European Strategy for the Security of Energy Supply".

The objective of the EPBD is to set up basic requirements for energy consumption in the EU and establish assessment criteria for energy efficiency in buildings. The directive lays down requirements regarding:

- A general framework for a methodology of calculation of the energy performance of buildings,
- The application of minimum requirements on the energy performance of buildings,
- The energy certification of buildings, and
- A regime of boiler inspections at regular intervals and in addition an assessment of the heating installations with boilers of more than 15 years of age.

Member States shall apply a methodology, at national or regional level, to be used for the calculation of the energy performance. Hereby it is acknowledged that there are major differences among the Member States with regard to the building stock and construction

[47] Construction Products Directive, Guidance Paper E, Levels and Classes in the Construction Products Directive, Revision Sep 2002. http://www.lnec.pt/qpe/marcacao/outros_docs/gp_e.pdf

[48] White Paper from the Commission to the European Council, Completing the Internal Market, Milan 28 - 29 May 1985, p. 22.

works which have an impact on the state and the evolution of energy efficiency. One of the objectives of the recasting of the EPBD is to reduce national differences and – in the long run –establish a common system for the assessment of energy efficiency. However, the draft of the Directive mentions a comparative methodology which implicitly means that in the future national differences will be accepted.[49] A more recent investigation in the possibilities to harmonize energy performance assessment procedures indicates that, even between countries which share a similar climate, there are considerable differences in the building stock. Hence it will be difficult to compare energy performance.[50]

As a consequence there are different regulatory framework conditions between Member States which are of importance for GA. These have an impact on the assessment of the energy performance not only concerning the building in which a GA will be installed but also to the calculation method applied in a certain Member State.[51]

Energy-Using Products Directive (EuP)

In 2005 the European Parliament and the Council passed the Framework Directive 2005/32/EC *Ecodesign Requirements for Energy-Using Products (EuP)*.This Directive refers to disparities between the laws or administrative measures adopted by the Member States in relation to the Ecodesign of energy-using products. These disparities can create barriers to trade, distort competition within the community and may thus have a direct impact on the functioning of the internal market. The EuP aims at creating a framework for the application of Community Ecodesign requirements for energy-using products. Subject matter and scope as defined in Article 1 apply to GA. As shown in the EcoBoiler Project, the environmental impact of boilers is of outstanding importance for the climate change and the criteria mentioned in Article 15, §2 are to the point.[52] Therefore, provisions of the BED fall under the EuP regarding Minimum Efficiency Performance Standards (MEEPS) and labelling.

6.2.2 Transposition of directives of relevance for GA into national law

GA are regulated through several EU directives. A large part of these are covered within the tests for CE-marking, following Article 95 EEC Treaty, while others are based on Article 175 of the Treaty. It is in the nature of directives that the transposition into the law of each Member State is of crucial importance. The aims of a directive can be achieved only if the transformation is conducted in a proper style. The differences of national systems of jurisdiction give rise to diverse forms of the implementation of the directives. For placing on the market and putting into service in each country, different legal provisions for GA exist. In many cases the integration of EU directives into national law demands a specific legal procedure which takes into account existing institutions and the legal system.

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[49] See: Directive of the European Parliament and of the Council on the energy performance of buildings (recast); 13 November 2008; http://ec.europa.eu/energy/strategies/2008/doc/2008_11_ser2/buildings_directive_proposal.pdf

[50] Peter D'Herdt, Dirk Van Orshoven, Peter Wouters et al. (Belgian Building Research Institute (BBRI)); Energy performance regulations: small scale comparison between Flanders, the Netherlands, Germany and France – Subreport 4: Some Lessons learned about comparing EP-requirements, 22 Sept. 2008

[51] European Standard EN 15316-4-1 defines three different methods for the calculation of boiler efficiency. Each of these methods requires a national Annex

[52] Van Holsteijn en Kemna (VHK); Eco-design of Boilers (Executive Summary); 30 Sept. 2007; http://www.ecoboiler.org

In view of the transposition of the directives there are differences regarding the type of legal act and the amount of acts in the respective Member States. The GAD was transposed by administrative acts. While most countries carried out the implementation in a single legal act, in Germany the Directive was transposed into two different legal systems. This is due to the German federal system of jurisdiction. Placing GA on the market is ruled on the federal level whereas putting into service is ruled on the regional level. For the same reason Germany has implemented the CPD through two different laws, the Federal Law on Construction Products and the Model Building Code, which is in the framework jurisdiction of the 16 Länder. Also Poland needed a law and an executive order which consists of the implementation rules of the superior law. Due to its complexity, the EPBD was implemented in most Member States in several legal acts. Beside Germany, the United Kingdom has different regional regulatory systems according to its major territories.

Differences also exist with respect to the duration of implementing the directives into national law. Although obligatory deadlines are mentioned in the directives, Member States partly enacted the legal measures afterwards. The actual date of transposition also seems to depend on the kind of directive. The GAD was adopted relatively early in France whereas Germany needed more than twice the time. With the CPD, the differences are not as great due to the fact that the directive is applicable step by step when respective harmonised technical standards are available. The implementation of EPBD lasted about four to six years.

According to representatives of European GA manufacturers and information provided by the Association of the European heating industry, there are some legal and administrative issues on the national level that are causing problems primarily with respect to the aim of §95 of the Treaty with regard to the internal market. In some Member States additional demands are made for putting GA into service.

In Poland §266 of the Polish "Regulation of the minister of infrastructure of 12 April 2002 regarding the technical requirements for buildings and their location" determines: flue pipes must be made of non-flammable materials and should comply with requirements defined by the Polish norm regulating fire testing of chimneys. Polish authorities therefore constantly reject the putting into service of CE-marked appliances that are equipped with plastic pipes although these meet the essential requirements of the GAD and the harmonised CEN standards EN 297, EN 483 and EN 677. These standards are deemed to satisfy the essential requirements of the GAD. The European Commission had expressed its view that the Polish requirements are not touching the GAD as only permissible national building regulations are concerned. These standards seem however not to take into account building regulations of Member States. Therefore, these standards should be examined for their capacity to meet the applicable building requirements in the Member States. However, the boiler including the pipe has been certified under the standards mentioned above. It is questionable if a component (boiler) of a CE marked heating system can be put on the Community market without any additional compliance procedure.

In Germany, the implementation of the GAD is established in two separate frameworks, thus potentially leading to problems in terms of application: The placing on the market is regulated by federal legislation and the putting into service is regulated by the Länder through their respective building regulations ("Landesbauordnung"). These 16 building regulations authorise the putting into operation of an appliance when it is considered "usable", i.e. when the appliance satisfies the requirements of the building regulations. Indeed there is a Model Building Code ("Musterbauordnung") that is meant to harmonize the 16 regional building regulations but it is not necessarily fully ratified by the regional parliaments, thus relevant specifications can differ from the Model Building Code. The requirements which have to be satisfied by GA are recorded in Building Regulation Lists. Several of the interviewed manufacturers mentioned, the German legislation incorporates the threat that the manufacturer of GA must carry out additional costly technical and labelling requirements as a prerequisite for putting GA with a CE mark into service.

6.2.3 Assessment of the EU regulatory scheme

The gas appliance sector (GAS) has been confronted with an extensive regulatory framework. The legal institutions make allowance for pivotal goals of the European Community: the completion of the internal market, the safety of products, the protection of the environment and a prudent and rational usage of natural resources. The use of GA incorporates the risk potential for the physical integrity of people. Accidents can cause considerable damage. Emissions have an impact on the environment. The European Community provides the general framework to reach the objectives by the use of regulations, directives and decisions.

Most important for the framework of GA are directives which have to be transposed into national law. Directives which draw on Article 95 of the EC Treaty - regarding the establishment and the functioning of the Internal Market – are mandatory as to the essential requirements for each Member State. Products which follow harmonized standards must comply with the requirements of the directives in order to ensure a free circulation. Moreover New Approach directives, such as the GAD, provide the opportunity to develop innovative products for the Community Market. However, for safety reasons, third party testing is a necessary prerequisite. Directives with relevance to the GAS and referring to Article 95 are primarily the GAD, BED, LVD, EMC and EuP. Directives which draw on Article 174 EC Treaty concern initiatives for environmental protection. The measures under Article 174 are taken without prejudice of Article 96 (Creation of the Single Market). Moreover, Article 176 refers to protective measures taken under Article 175 and explicitly gives freedom of action for national regulators to maintain or introduce more stringent protective measures. These must be compatible with the treaty and shall be notified to the Commission. This national freedom of action turns out to be problematic for the free circulation of goods. Even if harmonized standards are available, national authorities are allowed to deviate from these specifications. In particular the EPBD is of importance in this respect, as is the WEEE to a lesser extent.

Until now, the GAD and BED have played a major role for the GAS. Scope and objectives of both of them are clear-cut. The GAD is well-founded by several harmonized norms. The requirements can be met by the manufacturers without the need to supply products for different regional regulations. Other directives, however, are also of

relevance for GA, which do not provide those harmonized framework conditions. Problems are caused by overlapping and interferences from different provisions, e.g. the calculation of energy efficiency. Discrepancies between Member States are caused by the transposition into national law. This can have legal reasons, such as the admission of differences in provisions for construction works based on specific techniques and climate, but also on tighter environmental standards. Some directives with a vaguely defined scope, such as the CPD, incorporate the potential of legal disputes.

The transposition of the directives into Member States' law does not generally cause problems. However, activities and attempts of national and regional authorities are reported to circumvent the binding character of European provisions. It was reported that in Germany a supervisory authority for construction products insisted on a separate approval according to the CPD before a CE-marked boiler could be put into operation.

From a manufacturer's point of view GA may be placed on the market and put into operation if the boiler complies with the GAD which is indicated by the CE mark. In fact some national authorities find it disputable if a boiler is within the scope of the CPD. From the point of view of European manufacturers of GA this requirement of German authorities is not in line with current European legal provisions. It does not reflect article 2 No. 3 of the CPD which states that directives subsequent to the CPD shall contain provisions ensuring that these also cover the CPD requirements. According to the Gas Appliance Directive Advisory Committee (GADAC) the GAD has always been regarded as being such a directive and is matching this rule. Consequently, the responsible CEN standardization committee for boilers (TC 109) has been developing the technical standards to meet this request. It seems, nevertheless, that there is still some grey area in this respect that needs to be clarified.

Many of the difficulties disclosed in this chapter concern appliances for heating and hot-water production. Their installation in buildings is accountable for the fact that they come under directives which have construction in their focus. The obstacles to free market access often derive from existing national legal provisions which are within the transposition of European directives into national law.

For domestic appliances the regulatory framework is less challenging. This can be explained by the fact that they are - without any doubt - no construction products. Minor problems have been reported. Flexible hoses are regarded as construction products and national building codes are of importance. This component is an interface between in-house gas grids and domestic appliances. It can be disputable if the scope and the essential requirements of GAD sufficiently cover all the requirements applicable to such a product.

6.2.4 Environmental aspects and energy efficiency of GA

The BED defines mandatory Minimum Energy Efficiency Performance Standards (MEEPS) for products. The EPBD defines minimum standards for the energy performance of buildings. Yet each Member State is free to set its own, stricter standards or it may allow additional labels. One problem for the free circulation of goods is the fact that within the EPBD no common calculation scheme exists which has to be applied by

all Member States. Member States are allowed to create their own calculation methods for their specific requirements. 22 regions exist in Italy with authorities who have the right to fix their own requirements. The 16 Länder of Germany have their Landesbauordnungen and so on.

Hence the boundary conditions for building products set up by EPBD determine the market access for those products. Thus it is possible that even products marked with the CE sign according to European directives may not be put into operation. The coexistence of different regulatory approaches concerning the same products prevents the exploitation of the benefits of economies of scale provided by the Single Market. A single harmonised calculation method with objective parameters would allow for harmonised European wide boundary conditions. From an economic point of view, this is a precondition for a successful implementation of other European measures regarding the Internal Market and to effectively promote market penetration of ecologically advanced products.

With regard to NOx and CO emissions, limit values for boilers have been determined in European harmonized standards. They are mandatory only at the level of some Member States (e.g. Italy). Other Member States have imposed more stringent NOx and CO limits in their type approvals (e. g. NL).

The EuP is a Framework Directive and relevant for boilers and water heaters. The operationalisation of the EuP is to be carried out by implementing measures. Until now, the BED is an implementing measure of the EuP in terms of minimum efficiency for boilers. Currently regulatory bodies have been working on a methodology for a new efficiency calculation. This new procedure is meant to comprise not only boilers but the whole heating system including control fittings, valves, radiators, solar collectors etc. The new implementing measure is to supersede the present BED.

From the view of a consistent regulation scheme one has to clarify the interrelation of EuP and EPBD. The EPBD also follows a system approach as it is directed at entire buildings. However, whereas the EPBD calculates individually for each building, the EUP envisages calculation for standardized cases. Although attempts have been made to align the calculation schemes of EuP and EPBD, practical problems might ensue from the fact that according to Article 95 EC Treaty the CE marking would now be covering entire systems and not only products. Though manufacturers would make heating combinations or packages to be CE-certified, customers could also demand individual systems. Again the calculation according to EPBD will remain and must be carried out as well. Different assessment results may occur.

Moreover, maintaining a system approach under EuP dealing partly or fully with the installation requirements already defined within the EPBD framework would hardly be able to reach the objectives of such an approach. The successful implementation of any EuP measure would depend on harmonised boundary conditions set up by EPBD.

6.2.5 The scope of the GAD

The GAD provides a detailed definition of what is covered by the directive. It comprises appliances run by gas and fittings. Fittings are parts and components necessary for the functioning of GA. These controls, valves sensors etc. have become increasingly important in line with the technological process and requirements from environmental policies, such as a rational use of fossil fuels, lower emissions, energy efficiency and the combined use of gas and renewable energies.

These developments have brought forward holistic approaches for the design of GA. This is reflected in harmonized standards under the GAD with test procedures following a system approach. Low emission, safe and efficient combustion processes need well-defined surrounding conditions. As a result, supply and exhaust evacuation ducts have become subject to test procedures to demonstrate compliance with the GAD.[53] According to point 2 of Annex II to the Directive, the EC type examination certificate must contain amongst others the necessary data for the identification of the approved type. This means that the GAD requires a direct link between the type as described in the EC examination certificate and the GA. As a consequence, a GA certified under the GAD can be put on the market together with its ducts, although they are not explicitly mentioned in the GAD. The investigation of the regulatory framework conditions unveiled some overlapping of directives. One of the most urgent problems reported is the coverage of ducts.

The scope of the CPD comprises all products intended to be incorporated permanently in both buildings and civil engineering works. Obviously this is not a clear-cut definition. It has been used as a justification for another point of view: Gas appliances with ducts (as a kit) must also comply with the national building codes concerning their chimneys. Also the latest draft for a new Construction Products Regulation (CPR) does not change this. It is clear that GA's chimney dismantling would decrease the performance of the work or the dismantling or replacement of the chimney would need "construction operations", see Art 2 No 2.[54] However, from the perspective of the end-user replacing existing GA including its ducts is perceived as "construction operation"

As mentioned in Chapter 6.2.1**,** there are two areas which affect the market access of GA, their free circulation on the Community Market and their putting into operation. While the free circulation has been a success story based on the GAD, the set-up and operation of GA have been hampered by framework conditions which have not yet been harmonized in a satisfying manner by European regulations. This has been accepted by the European Commission on the grounds that markedly different boundary conditions among Member States in climate, construction works etc. demand that national authorities be free to define their own provisions. This can result in additional administrative burden for the manufacturers of gas appliances and has the potential to reduce the so far positive effects of the GAD for the free circulation of GA.

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53 See: Harmonized standard EN 483:1999

54 Commission of the European Communities; Interpretation of CPD in OJEC C 62/1994 of 28 February 1994: "Communication of the Commission with regard to the interpretative documents of the Council Directive 89/106/EEC.

The "system" approach pursued by the GAD and their harmonized standards follow close technological and functional interdependencies of parts and components necessary for a high performance combustion process. From this standpoint it is not satisfactory that, as disclosed during the fieldwork, public authorities argue that parts of certified GA-systems fall under different jurisdiction and in some Member States systems cannot be put into operation with all their subassemblies and parts.

This should be changed in favour of more coherent body of legislation. A clear distinction between the regimes of different directives and their scope would contribute to a better market access. This means that the interface between a building and a gas appliance which can be attached to it has to be properly defined. The interaction of the GAD and the CPD (CPR) will be of major importance in this respect. Safety aspects referred to by the CPD have to be met by flue gas carrying ducts certified under the GAD if they do not dissipate waste gases directly outdoors. Important are the requirements of mandate M/105 that asks minimum distances between the chimney/duct and flammable parts if temperatures can reach 100^{o} C and more. The scope of M/127 is on fire cuts and protects different areas of a building from spreading fire.

The relationship between the GAD- and the CPD-requirements is mentioned in the European norm on gas fired central heating boilers not exceeding 70kW (prEN 483 A4). It also highlights the requirements for separated combustion products evacuation ducts under 5.3.5. The manufacturer of GA is responsible for the evacuation of waste gases without any hazard for health and buildings. This is in particular of importance because with new GA waste gases are exhausted under pressure. However, the requirements are not only set by the European norm on gas fired central heating boilers these ducts have also to fulfil the requirements to chimneys as laid down in EN°1443. Adequate materials have to be used such leak tightness, resistance against humidity and the backflow of burned gases must be excluded.

Theoretically there are two options for a solution to this overlapping:

- The compliance of the complete system with the GAD is carried out in line with prEN 483 A4. The evacuation duct is comprehensively described by the necessary physical parameters that take into account not only aspects on safety and energy efficiency. But this alternative has already been rejected by the Commission.
- Definition of the interface between the GA and the construction by all necessary parameters, such as the diameter, the leak tightness, flow losses.

These options would allow the use of different ducts. They only have to meet those requirements that are of importance for safety and energy efficiency.

Another subject with regard to the scope of the GAD was raised especially by certification bodies. They suggest the incorporation of some gas-fuelled appliances into the scope of the GAD that are commercially applied. They highlight that many appliances not covered by GAD have to be certified in view of safety aspects. This would reduce the workload for companies that design and manufacture such products and the certification bodies who can refer to the GAD. A broad range of products has been mentioned, such as coffee machines with pressures above 105°, wallpaper removal appliances, mobile lighters, crematorium burners and other equipment, not yet being in the scope of the GAD definitions.

6.3 Analysis and assessment of framework areas for the GAS

6.3.1 Distribution channels for gas appliances

The analysis of the distribution channels for gas appliances requires a differentiation between heating and hot-water production on the one hand and other gas appliances on the other hand. Most of them fall under the broad category of domestic appliances, but also portable gas appliances are regarded. The market environments for both of these categories are totally unequal.

Heating and hot water production

Most of theses gas appliances are not plug-in products. They require qualified labour for the installation. This fact provides one explanation for the structure of the distribution channel. Another particularity is due to the fact that for the installation of this kind of gas appliances a broad range of mounting parts, taps, fittings, cocks, valves etc. is necessary.

It is of note that most of the manufacturers of gas appliances also produce appliances for same and similar applications which use other feedstock or electricity. Often, these products are marketed via the same distribution channels.

The manufacturers market by far the most of their gas appliances via wholesalers who serve as a one-stop shop for installers. Only few manufacturers command a comprehensive product programme that is suited to meet all needs for the installation. For the majority of manufacturers and installers the distribution via wholesale is more convenient.

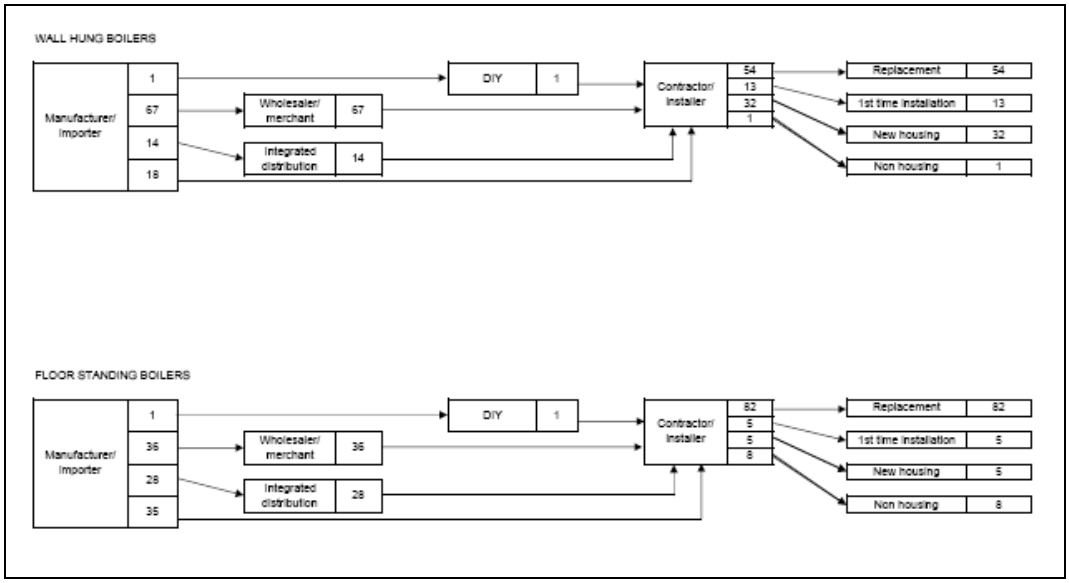
These days the predominant market strategy pursued by companies is to focus on core competencies. Most of the manufacturers of gas appliances do not understand the business with these peripheral parts and components not as their core business. For those manufacturers that offer such a comprehensive product programme it is a legacy. This suggests that wholesale will maintain its important role as a distribution channel. Its share of the total market is at around 60% to 80%. However, the portion varies strongly between the Member States. It is dependent on the specific national situation and the kind of product.

Usually, in their domestic market the manufacturers access the wholesalers directly. In foreign markets they tap the market via importers and own subsidiaries. The foundation of an enterprise is less common. It is carried out above all by the bigger firms, in markets of key importance, where the firm has or strives for a bigger stake.

In some Member States “integrated distribution” is another important sales channel. Its portion is highest in Germany with a double digit share of between 15% and 30%, dependent from the kind of product. Integrated distribution means that manufacturers directly access installers. They provide qualification, logistic support and other services. The installers offer a broad range of services to the final clients, the installation, set-up, maintenance and repair and dependent on the contractual agreements extend warranty. As

an exception to the rule there are HVAC gas appliances installed “do-it-yourself” (DIY) in Germany (Figure 6.1).

Figure 6.1 Distribution channels in Germany

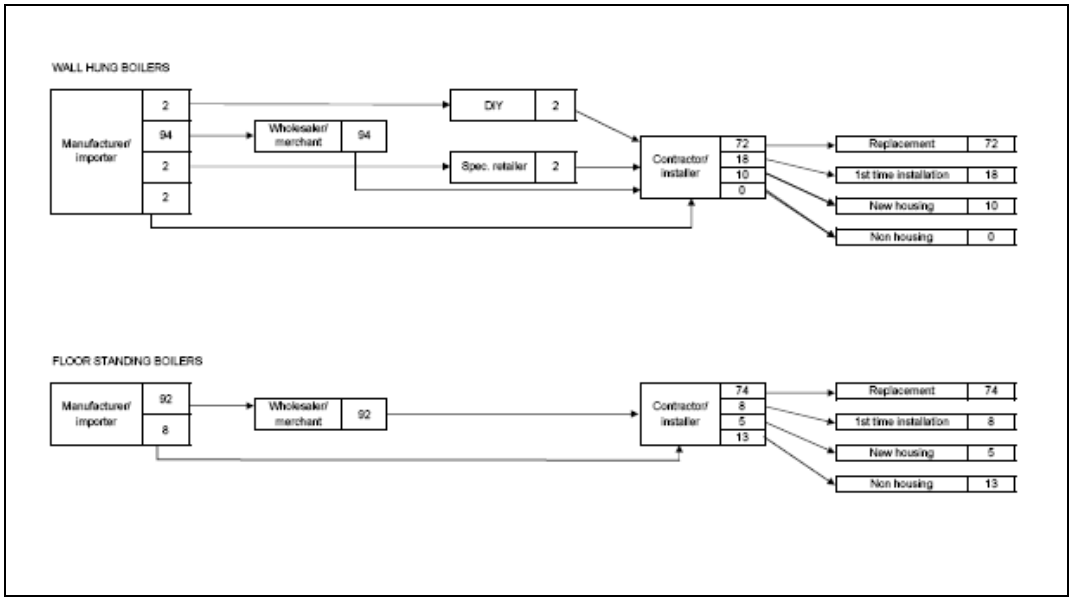


Source: BRG study commissioned by the European Commission June 2006.

Poland is another country where integrated distribution is important, at least to a certain extent.

Property developer, property management, sometimes even utilities are clients to the gas appliance manufacturers. They are subsumed by the term contractor and sometimes exercise purchasing power. In some cases contractors procure gas appliances directly from the manufacturer, but even for them in most cases they directly access wholesalers. In this environment wholesalers are of major importance as it is the case for the United Kingdom (Figure 6.2).

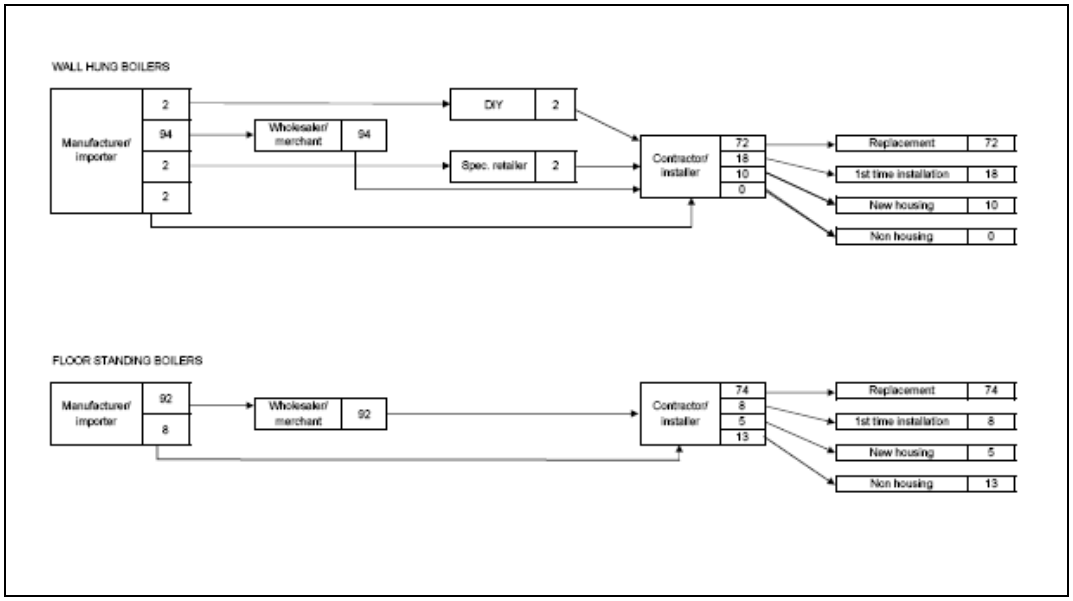
Figure 6.2 Distribution channels in United Kingdom



Source: BRG study commissioned by the European Commission June 2006.

Beside these predominant channels in some countries there are specialized retailers and sometimes even direct sales to final clients. In most countries these channels are of minor importance only. Of the bigger countries only for France direct sales to final clients are noteworthy (Figure 6.3).

Figure 6.3 Distribution channels in France



Source: BRG study commissioned by the European Commission June 2006.

It was reported that the direct sale of gas appliances via non-specialized retailers to final consumers are of importance in some countries, for instance Portugal. This must be perceived as safety risk because it cannot be assured that qualified personnel carries out the installation and the setup.

Domestic appliances

The distribution channels for other gas appliances differ much from heating and hot water production. Among them are products such as outdoor equipment that is purchased directly by private households. Portable cookers, lighting etc. are put into operation without the need for professional installation. These are plug-in products distributed via all channels which directly access the final consumer. Most of these products are dedicated for camping, sports and other leisure time activities.

The market for domestic appliances comprises durable consumer goods that are dedicated above all for cooking, baking, storage of food and beverages, as well as for refrigeration and washing. Most of the manufacturers of such gas appliances also produce appliances which are run by other feedstock or by electricity. Generally speaking the distribution channels are the same. But it has to be taken into account that there are different habits and traditions in the Member States, in particular for gas appliances. This means that their share of all domestic appliance markets differs from country to country. Most widespread are cookers, stoves and ovens. In some regions coffee machines run by gas are common, other gas appliances, such as for washing, drying are rarely found in the market.

In principle two different distribution channels exist for domestic appliances, a one-tier and a two-tier network. In contrast to the market for heating and hot-water production equipment the distribution via wholesalers is of minor importance only. Although, this channel has a longstanding tradition in central Europe its share in Germany is between 10% and 20%. Wholesalers deliver domestic appliances to small and independent retailers. Most of the manufacturers output is directly delivered to independent retailers that are more important in Germany than in many other European countries. Wholesalers' portion in the distribution of domestic appliances does not reach a double digit share in most Member States of the EU.

Usually the final consumers purchase at the retailers. Traditionally specialized shops, retail chains, buying co-operatives, such as Euronics and Expert that bundle the purchasing power of retailers, department stores and hypermarkets, such as Metro, Carrefour, Tesco, Cora, divide most of the market. Specialized chains, such as Saturn and Media Markt, have turned out to be the most aggressive players in the market. They gain market shares, whereas department stores and independent retailers are losing ground. However the traditional retailers yet command more than 60% of the sales to the final consumers in the Single Market. The share of the specialized chains has reached 20% to 25%.

Mail order business and Internet do most of the remaining sales. There is a disadvantage, because consumers prefer to procure bigger appliances in stores, whereas for smaller products non-store shops are accepted. The consumers expect better services for set-up, repair and maintenance from local shops or subsidiaries of retail chains. However in some countries there exists a tradition in mail order businesses that even do their own trade label management for domestic appliances, which also comprise gas appliances. These mail order businesses trust on agreements with local craftsmen and to a certain extent have their own back-offices.

6.3.2 Market environment in gas appliance service markets

Competency requirements and skills for the installation sector

Because of the risks to the public there is common sense that work on gas appliances should only be undertaken by those who have sufficient skills. However, international comparisons show that there are different perceptions how to ensure an appropriate competence level and even within the EU noteworthy differences between Member States exist. Some countries practice a relatively modest approach of regulation other countries have put into effect a comprehensive system of qualification and supervision. There are different instruments that are applied to define admission standards.

One widely applied tool is registration. Subject to registration can be the installation company as a whole, a responsible person within the company or the individual employee. Registration body can be an industry association, a professional organisation or a government authority. Registration can be done without special requirements or based on specific conditions as formal skills or pertinent experiences. If specific requirements are parts of a coherent approval system registration is often the result of a certification process. If a registration scheme exists it can be mandatory or voluntary.

As a proof of expertise formal qualifications can be mandatory. This can be a diploma, a skills' based certificate or another third party assessment of competency. A formal skill record can be sufficient for evidence of appropriate experience. Often minimum time periods of experience are required.

A registered operative might not meet the skill demands in an innovative environment, because the competency of registered workers can be outdated after a couple of years in his profession. It is not ensured by the mere fact of them being registered that they have the qualification to install, repair and carry out maintenance on latest technologies. In highly safety-relevant areas the concept of registration is abolished in favour of licensing. The reason for that is that licensing offers the same benefit as registration in signalling that a person has reached a particular standard but in addition confirms that the competency of a mechanic is on the state of technology within the scope of the licence. In the gas installation sector in Europe licensing systems have not been applied but some countries have implemented periodic assessments.[55] Accredited industry bodies or government agencies re-assess the competency of operatives, in the range of gas work carried out by them, in a formal periodic way.

Besides ensuring qualification of gas workers inspections of gas appliance installations are another way to check quality of work and ensure safety. Inspection or assessment of work, carried out by a gas operative can be executed by an appropriate industry body or a government agency. This may be based on periodic or risk based assessment.

[55] The initiative of the European Heat Pump Association (EHPA) to offer training courses for heat pump installers is an example for the certification of workers in a new and complex technology which in traditional qualification schemes is not foreseen. dhttp://www.ehpa.org/en/themen/thema420.html

Finally language skills are considered important for safeguarding safety of gas installations. To understand, read and speak the national language is essential for handling technical systems and installations. Usually skilled workers are supposed to be able speaking the domestic language. Nevertheless in some countries language skills are explicitly mandatory for becoming a professional worker.

Table 6.3 Regulatory framework for gas appliance services

Countries	Registra-tion	Mandatory formal qualify-cation	Minimum experi-ence	Periodic assess-ment	Ongoing inspection	National language skills
Belgium	voluntary	yes	none	5 years	randomly	mandatory
Czech Republic	mandatory	yes	1 year	5 years	yes	no provisions
Denmark	mandatory	yes	4 years education as fitter	2 years for compa-nies	company sample	mandatory
France	voluntary	no	none	1 year	randomly	mandatory
Germany	mandatory (gas supplier)	no	3,5 years	continu-ing education	none	no provisions
Italy	mandatory	no	3 years	.	.	.
Netherlands	none	no	none	none	none	no provisions
Portugal	mandatory	yes	none	5 years	none	no provisions
Slovakia	state authoriza-tion	apprentice-ship	3 years	none	5 years for open flued appliances	no provisions
Spain	regional administra-tion/ certifica-tion	accredita-tion	none	none	none	no provisions
UK	mandatory	yes	none	5 years	Sample	no provisions

Source: Marcogaz, Ifo Institute

Table 6.3 gives an overview of competency regimes in selected countries. Registration and formal qualification are implemented as alternative or complementary requirements. In the Czech Republic, Denmark, Portugal and the United Kingdom formal qualification is mandatory and a registration is required.

In Denmark gas installing businesses have to be authorised and registered in order to install gas appliances. The Danish Safety Technology Authority (SIK) registers and gives the gas installing company the authorisation based on a third party control of a mandatory Quality system (QS) based on ISO 9001 and education requirements for the person in charge of technical management.

The QS system has to be approved by a third party every 2 years. The educational requirements for the person in charge of technical management include that the person has to be a skilled worker in the area with 4 years training and has to hold a technical academy degree (2 years study).

The quality inspection in Denmark is depending on how much experience the gas installing companies have. There is a 100 percent in situ control for new gas installing companies and a spot check for experienced companies (10-15 percent). The inspection is a requirement from the Danish Safety Technology Authority and is carried out by specially trained inspectors from the gas suppliers.

In the United Kingdom the health and safety law, specifically the 'Gas Safety (Installation and Use) Regulations 1998', require that all gas installing businesses are registered with a UK Government approved body. At present this is the CORGI registration scheme. The body is charged by the Health and Safety Executive (HSE) to maintain a register of competent gas installers in Great Britain, Northern Ireland and the Isle of Man. From 1 April 2009 CORGI will be replaced by a new gas registration scheme, the 'Gas Safety Register'.

The registration scheme in the United Kingdom monitors the people allowed to carry out gas work. It issues each person with an ID card showing their picture and listing their competencies. There is a new entrant's route based on "National Occupational Standards" and a competency re-testing requirement, which has to take place at five yearly intervals for all gas workers. Additionally gas operatives in UK must have a valid certificate, issued under the National Accreditation Certification Scheme (ACS) for individual gas fitting operatives or the Gas Services S/NVQ that has been aligned with ACS. This certificate is awarded by approved assessment centres.

After the installation of gas appliances in the United Kingdom the business and person who carries out the work self certifies their work as compliant. Site based and business based quality control of these businesses and individuals are carried out by CORGI or after 1 April 2009 by 'Gas Safety Register'. It takes place on a routine basis by unannounced inspections and a customer complaint inspection.

For repair, maintenance and service of conduced appliances of more than 24.4 kW Spanish installers need a special accreditation from manufacturers or a certification body.

In Italy registration with the Chamber of Commerce is required. A minimum of three years of experience is sufficient, similarly in Spain, were regional administrative bodies are responsible for certification.

In Belgium and France registration is voluntary. However in Belgium a formal qualification is required. If French installers do not owe a certificate it is mandatory that installations must be checked by a third party organisation before it can be put on gas.

In Belgium, Czech Republic and Denmark formal qualification is required. In Slovakia most mechanics pass through an apprenticeship.

In order to be qualified by the Construction Institute in Portugal it is mandatory that the gas technician is registered in the Energy Entity DGE after having fulfilled requirements such as vocational training and carries out his activity in a gas enterprise also registered in DGE.

In France every three years a voluntary test of approximately 30 questions can be taken to check necessary qualification.

In Germany a gas installing business has to be a standing industry within the meaning of the Crafts and Trades Regulation Code (Handwerksordnung). For this purpose the gas installing businesses must be registered with the Chamber of Crafts of the plumbing and heating trades (Handwerkskammer des Installateur- und Heizungsbauerhandwerks).

German gas installing businesses conclude a contract with a gas supplier and - according to law - have to be listed in an "installer's list" of a gas utility. The German gas suppliers review the eligibility of an installation company on the basis of private law, referring to own standards.

The registration with the installer directory in Germany does not require mandatory formal qualification of gas installers. German gas installers can have the qualification in form of the “Meisterprüfung“ (examination for the master craftsman's certificate). Furthermore the German gas installers must be aware of safety-related knowledge, which is a part of the “Meisterprüfung” (examination for the master craftsman's certificate). In case of failing only this one part (safety and maintenance engineering) one will not be registered. Candidates without the “Meisterprüfung” must pass an extra examination in the ‘safety and maintenance engineering’ (Sicherheits- und Instandhaltungstechnik) in order to be registered with the installer directory.

As a rule, German gas operatives have passed an apprenticeship lasting three years and a half. They pass an official examination by the Chamber of Crafts as Heating, Ventilation and Air Conditioning (HVAC) Mechanic (Anlagenmechaniker, Sanitär-, Heizungs- und Klimatechniker).

The proof whether a gas installer passed the examination of safety and maintenance engineering exam can be provided by expert discussions, references or through participation in the TRGI (Technical rules for gas installations).

Once the gas appliances are installed by the gas installing businesses, the quality inspection is carried out by the German chimney sweep through an approval (Baurechtliche Abnahme) the so called examination of serviceability (Tauglichkeitsprüfung). Subsequent monitoring of the installed devices is not taking place. Only within the framework of the emission control the gas appliances are controlled further on by the chimney sweep.

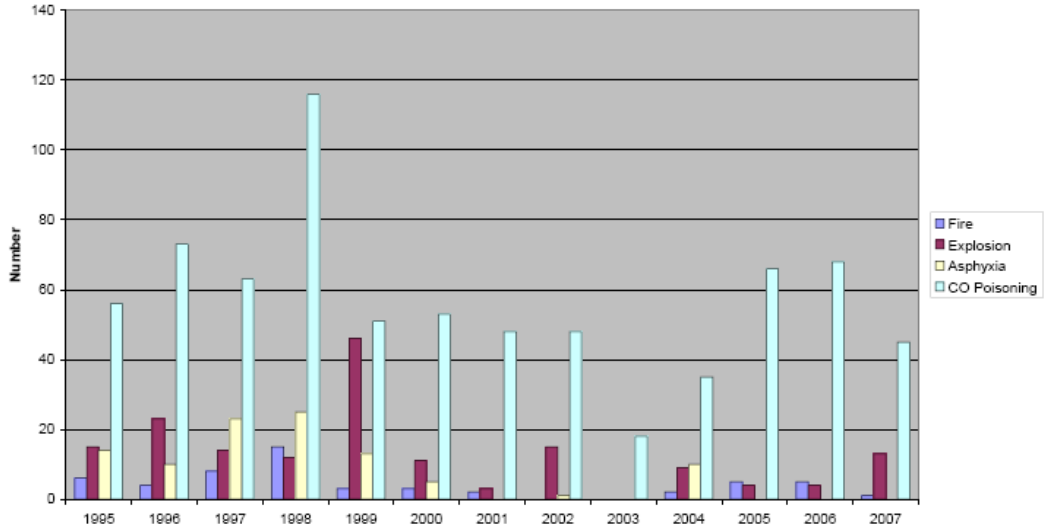
In the Netherlands there are only regulations on the installation. However not for the gas installers, that means that everybody may work on gas installations. Regulations / Demands, that have to be fulfilled, are described in the standards mentioned in the “Bouwbesluit” (Building directive). The “Bouwbesluit” only specifies one performance-demand: the gas installation has to be safe and it is supposed to be safe as it is build following NEN 1078 for new buildings and NEN 8078 for existing buildings.

The gas supplier in the Netherlands is only responsible for the installation until the point of delivery (generally spoken: the gas meter).

In the Netherlands there is no inspection of the installation at all. The installation is supposed to be safe, until “the opposite is proven”.

In some countries minimum time of practical experience is needed, which partly can be obtained by completion of vocational training. In most countries a periodic assessment takes place. The inspection of work carried out by operatives is randomly conducted in Belgium, Denmark, France and UK. Above all in Belgium, Denmark and France mastering the national language is mandatory.

Figure 6.4: Gas related accidents in the EU



Source: Marcogaz (EGAS C Report); calculations by Ifo Institute.

The big differences in the qualification requirements for installers are noteworthy with regard to the reporting of gas accidents in the media and the perception of the consumers that gas is not a safe feedstock. In particular the fact that in some countries there are no formal qualification requirements at all. However, the statistics show a calming picture. The overall number of accidents in Europe is extremely low. Above all the fear of consumers of explosions and fires are a minor problem only (Figure 6.4). The major threat is asphyxia and CO-poisoning. This indicates that there is some need for the qualification of craftsmen in Europe who are working on the installation and bringing into service of gas appliances.

There is only little self-interest in craftsmen to become qualified for the installation of gas appliances because most of them are installing all kinds of appliances using different feedstock and often only a small portion of their workload is related to gas appliances. Moreover the growing complexity of appliances for heating and hot water production asks for additional qualifications to meet the requirements of energy efficiency and safety. This means that initiatives such as the European Heat Pump Association can become more important not only for the safe installation of gas appliances but the implementation of political objectives, such as the reduction of CO_2 emissions.

The safety aspect of gas and gas appliances is of outstanding importance for consumers. The diverse regulatory framework for installation, maintenance and repair in the Single Market alienate consumers. Beside the necessity to increase the qualification of installers to enable them to meeting the requirement of the more complex and environmentally friendly systems that are about to come into the market safety aspects are of outstanding importance. Although in some Member States the safety standards are high in others the situation is not satisfying. The "European Consumer Voice in Standardisation" (ANEC) has outlined a proposal for the revision of the GAD which tackles the problem of services comprehensively. The proposal defines qualification requirements to be placed upon installers, asks for an adequate training and registration of personnel concerned with the installation, maintenance and repair of gas appliances. Moreover an annual inspection of gas appliances is suggested to ensure the safe operation.[56]

Provisions for installation

Beside the qualification requirements each Member State has its own rules for gas installations. They comprise all provisions which are considered to be necessary for safeguarding the use of gas appliances. A large part of the rules addresses the way how to dimension a gas appliance for a house and the laying pipes, the installation of combustion air supply and ducts as well as the putting into service of gas appliances.

Moreover installation rules define the technical features of pipes, fittings, components, connections and other parts. These products must comply with national technical standards. Meanwhile some products are subject to EU directives and are certified according to these directives and furnished with the CE-mark instead of a national marking, e.g. ducts.

Concerning free circulation of goods the harmonisation of the entire downstream side of gas installation does not seem to be necessary. Rather one has to discern on-site installation work and installation related aspects of gas appliances and related components. On-site installation of gas appliances takes place locally and is normally conducted by indigenous firms. Hence the unification of installation procedures and civil engineering specifications is not crucial for the internal market. Also there is no evidence that qualification requirements prevent functioning of the internal market. However a comprehensive standardisation of the installation interfaces of gas appliances, related mounting parts and so on would lead to a higher level of standardisation of gas appliances and reduce manufacturing cost. This could contribute to an easier to handle regulation and more transparency in Europe.

6.3.3 Access to input markets

Labour market regulation

Labour market policies comprise measures on employment, unemployment, qualification and wages. In recent times, demographic changes have resulted in an increasingly ageing workforce. Labour markets shall provide the skill profiles of blue and white-collar

[56] ANEC (ed.); Proposal for the revision of the Gas Appliances Directive; November 2007; http://www.anec.org/attachments/ANEC-DOMAP-2007-G-054final.pdf

workers that match the employers' needs. Working conditions, salaries and other factors are subject to bargaining in the labour markets. The functioning of the labour market, matches and mismatches are influenced by institutions. Processes of collective bargaining are conducted by employers' organisations and trade unions. The governments and legislation set the general framework for industrial relations and supporting measures for employment and job creation.

Creating a European labour market is quite different from the objectives associated with national labour market regulation, where employment protection and industrial relations are the chief concerns. The aim to establish a free movement of workers provided the major context of regulation of the European labour market since the foundation of the European Economic Community. The nature of labour market regulation in the EU is ranging from norms guaranteeing free movement of workers in a Community-wide labour market, to norms providing rights and protection beyond existing Member State provisions (as in equality between women and men). A major driving force is the interaction of Member States, both individually and collectively, with EC institutions.

Regarding gas appliances generally there are no specific regulations in the manufacturing sector. Referring to putting into service of gas appliances the situation is different. In most of the member countries specific conditions and qualification requirements must be fulfilled before a worker gets the accreditation, to install, put in service, repair and maintain gas appliances. In principle, these provisions restrain the free movement of workers. Yet some EU directives contain regulations that affect harmonization of specific qualification requirements:

- The freedom to provide cross-border services is in the scope of Article 16 of the directive 2006/123/EC on services in the internal market. The directive has to be transposed before 28 December 2009. By the end of 2011 the Commission shall submit a report on the application of this article, in which it has to consider the need to propose harmonisation measures regarding service activities covered by the directive. This might also comprise gas appliance services.
- Directive 2002/91/EC on the energy performance of buildings stipulates regular maintenance of boilers by qualified personnel. Member states have to ensure that the certification of buildings and the inspection of boilers are carried out in an independent manner by qualified and/or accredited experts, whether operating as sole traders or employed by public or private enterprise bodies.
- In the proposal for a directive on the promotion of the use of energy from renewable sources, presented by the Commission (COM (2008) 19 final), Member States are envisaged to develop certification schemes for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems and heat pumps. Each Member State shall recognise certification awarded by other Member States.

Access to finance

In the past years financial markets were characterized by lose funding conditions. Companies quoted on the stock exchange as well as companies going public enjoyed a friendly environment and could raise capital. Private equity firms, financial and industrial investors were busy looking for investment opportunities. All in all the financial market provided a growth friendly environment. The financing situation for small and medium

sized enterprises (SME) was a bit different, but not too bad. Primarily they borrow from banks, credits were available and credit costs comparable low.
However, the situation on the credit markets has been worsened for many SME. The new Basel Accord (Basel II) has changed the conditions by which banks are allowed to lend money to private companies. The Capital Requirements Directive (2006/48/EC) is the common framework for the implementation of Basel II. It has further increased the use of formal rating procedures and credit scoring systems in banks, having also an effect on many of their SME customers. To ensure a good rating, it is essential to be aware of the factors influencing it. If SMEs can improve the quality of information for banks, they may obtain better credit terms reflecting their actual creditworthiness. Transparency and a constructive dialogue between the two parties are essential prerequisites.

Mezzanine finance that combines features of loans and equity (for example subordinated loans) can help to finance the start-up and expansion phases of SMEs, including innovation and transfers of business. It is used as an important complementary source of corporate funding. Although the use of mezzanine finance instruments has recently expanded, they are of minor importance compared to traditional loan financing. In some Member States SMEs have a choice of a wide range of mezzanine products, but in others there is a lot of ground to make up.

There are many SMEs among the manufacturers of gas appliances, in particular in the new Member States. Their creditworthiness often suffers from low equity ratios. This is not only true for the manufacturing sector, but even more for the downstream installation sector. Hence they are notably affected by the new Basel II regime. However, there were no significant signs which indicate sectoral drawbacks. Indeed Basel II ratings not only refer to companies' financial situation but also the perspective of the industry a company is engaged. Concerning the latter the future development of gas appliances markets are mainly determined by the construction sector and policies aiming at energy saving and reduction emissions of green house gases. Cyclical slumps of the construction sector are affecting the gas appliance business. But it is expected that in the long run the need of energy saving will stabilize demand and push sales.

Currently the crisis in the financial market has induced a tightening of the credit conditions and it has become difficult to attract investors and raise equity. Most affected are the markets in Spain and the United Kingdom. The breakdown of construction activities, in particular new dwellings and residences will affect the demand. The cash-flow of the concerned companies will be markedly reduced and the profitability will shrank. In connection with the worsened refinancing conditions it must be feared that the funding of project, especially those with expected long-term returns on investment will be stretched or even cancelled. This could pose a problem on the gas appliances sector’s international competitiveness, because currently many R&D initiatives are well on their way to catch up to the leading edge in technology.

6.3.4 Access sales markets

Third market access

The European Union is negotiating with its trade partners to open up markets for goods and services. The EU seeks to help developing countries by giving them better access to its market in the short-term, while allowing them more time to open up their own markets to European products. The EU is a supporter of the World Trade Organisation (WTO), which lays down a set of rules to foster global trade and ensure fair trade rules. Despite a need for improvement, this system offers a degree of legal certainty and transparency in the conduct of international trade. The WTO also provides a dispute settlement procedure when direct disputes arise between two or more trading partners.

The EU has become a key player in the successive rounds of multilateral negotiations aimed at opening up world trade. It attaches particular importance to the current round, known as the 'Doha development round', which was launched in 2001. The aim is to remove obstacles to open trade, particularly to benefit developing countries.

The European gas appliance companies face no tariff barriers in third country markets with the export of manufactured goods. However, similar to Europe, there are industry specific standards which must be met. The manufacturers of gas appliances of the new Member States have traditionally good trade relationships with their eastern neighbouring countries. They are well aware of the formal requirements and hold a strong position in the markets.

6.4 Impact of energy markets on the perspectives for gas appliances

6.4.1 Overview of the present situation and outlook for gas sales in the EU

According to a survey conducted in 2007 by Eurogas[57], over the last 15 years, gas consumption in the residential and commercial sector has increased by 2.8% per year to 175 million ton oil equivalent (Mtoe). This rise is in line with the growth of the infrastructure and the associated rise in the number of gas users. The share of gas in the residential and commercial sector is around 35%, making gas a market leader. In 2005, roughly 80 million households were supplied with gas in the EU27.

The EU27 population growth is expected to be moderate in the future, with some countries experiencing a population decline. In addition, the rate of market penetration is already high in some major gas consuming countries, and other countries are expected to gradually reach saturation in this market segment. Moreover, in some countries the potential for market growth is limited due to low population densities, settlements structures and topographical conditions. Finally, improved energy efficiency in buildings is another factor likely to adversely impact further growth in this sector. The implementation of stricter insulation standards, together with more efficient heating systems and an increased use of renewable energy sources will hamper further developments. The combination of all the above factors is likely to have a substantial

[57] Eurogas (2007), *Natural gas demand and supply – Long term outlook to 2030*.

impact on growth. For the residential and commercial sector, Eurogas expects gas sales to increase by only 0.4% per year to 194 Mtoe by 2030.

However, the direct use of gas in the households and commercial sector can present advantages in terms of energy efficiency, relative to the generation efficiencies and distribution losses of the electric sector, through the use of micro Combined Heat and Power (micro-CHP) unit and high efficiency boilers and appliances[58]. The use of micro CHP units is however dependent on the right framework conditions and incentives for a development on a mass-market scale. In particular, the ability to sell the electricity surplus produced by supplying it to the grid is of importance.

In addition, the sector is looking into the possibilities offered by biogas, in particular of the second generation. Until now very small volumes of biogas have been fed in low pressure networks. Biogas being a renewable energy source, a further use of biogas could enable customers to choose a more environmentally friendly fuel. Further developments require biogas developments, strict gas quality monitoring and technical planning[59].

6.4.2 Overview of natural gas supply in the EU

The EU27 used natural gas to cover 25% of its primary energy needs in 2007. Natural gas also represented 23% of the EU27 final energy consumption. The EU27 relies for 37% on indigenous production, and imports the rest of its supplies mainly from Russia (24%), Norway (17%) and Algeria (9%)[60]. The UK, Germany and Italy are the biggest consumers of natural gas followed by France, the Netherlands and Spain (in ranking order)[61]. Except for Spain, these countries are considered as the most mature gas markets, together with Belgium, in the region. Gas use per household is the highest in the Netherlands and the UK[62].

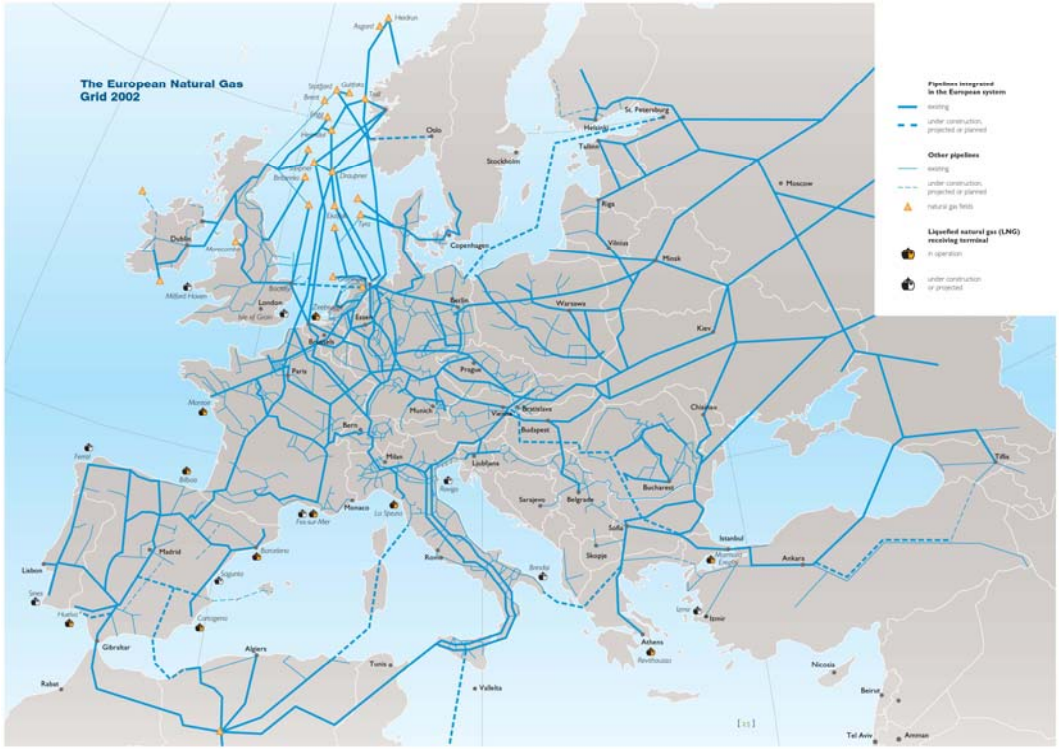
The development of the gas industry in Europe[63] started with the use of manufactured gas, mainly produced from coal, for lighting from the beginning of the 19th century. From early in the 20th century, manufactured gas was also used for cooking. The gas was called town gas, in reference to the fact that it was produced and used locally. This changed at the start of the 20th century when the first long distance pipelines were built to distribute coke-gas to households. Manufactured gas was in part replaced by the use of electricity and petroleum and finally displaced by natural gas during the 20th century.

The UK started importing liquefied natural gas (LNG) in the 1950s before launching domestic production in the 1960s. Italy and France first discovered gas in the 1930s, while the Netherlands and Germany started production in the 1950s. Thus modest indigenous productions were in place before international gas trade started in the 1960s

58 Eurogas (2008), The role of natural gas in a sustainable energy market, March 2008.
59 Eurogas (2008), The role of natural gas in a sustainable energy market, March 2008.
60 Eurogas (2008), Annual report.
61 Eurogas (2008), Natural gas consumption in the EU27 in 2007, 13 March 2008.
62 IEA (1998), Natural gas distribution, Focus on Western Europe and Griffin, Harriet (2000), Appendix R: Development of the European gas Network, supporting document for a lower carbon future, Environmental Change Institute, University of Oxford UK, cited in VHK (2007)
63 IEA (2008), Development of competitive gas trading in Continental Europe: How to achieve workable competition in European gas markets? May 2008.

and 1970s, when demand for natural gas in France, Italy and Germany started to outpace home supplies. The UK produced enough gas to match its domestic consumption and only started exporting in the late 1990s. The Netherlands started to export large volume of gas after the discovery of Groningen gas field. Thus the gas transportation network gradually expanded to trade gas internationally, first from the Netherlands, then from Russia and Norway, and later from the UK. In 1983 the Transmed pipeline connected Algeria to Italy. Around the 1990s production activities expanded in the UK, Norway, the Soviet Union and Algeria and important volume of gas were supplied to Europe. Meanwhile in Eastern Europe, the collapse of the Soviet Union, followed by a drop in industrial production, translated into a fall in gas consumption. Gas consumption in the former USRR returned to its 1991 level in 2005.

Figure 6.5 The European natural gas networks in 2002



Source: Eurogas

Today the gas industry is undergoing structural changes triggered by the European liberalisation agenda and the diversification of energy sources' objective. Infrastructure investments are weak in regard to the growing European needs in natural gas. Demand is expected to rise by around 14% by 2020[64], mainly lead by the power sector[65]. This growth is expected to lead to an increase in imports representing 77 % of total demand under current trends and policies, and to 71 to 73% under the New Energy Policy scenario, which will curb demand from gas-fired electricity production.

64 EC (2008), Commission working document accompanying the Communication from the Commission to the EU, the Council, the EESC and the Committee of the regions, second strategic energy review, An EU energy security and solidarity action plan, Europe's current and future energy position – Demand-resources-investments, COM (2008) 744.

65 Gas represents 21% of the EU27 electricity production mix in 2006 (EC COM(2008) 744).

6.4.3 The issue of gas quality

Natural gas is made up of a mixture of hydrocarbon gases, which can vary widely between sources. The quality of gas, including its caloric value, is determined by the relative quantities of these hydrocarbon gases, and therefore varies considerably. In addition natural gas as extracted from the field, formation or reservoir is not usually suitable for pipeline transportation or commercial use before being processed. Moisture and other components are removed before the gas is distributed and commercialised. Commercial gas is composed almost entirely of methane and ethane. Pipelines operate under set specifications for the quality of gas. Several European countries operate separate networks for high and low calorific natural gas[66]. Distribution networks operate with an operating pressure of 10 (polyethylene pipes) to 16 bar (steel pipes) according to European standards, although depending on national regulation it can also be 25 bar[67]. Domestic and industrial appliances are designed to operate within a certain gas quality specification range[68].

The quality of gas is increasingly becoming an issue in Europe as its indigenous production declines and its imports needs rise. The differences in gas composition and pressure can affect the safe and effective operation of appliances burning gases of a related quality within a given distribution pressure range. As larger volumes of gas from various sources and thus quality are used, the need to agree on a definition and measurement of natural gas arises to address the issue of gas interchangeability. Gas interchangeability is defined[69] as the ability to substitute one gaseous fuel for another in a combustion application without materially changing the operational performance of the application in terms of safety, efficiency or emissions.

The concept of gas interchangeability dates back from the switch from manufactured gas to natural gas. As markets were mainly local or regional, local or regional based parameters were defined, creating a wide variety of parameters and performance ranges used to assess the impacts of a given gas quality on gas supply and appliances operation. This variety throughout Europe has been identified as a real and potential barrier to an efficient internal gas market by the EU Gas Regulatory Forum (Madrid Forum)[70]. In 2002, the forum set up the EASEE-gas (European Association for the Streamlining of Energy Exchange), which provides a platform for industry participants to discuss the harmonisation and simplification of business processes and develop best practices. The EASEE-gas has discussed the harmonization of gas quality and proposed a specification based on the Wobbe index. Although at present most European countries operate under a narrower range than the one proposed by EASEE-gas, the Wobbe index is accepted as the primary interchangeability factor[71].

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66 Williams (2007), European gas quality, interchangeability issues reflect regional diversity, in LNG Observer, April 1 2007, Volume 4, Issue 2.

67 Eurogas (2006), How Distribution system operators contribute to the new European gas market, September 2006.

68 http://r0.unctad.org/infocomm/anglais/gas/quality.htm

69 Williams (2007), European gas quality, interchangeability issues reflect regional diversity, in LNG Observer, April 1 2007, Volume 4, Issue 2.

70 Groenendijk (2006), The global gas quality perspective: The European NGC view, Presentation to Platts Second Annual Gas Quality/Interchangeability forum, 13-14 November 2006.

71 Williams (2007).

In the meantime, the CEN is currently working on a reference standard to serve as a basis for the elaboration of standards for gas appliances (CEN/TEC 238). One of the objectives is to avoid adding more new gas groups than strictly necessary as "a proliferation of gas groups and categories would not help in the certification and would limit the free circulation of the gas appliances in Europe"[72]. In the UK industrial and commercial gas-fired appliances are expected to have a higher capacity to adjust to changes in gas qualities thanks to their sophisticated control systems. However gas turbines for electricity generation are expected to be more sensitive to fast changes in gas quality. In addition, new appliances with higher efficiency and lower emissions characteristics were found to be less adaptable as they are designed for a given gas quality specification[73].

The technical association of the European natural gas industry, MARCOGAZ, contributes to the mandate from the CEN to work on Gas quality in 2007, but activities only started in 2009. Gas appliances are first tested in different European laboratories with different gas qualities, to show whether and how certified GA operate under the different conditions. Any changes in the efficiency of the combustion process are also analysed within a certain range of the caloric value (Wobbe-Index). The test phase and results evaluation are expected to be concluded within two years. Based on these conclusions, the next step will be to decide on the gas quality and ranges for the caloric value to set up the necessary prerequisites for the interoperability of gas. However the Member States will still need to address the issue of the stock of installed GA that has not been certified under the GAD. It is not yet known whether this stock can be operated under a broadened range of gas qualities. Further, accelerating the renewal or upgrading of the stock of GA might become necessary.

6.4.4 Natural gas grid access

Domestic customers connected to the natural gas grid (EU15 and EU25)

According to the Preparatory study on Eco-design of water heaters[74] and based on Eurogas data, the number of domestic customers connected to the natural gas grid was around 82 million for the EU15 and 97 million for the EU25 (excluding Malta and Cyprus) in 2004. The rate of growth in the number of connected domestic customers for the EU15 declined from 2.5% in 2000-2001 to 1.1% in 2003-2004. Growth rate stood at 2% for the EU25 (excluding Malta and Cyprus) in 2003-2004. This means high growth rates for the new Member States.

Among EU25 countries in 2004, the UK ranked first with over 21 million connected domestic customers, followed by Germany (over 17.5 million), Italy (15 million) and France (over 10.5 million); Poland (6.9 million), the Netherlands (6.3 million) and Spain (5.3 million); then Hungary (over 3 million), the Czech Republic, Belgium (over 2.5 million each), Slovakia (1.4 million) and Austria (1.2 million). Greece, with 31 thousands of domestic customers, experienced a very important growth from 2001 that reached

[72] CEN (2006), CEN/TC 238 Business plan, 21 September 2006, Version 2.

[73] Williams (2007), European gas quality, interchangeability issues reflect regional diversity, in LNG Observer, April 1 2007, Volume 4, Issue 2.

[74] Van Holsteijn en Kemna (VHK) BV (2007), Preparatory study on the Eco-design of Water Heaters, 30 September 2007.

almost 95% over 2003-2004. Other countries that experienced an important growth are Poland (15% in 2003-2004), Spain (6.7%) and Portugal (8.9% with 744 thousand customers), but also Ireland (5.1% with 472 thousand customers) and Slovenia (5% with 105 thousands customers).

A study by Griffin and Harriet[75] collected data, for some EU countries, on the total number of households living in gas supply areas that are connected and not connected to the grid. The data was collected over the years 1997-2000, and results do not take into account obstacles for dwellings to get connected. This set of data shows that almost all households are connected to the grid in the Netherlands, over 80% in the UK, 70% in Italy and around 55% in Belgium. Germany, France and Austria have around 40% of their households connected, and Spain around 25%. The data further shows that in Germany and Greece, around 50% of households are within the gas supply area but not connected. In Austria, Belgium, Denmark, Finland, France and Spain, around 30% of households are within the gas supply area. The Netherlands and the UK, together with Denmark, Finland and Sweden were identified as countries where developments would be inexistent or limited. These expectations appear to be in line with more recent data on the growth of gas customers (See Table below, based on Eurogas Annual Reports data). Finland has even known a negative tendency over 1995-1998 and in 2005 at -0.87% per annum on average. Data for domestic gas customers alone is not available for the Netherlands. However the rate of growth for the number of both domestic and non-domestic gas customers over the 1995-2005 period is limited at 0.42%.

Table 6.4 Developments in the number of domestic customers and distribution grid lengths in the EU from 1995 to 2006

Countries	Number of domestic gas customers at 1st January 2005 (thousands)	Rate of growth (customers) over 1995-1998 %	Rate of growth (customers) over 2000-2005 %	Length (km) of distribution pipelines at 1st January 2008	Rate of growth (pipelines) over 1995-2008 %
Austria*	1,338	2.34%	1.51%	26,000	2.54%
Belgium*	2,591	1.86%	1.74%	62,518	3.81%
Denmark	340	3.86%	1.55%	17,000	0.46%
France	10,731	1.17%	1.52%	193,330	2.95%
Finland	34	-0.92%	0.02%	1,660	3.59%
Germany*	17,730	2.26%	1.23%	314,000	1.99%
Greece	31	n.a.	43.17%	4,239	12.40%
Ireland	472	7.76%	7.61%	10,062	7.05%
Italy	15,050	1.49%	0.71%	229,542	3.07%
Portugal*	744	n.a.	13.14%	11,021	5.40%
Spain*	5,552	7.82%	8.04%	53,795	11.40%
Sweden	52	4.35%	0.00%	2,150	-1.45%
United Kingdom	21,378	2.78%	0.98%	132,000	-4.77%
Czech Republic*	2,592	3.28%	1.65%	70,787	9.04%

[75] Griffin, Harriet (2000), Appendix R: Development of the European gas Network, supporting document for a lower carbon future, Environmental Change Institute, University of Oxford UK, cited in VHK (2007).

Hungary*	3,106	4.90%	3.10%	81,335	3.60%
Slovak Republic*	1,440	n.a.	1.61%	31,537	7.07%
Estonia*	63	n.a.	-1.56%	1,395	-10.23%
Lithuania*	518	n.a.	0.00%	7,500	4.04%
Slovenia*	105	n.a.	5.00%	2,600	1.61%
Switzerland*	435	0.50%	1.19%	14,838	2.17%

The data is based on Eurogas Annual Reports for the years 1995 to 2008. The split between domestic and non-domestic gas customers is no longer available after 2005. For countries with an asterix, data was not fully available for the two periods covered, and so the coverage is done over shorter periods. EU 27 countries with no data or data presenting discrepancy are left out [76]. There is no data available for Turkey.

6.4.5 Non-grid gas access

Besides the use of gas from the natural gas network, Liquefied Petroleum Gas[77] (LPG) can also be used outside areas provided by the network. Access to LPG is done via three main forms: stationary containers, portable cylinders or cartridges and, more recently, local LPG networks.

World LPG demand reached 113.2 million tons in 2005, and is expected to reach 135.7 million tons in 2010. The domestic sector consumed almost half of the LPG produced worldwide in 2007[78]. In Europe, LPG accounts for 1.6% of total energy consumption. The domestic sector consumed 50% of LPG in Europe in 2006 [79]. European domestic consumption amounted to 12.3 million tons in 2001 and is expected to reach 19 million tons in 2030[80].

In Portugal LPG was the most used form of gas, mainly for heating purposes (64% of households) in 1998-1999[81]. Today France is one of the most important LPG markets in Europe, with a consumption of around 2.6 million tons, of which about 60% is used for residential and commercial purposes[82]. Over 70% of sales were in bulk and over 20% in the form of portable cylinders and cartridges in 2007. In addition to the two traditional forms of LPG access, local propane networks are starting to develop in France. The Dutch based company SHV Gas is the world leader for LPG supply.

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[76]. The rate of growth for the number of domestic gas users is based on the average of the annual change [AVERAGE ((Vx-Vx-1)/Vx-1)]. The rate of growth of the distribution pipelines is based on the difference between the first and last value and time [(V2/V1)^(1/t)-1].

[77] LPG mainly refers to butane and propane, but also to ethane and condensates, which have their own distinctive markets. LPG is a mixture of third family gases (propane 70-80 vol.%, butane 20-30%) 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 gas appliances, such as boilers. Generally, the LPG storage tank is filled before/during the heating season by a delivery truck, similarly to the practice with oil-fired boilers. LPG has a negligible sulphur content and low emissions

[78] Comité Français de Butane et du Propane, http://www.cfbp.fr/?p_idref=867.

[79] Domestic sector includes leisure. Source: European LPG Association (AEGPL), LPG, The Immediately Available Clean Alternative, 2007.

[80] European LPG Association (AEGPL), The LPG Industry Roadmap, 2007.

[81] Environmental Change Institute, Lower carbon Futures, Country Profile Portugal, Oxford, cited in Van Holsteijn en Kemna (VHK) BV (2007), Preparatory study on the Eco-design of Water Heaters, Task 3, p. 60, 30 September 2007.

[82] Stakeholders consultation in France.

Stationary containers

Storage tanks are usually located outside dwellings, above or underground, and are periodically filled. The Eco-Design of Water-Heaters study highlighted the fact that data on the number of LPG consumers in Europe was difficult to assess and the end-use hard to differentiate. From BRG data the study estimates at 4% of sales the use of LPG for central heating boilers. The main areas of demand are found in areas with no access to the grid in Italy, Spain, France, the UK and Portugal.

The study further investigates the cost of installing a LPG storage tank and compares it with the equivalent based on heating oil. Costs cover the tank, tank installation, boiler, annual service and tank maintenance. They amount to €5, 560 for a heating oil tank and €2, 435 for a LPG tank, which results in a €3, 000 difference between the two sources of energy for the same end-use. It must be noted that usually the tanks are owned by the supplier, which also takes care of the maintenance.

The various requirements attached to gas tanks in terms of safety, inspections, tank access and so on imply that the setting of stationary containers are in practice limited to rural or semi-rural areas. In the EU-25, about 56% of the population lives in predominantly or significantly rural regions. For the countries mentioned above, Italy and Portugal have 86% and 45% of rural population respectively, while France and Spain have 24%, and the UK 9%.

Portable cylinders and cartridges

Portable cylinders and cartridges are used for a variety of purposes, whether in the domestic or commercial sectors, as well as for leisure activities. It is used for cooking, heating, air conditioning and transportation, and other applications.

Local LPG networks

Isolated areas not connected to the grid can also have access to LPG via local networks, usually supplied by centralised underground tanks. Such local networks concern mainly a group of dwellings within a specific area. In France such networks are just developing and are fed with propane[83].

6.4.6 Price competitiveness of gas

Gas distribution is very capital intensive, and requires roughly double the level of investment that transmission requires. In 1998 in Western Europe, the International Energy Agency estimated that for a country with no indigenous production, gas distribution investment could represent 70% to 80% of the total investment in the supply chain to the end user. The investment is very long term and most of it is sunk (it cannot be retrieved if the company leaves the market)[84].

[83] An example of a company developing such a service in France can be found at http://www.vitoreseau.com/gaz-propane-reseau.php

[84] IEA (1998), Natural gas distribution, Focus on Western Europe.

The costs associated with connecting a household to the gas network vary greatly and depends on such factors as the distance to the grid, the number of connections to be made, the connection capacity, local circumstances (such as road crossing) and the tariffs in place. Figures collected for the Eco-design of water-heaters report give indicative ranges for a few countries[85], although actual costs are not readily available and tariffs do not necessarily reflect the cost of the connection. In the UK costs range from 1,050 to 2,000€, in Belgium and the Netherlands the cost is around 700€, and in Denmark roughly 1, 000€. In Germany tariffs range from 1,000 to 3,000€ and in Italy from 100 to 300€.

Energy prices have been increasing due to rising global demand and the global geopolitical situation. The Eurostat's Harmonised Index of Consumer Prices (HICP) shows a gas price increase with an additional 50 index points in 2005 compared to 1996 (base year). Electricity prices growth was relatively moderate and stood at 120 index points in 2005. Liquid and solid fuel prices increased by 85 and 45 index points respectively.

Regarding energy sources for heating in the residential sector[86] in the EU27, natural gas has a 45.5% share of the heating market, leading against oil (20%) and electricity (12.3%). Coal has a 3% share while the remainder is covered by wood chips, pellets, solar and geothermal sources of energy. Gas is the cheapest mean to produce heat when considering current state of the art heat generation technologies and total production costs, including taxes. It also has the lowest direct and life cycle emissions among the fossil fuels and competes well with electricity for the latter, as electricity production emissions differs greatly depending on the energy source. For selected current state-of-the-art technologies for heating, the life cycle emissions with natural gas[87] as the energy source is estimated at 2.9 to 3.3 tons of carbon dioxide per ton of oil equivalent, while from electricity[88] it is estimated at 0.2 to 15.2 tCO_2/toe.

The difference in prices of feedstock is further analysed below in order to gain an insight in its influence on customers' behaviour regarding the choice of appliances.

6.4.7 Comparison of energy prices

Eurostat is the source for the EU-27 energy prices presented in this section. The electricity prices as well as the prices for heating oil have been derived from the Energy Pocketbook[89]. The data for natural gas prices have been derived by analyzing publicly available data from Eurostat. The data is restricted to energy prices for households, including all taxes, as these prices are the most relevant for the study. As for LPG, the

[85] Van Holsteijn en Kemna (VHK) BV (2007), Preparatory study on the Eco-design of Water Heaters, 30 September 2007, p.60.

[86] EC COM (2008) 744, Energy sources, production costs and performance technologies for the power generation, heating and transport. District heating, which has a market share of 7.6%, and cogeneration of heat and power (CHP) are not included in the analysis.

[87] The technologies selected are the large, medium and small combination boilers as well as the medium size condensing combination boilers.

[88] Technologies selected are the combination heating/water boiler, medium and small sizes as well as resistance heaters with fan assisted air circulation. Power generation technologies selected for the assessment of the life-cycle greenhouse gas emissions covered state-of-the-art technologies including solar, hydro, wind, biomass and nuclear power, as well as coal, oil and natural gas fuelled power.

[89] Published by the Directorate-General for Energy and Transport (DG TREN, 2009), which also publishes Eurostat data

data used is from the European Commission's Weekly Oil Bulletins, from 2005 until 2008. As far as the methodology is concerned, all available price data has been used in the calculation of EU-wide energy price averages. The average EU-27 price has been taken form the mentioned Energy Pocketbook and the weekly Oil Bulletin data respectively.

Electricity

According to the Directorate-General for Energy and Transport, electricity prices for EU-27 households increased by 9.26% in the year 2007,compared to 2006, leading to an average price of €14,51 per 100 kWh in 2007. In addition, the average price for EU-27 households rose by 4.81% in 2006, compared to 2005[90].

Price changes between January 2006 and January 2007 varied significantly between Member States. For households, the largest price rises were observed the UK (+27.74%), Sweden (+17.69%) and Hungary (+13.13%), while prices fell in Cyprus (-3.88%), Bulgaria (-2.17%) and Poland (-0.43%)[91].

In absolute values, household electricity prices were highest in 2007 in Denmark (€24.25 per 100 kWh), followed by The Netherlands (€22,30 per 100 kWh) and Italy (€ 21,97 per 100 kWh). The lowest prices were observed in Bulgaria (€6.75 per 100 kWh), Latvia (€6.88 per 100 kWh) and Estonia (€7.25 per 100 kWh).

Table 6.5 Electricity prices for households in EURO/ 100 kWh, all taxes included

Electricity prices, households, all taxes included, EURO per 100kWh				
	Ø 2006 price in EURO per 100kWH	%increase 2006/2005	Ø 2007 price in EURO per 100kWH	%increase 2007/2006
EU-27	13.28	4.81	14.51	9.26
Belgium	13.78	-0.22	14.86	7.84
Bulgaria	6.90	1.47	6.75	-2.17
Czech Republic	7.87	8.85	8.66	10.04
Denmark	22.31	3.53	24.25	8.70
Germany	16.96	2.48	18.06	6.49
Estonia	6.97	5.93	7.25	4.02
Ireland	13.46	4.75	15.12	12.33
Greece	8.11	3.97	8.53	5.18
Spain	10.52	4.47	11.31	7.51
France	11.62	0.00	11.74	1.03
Italy	20.00	7.41	21.97	9.85
Cyprus	14.17	33.55	13.62	-3.88
Latvia	6.68	0.00	6.88	2.99

90 The prices are as of January 1st in the year shown. Prices are collected at a variety of locations in each country (DG TREN,2009). According to DG TREN, the average price in each country is calculated as the median of the prices in the various locations. These country average prices are weighted by their final consumption to have the EU-wide price average. The domestic prices shown here are the final selling prices.

91 All Electricity prices in the table below refer to a household with an annual consumption of 7500 kWh, living in a standard dwelling of 100 m 2 with 4-5 rooms plus kitchen.

Lithuania	7.34	0.00	7.92	7.90
Luxembourg	14.61	8.06	15.52	6.23
Hungary	11.12	2.11	12.58	13.13
Malta	12.01	25.89	12.52	4.25
Netherlands	20.54	6.81	22.30	8.57
Austria	12.78	-4.27	14.09	10.25
Poland	11.64	11.60	11.59	-0.43
Portugal	12.60	2.61	13.30	5.56
Romania	9.19	29.44	9.91	7.83
Slovenia	9.40	1.73	9.68	2.98
Slovakia	11.04	5.65	12.11	9.69
Finland	9.10	0.11	9.93	9.12
Sweden	13.23	1.46	15.57	17.69
United Kingdom	10.31	17.16	13.17	27.74

Natural Gas

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

Natural gas prices (all taxes included) for households in the EU-27 were on average 9.62% higher in 2007 compared with 2006. In addition, the average price for EU-27 households in 2006 had risen by 17.36%, compared to 2005 average price.

Changes between the average 2007 and the average 2006 prices varied significantly between Member States. For households, prices rose by more than 25% in UK (+42.75%), Latvia (+40.29%), Hungary (+35.56%), Ireland (+33.75%) and Estonia (+27.04%), while prices decreased in the Czech Republic (-5.71%), Belgium (-4.52%) and Portugal (-4.40%).

In absolute values, 2007 average household gas prices were highest in Denmark (€30,84 per GJ), followed by Sweden (€26.58 per GJ), Germany (€18.45 per GJ) and The Netherlands (€18.42 per GJ). The lowest prices were observed in Estonia (€5.89 per GJ), Lithuania (€7.04 per GJ) and Hungary (€7.16 per GJ). No data has been available for Greece, Cyprus, Malta and Finland.

Table 6.6 Natural gas prices for households in EURO/ Gigajoule, all taxes included

Gas prices, households, EURO/Gigajoule, all taxes included				
	Ø 2006 price in EURO	%increase 2006/2005	Ø 2007 price in EURO	%increase 2007/2006
EU-27	12.46	17.36	13.65	9.62
Belgium	13.50	20.97	12.89	-4.52
Bulgaria	7.70	14.39	8.83	14.73
Czech Republic	10.03	33.79	9.45	-5.71
Denmark	29.82	4.86	30.84	3.43

Germany	15.98	17.85	18.45	15.46
Estonia	4.63	0.11	5.89	27.04
Ireland	12.51	25.35	16.73	33.75
Greece	x	x	x	x
Spain	13.63	14.58	14.23	4.43
France	12.72	20.34	13.46	5.82
Italy	16.50	7.55	18.34	11.12
Cyprus	x	x	x	x
Latvia	5.34	17.77	7.50	40.29
Lithuania	6.24	15.30	7.04	12.93
Luxembourg	10.33	26.91	11.52	11.55
Hungary	5.28	3.57	7.16	35.56
Malta	x	x	x	x
Netherlands	16.92	11.54	18.42	8.87
Austria	15.65	17.14	15.99	2.17
Poland	9.46	25.34	10.69	12.99
Portugal	14.52	17.69	13.88	-4.40
Romania	7.66	59.84	9.05	18.14
Slovenia	12.99	25.70	13.86	6.73
Slovakia	10.88	33.68	11.48	5.51
Finland	x	x	X	x
Sweden	25.95	16.97	26.58	2.42
United Kingdom	8.24	13.50	11.76	42.75

Heating Oil

The data for heating oil have also been derived from the Energy Pocketbook published by the Directorate-General for Energy and Transport (DG TREN, 2009). For the first half of 2008, Eurostat data has been consulted.[92]

The table shows that heating oil prices (all taxes included) for households in the EU-27 decreased, when comparing the average 2007 price (€ per 1000 litre) to the average 2006 price, by -6.42%. The EU-27 average price in 2007 was ca. €602.10/ 1000 litres.
The average price for the first half of 2008 was up to ca. €798.25/ 1000 litres. In addition, the average price for EU-27 households in 2006 had risen by ca. 30.31%, compared to the 2005 average price.

Changes between the average 2007 and the average 2006 prices varied significantly between Member States. For households, only the island Member States Cyprus (+3.10%) and Malta (+0.41%) experienced an increase in heating oil prices. The largest price decreases were observed in Finland (-12.40%), Poland (-12.13%) and Belgium (-10.05%).

[92] The heating oil prices given are for deliveries of between 2000 and 5000 litre. The EU average prices have been calculated by weigthinh the prices from each country by the corresponding final energy consumption.

In absolute values, average 2007 household heating oil prices were the highest in Italy (€1045.7/ 1000 litre), Sweden (€976.5/ 1000 litre), Hungary (€970.2/ 1000 litre) and Denmark (€913,3/ 1000 litre). The lowest prices were observed in Luxembourg (€457/ 1000 litre), Lithuania (€469.8/ 1000 litre) and Belgium (€494.2/ 1000 litre). No data has been available for Bulgaria and Romania.

Table 6.7 Heating oil prices for households in EURO/ 1000 litres, all taxes included

Heating oil prices, households, EURO/ 1000lt, all taxes included					
	Ø 2006 price in EURO	%increase 2006/2005	Ø 2007 price in EURO	%increase 2007/2006	Ø First half of 2008 price in EURO
EU-27	653	30.31	602.1	-6.42	798.25
Belgium	549.4	47.53	494.2	-10.05	682.70
Bulgaria	x	x		x	x
Czech Republic	610.6	24.11	554.3	-9.22	714.74
Denmark	1002.4	19.65	913.3	-8.89	1092.28
Germany	587.7	36.39	537	-8.63	707.60
Estonia	541.1	25.43	506.5	-6.39	710.38
Ireland	685.1	30.32	630.3	-8.00	807.75
Greece	589	41.93	544	-7.64	716.00
Spain	584.8	31.06	551.6	-5.68	733.64
France	632.4	32.41	572.4	-9.49	761.76
Italy	1102.1	15.72	1045.7	-5.12	1203.09
Cyprus	720.3	15.66	743.3	3.19	731.78
Latvia	600.6	-3.56	588.8	-1.96	764.34
Lithuania	521.3	38.46	469.8	-9.88	644.11
Luxembourg	504	33.69	457	-9.33	623.00
Hungary	1019.6	8.82	970.2	-4.85	1164.72
Malta	556.7	50.38	559	0.41	626.60
Netherlands	854	22.00	820	-3.98	964.00
Austria	644.8	30.87	582	-9.74	748.18
Poland	600.8	39.43	527.9	-12.13	729.52
Portugal	649	29.80	622	-4.16	876.00
Romania	x	x		x	x
Slovenia	583.7	19.83	563	-3.55	720.00
Slovakia	583.5	36.30	559.7	-4.08	681.78
Finland	621	38.31	544	-12.40	724.00
Sweden	992.5	16.30	976.5	-1.61	1156.35
United Kingdom	538.7	44.50	499.2	-7.33	671.92

Liquefied Petroleum Gas (LPG)

The table below provides LPG motor fuel prices from the DG TREN weekly Oil Bulletin. The straight average prices have been calculated by consulting weekly Oil Bulletin data from 2005 to 2008. It is important to note that the Oil Bulletin does not clearly state whether the stated LPG motor fuel numbers also count for LPG fuel used for heating and other domestic advices. Furthermore not precise methodological statement concerning the price in relation to the size of delivery (e.g. for deliveries of between 2000 and 5000 litre)

is provided. Therefore, the numbers presented below shall only provide a brief insight into LPG price developments. It is of further importance to note that the informative value of the average EU-27 price is not very significant as no LPG data was found in various Member States.

The table shows that LPG motor fuel prices (all taxes included) for households in the EU-27 very slightly decreased (-0.26%) when comparing the average 2007 price (€ per 1000 litre) to the average 2006 price. The EU-27 average price in 2007 was ca. €566.75/ 1000 litres.
The average price for the year 2008 was up to ca. €673.90/ 1000 litres. In addition, the average price for EU-27 households in 2006 had risen by ca. 12.86%, compared to the 2005 average price.

Changes between the average 2007 and the average 2006 prices varied significantly between Member States. For households, Hungary (+5.10%), followed by Belgium (+4.45%) and Luxembourg and Slovenia (both +3.9%) experienced an increase in LPG motor fuel prices. The largest price decreases were observed in Spain (-6.77%), Czech Republic (-3.50%) and Italy (-3.48%).

In absolute values, household LPG motor fuel prices in 2007 were the highest in France (€710.54/ 1000 litre), Hungary (€666.59/ 1000 litre) and Italy (€625.79/ 1000 litre). The lowest prices in 2007 were observed in Latvia (€488.69/ 1000 litre), Luxembourg (€489.98/ 1000 litre) and Lithuania (€491.27/ 1000 litre). No data has been available for Bulgaria, Denmark, Ireland, Greece, Cyprus, Malta, Finland, Sweden and United Kingdom. As far as data from Romania is concerned, only data from January 2008 onwards was found.

Table 6.8 Consumer LPG motor fuel prices in EURO/ 1000 litres, including all taxes.

	LPG motor fuel prices in EURO/ 1000 liter, all taxes included				
	Ø 2006 price in EURO	%increase 2006/2005	Ø 2007 price in EURO	%increase 2007/2006	Ø 2008 price in EURO
EU-27	568.24	12.86	566.75	-0.26	673.90
Belgium	489.78	13.74	511.55	4.45	575.61
Bulgaria	x	x	x	x	985.95
Czech Republic	533.83	12.51	515.13	-3.50	643.09
Denmark	x	x	x	x	x
Germany	564.60	6.06	580.39	2.80	641.01
Estonia	542.14	21.07	539.71	-0.45	655.81
Ireland	x	x	x	x	x
Greece	x		x	x	x
Spain	616.95	13.69	575.16	-6.77	576.51
France	711.38	11.02	710.54	-0.12	764.99
Italy	648.33	14.01	625.79	-3.48	682.73
Cyprus	x	x	x	x	x
Latvia	470.42	9.99	488.69	3.88	603.43
Lithuania	485.69	15.48	491.27	1.15	551.95
Luxembourg	471.59	10.03	489.98	3.90	541.54

Hungary	634.23	5.47	666.59	5.10	720.95
Malta	x	x	x	x	x
Netherlands	572.63	12.86	591.80	3.35	664.86
Austria	x	x	x	x	x
Poland	523.34	13.13	529.70	1.21	625.90
Portugal	593.00	8.12	592.45	-0.09	677.86
Romania	x	x	x	x	600.63
Slovenia	561.53	10.72	583.41	3.90	677.59
Slovakia	590.12	15.02	603.83	2.32	626.13
Finland	x	x	x	x	x
Sweden	x	x	x	x	x
United Kingdom	x	x	x	x	x

7 Competitive position of the European gas appliances sector

7.1 Introduction

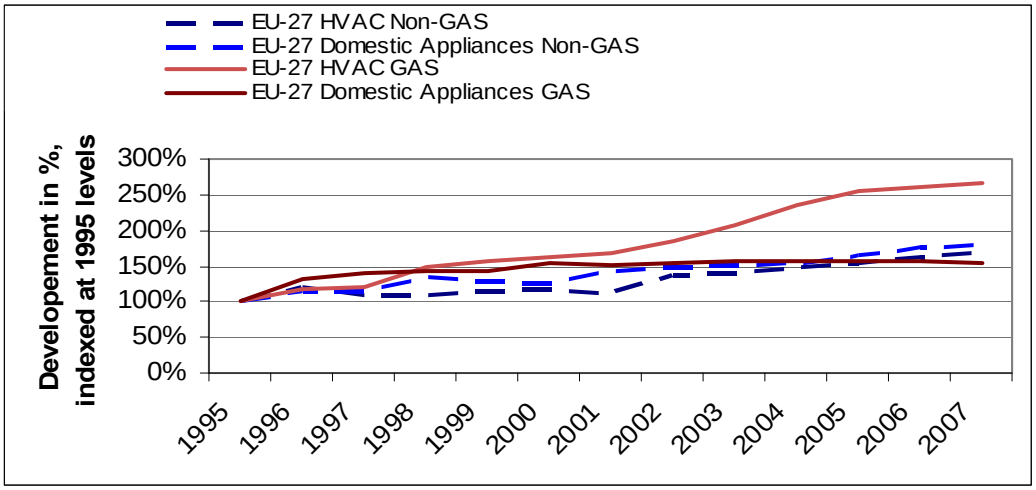
This chapter will outline the position of the European gas appliance sector. In order to assess past developments and depict the present situation, a Eurostat Prodcom database has been used and processed. The findings of this data evaluation provide insight on how the gas appliance sector has performed compared to non-gas domestic appliances and HVAC products. Section 7.2 focuses on production and market (apparent demand = production + imports – exports) developments from 1995 until 2007. The available data record allows an analysis of the EU-27 Member States no data has been available for the entire EEA, Switzerland and Turkey. Once again it has to be stated that percentile changes and monetary production volumes will be presented as the data record does not allow to present precise figures. Furthermore some eminent entry barriers within the EU-27 market will be discussed. Section 7.3 provides a brief insight into the global market for gas appliances and how the EU-27 market is integrated in the international market, which countries are important in terms of exports and imports. Finally, section 7.4 presents a description of current trends and technological developments within the GAS.

7.2 The European gas appliances sector in the EU-27

7.2.1 Size and evolution of the EU GA production

Figure 7.1, which has applied Prodcom categories, shows the development of real production volumes for each selected GA category in the EU-27, compared to the non-GA, indexed at 1995 production volumes. Table 7.1 provides the corresponding average annual growth rates in the EU-27 as well as in the EU-12 and EU-15. The figure reveals that the real production volume for GA, in particular driven by very high growth of HVAC GAS, grew at a higher rate than the non-GA. The higher production growth rates of GA, compared to the non-GA can be explained by the accumulated backlog demand in the EU-12 Member States, where a large need for modernization of gas appliances and especially HVAC gas products is seen, a demand that enhanced the production of GA and HVAC gas products. In order to prove this qualitative statement, which also surfaced throughout the fieldwork, Figure 7.2 displays the indexed development of demand volumes for GA and non-GA appliances in the EU12. It is clear that the demand (indexed at 1995 levels) for GA grew at high rates until 2005. In both figure one can also see the increasing production and demand of Non-GAS-M HVAC and domestic appliances from 2005 onwards.

Figure 7.1 Real production volume developments of sub-sectors' production values in the EU-27 countries, compared to similar non-gas products from 1995-2007, indexed at 1995 production values.

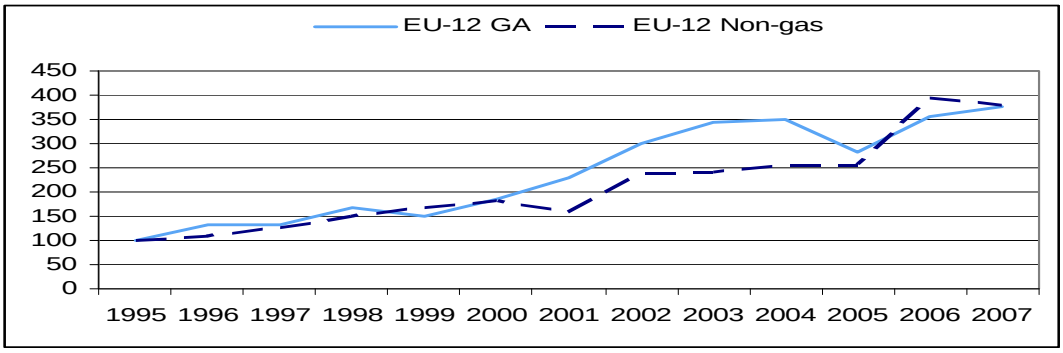


Source: Eurostat; Prodcom database

Table 7.1 Average annual growth rates from 1995 to 2007

	Average annual growth rate in % 1995-2007		
Product group	EU-27	EU-15	EU-12
HVAC Non-Gas	4.4	3.1	12.7
Domestic Appliances Non-Gas	4.9	1.8	9.3
HVAC Gas	8.6	4.0	32.4
Domestic Appliances Gas	3.8	0.1	3.2

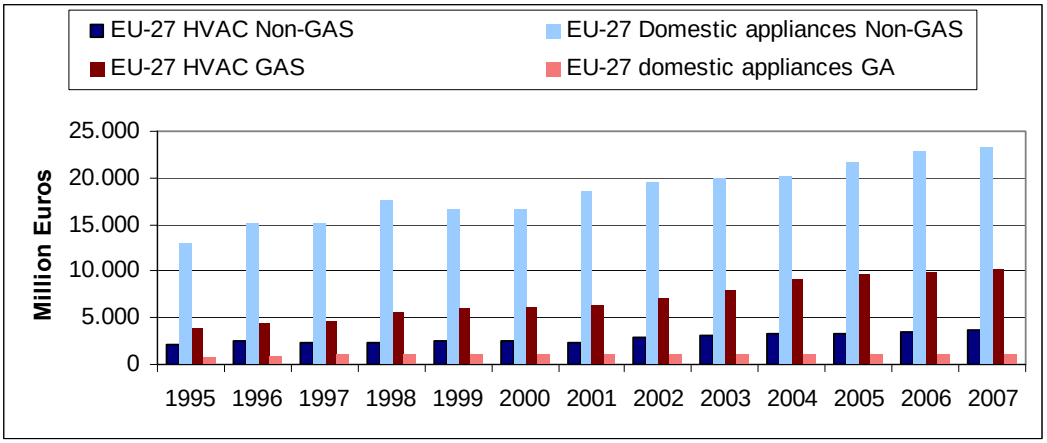
Figure 7.2 Real demand volume developments for GA and non-GA in the EU12 from 1995-2007, indexed at 1995 demand volumes.



Source: Eurostat; Prodcom database

In addition, Figure 7.3 provides insight in the nominal annual production values in Euro. The figure reveals that the annual EU-27 production value for each assessed product category increased from 1995 to 2007. The major value is still generated by non-gas appliances, especially non-gas domestic appliances. However, the HVAC gas product category also grew substantially which is coherent with the above made observation regarding the real production value in Figure 7.1.

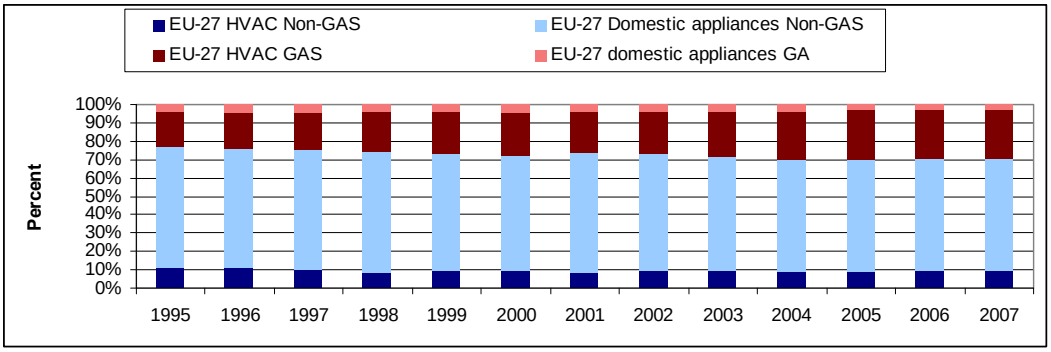
Figure 7.3 Nominal production values in million Euros of GA and non-GA in the EU-27 from 1995 to 2007



Source: Eurostat; Prodcom database

Figure 7.4 plots the indexed production value market share developments of the two main GA sub-sectors compared to the relevant non-GA sectors. The graph depicts that especially HVAC gas products gained market shares within the time segment from 1995 to 2007, ca. 26.7 % in 2007 compared to 19.3% in 1995, as far as production is concerned. Furthermore, the share of domestic gas appliances remained stable (at approximately 3.1 % in 2007), while domestic non-gas appliances experienced market share losses of ca. – 6.0%, maintaining a share of ca 60.0% in 2007. Non-gas HVAC products maintained more or less the same share of approximately 9.4%. The increased market share of gas HVAC products can be explained by data showing an increased demand for such products in the EU-12 from 1995 onwards due to backlog demand in the new member states and its lead in the progress of energy efficiency as compared to non-gas appliances. This observation is coherent with the developments seen in figure 7.2 above.

Figure 7.4 Development of sub-sectors' GA production value market shares in the EU-27 countries, compared to similar non-GA production, 1995-2007



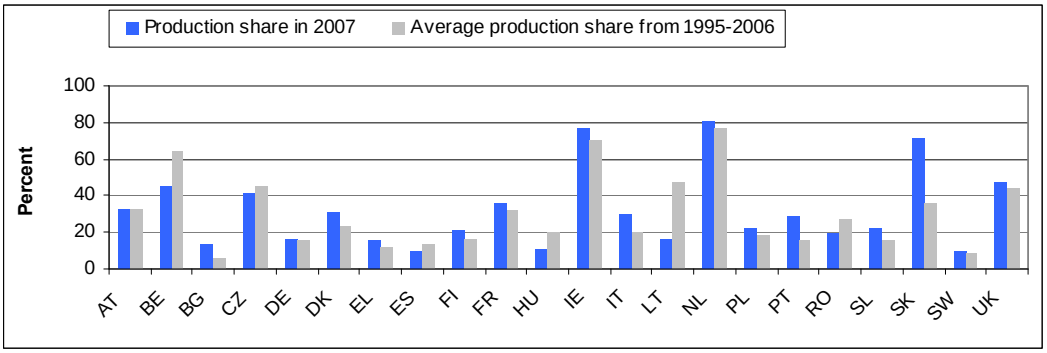
Source: Eurostat; Prodcom database

7.2.2 Regional structure of the sector in the EU GA production

Figure 7.5 provides an overview of the regional development in GAS-M production share, as compared to appliances with other feedstock. The figure compares the 2007 GAS-M production share with the average production 1995-2006 share of that product

group. It becomes obvious that the share of GA production has increased in some countries while the share has decreased in other countries in 2007. Remarkable is the increase in GA production share in Slovakia and the decrease in Lithuania. Furthermore striking are the large production shares in Ireland and the Netherlands. It has to be noted that no information was available for Cyprus, Luxembourg and Malta. The dataset for Latvia had only displayed GA production. It was therefore not possible to set the figures into relation with the production of appliances with other feedstock.

Figure 7.5 GA production share of total appliances

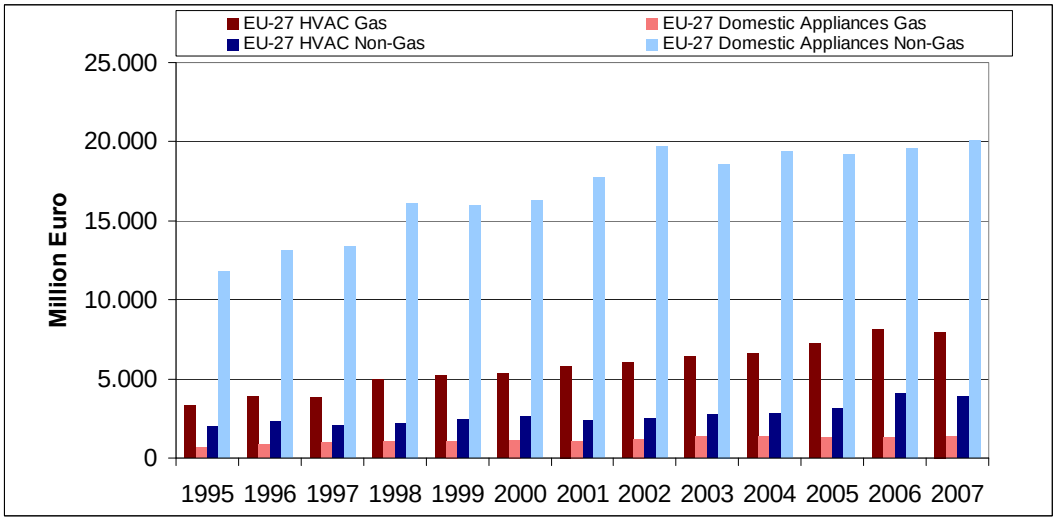


Source: Eurostat; Prodcom database

7.2.3 Size and evolution in the demanded values for gas and non-gas appliances

Figure 7.6 provides an insight in the demanded values for GA, compared to non GA. The figures are based on production figures, adjusted with import and export figures from the Eurostat Prodcom databases. From 1995 until 2007, the demanded value of the GA sector market grew, due to a growth in HVAC Gas demand. When comparing the annual growth performance of GA to non GA, the demanded value of non-GA demand is growing at a higher pace than GA. The development of demand for GA HVAC and GA domestic appliances displays a manifold picture. The demand for those two product groups has been growing at little percentages until 2001. After that the demand for GA HVAC and GA domestic appliances has more or less stagnated.

Figure 7.6 EU-27 Demand for GA and appliances of other feedstock (Million Euros)

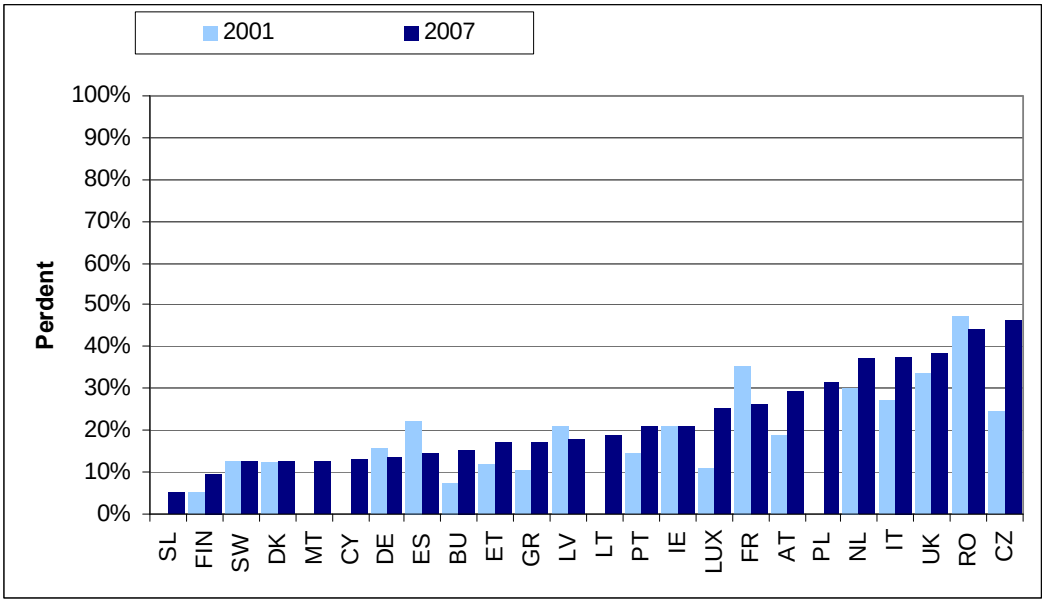


Source: Eurostat; Prodcom database

7.2.4 Regional structure of the sector in the EU Demand

The demand for GA is compared to the non GA demand in Figure 7.7. Czech Republic has the highest relative demand for GA, followed by Romania, the UK, Italy and the Netherlands. Overall, the relative demand for GA has, slightly declined compared to non GA.

Figure 7.7 Regional demand of GA as a percentage of non GA



Source: Prodcom

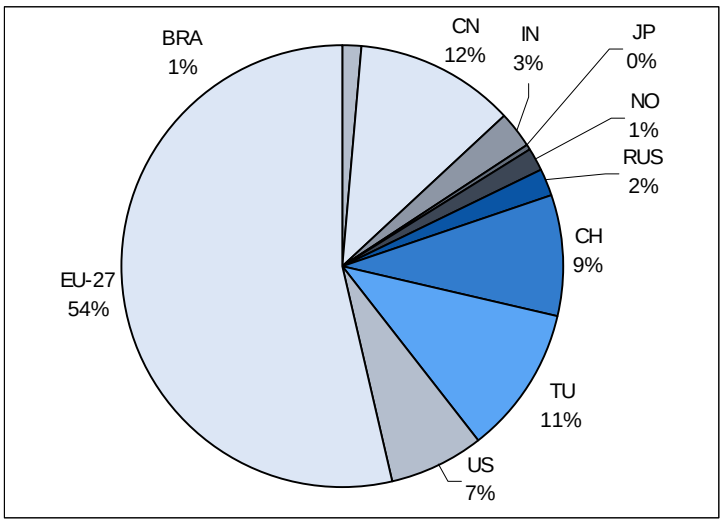
7.3 The European gas appliances sector in the world

7.3.1 Key players in world market and their strategies (including global value chains)

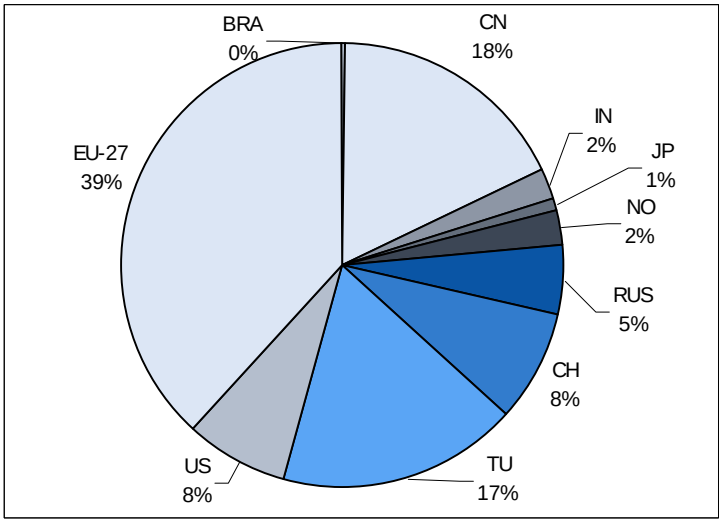
Figure 7.8 displays the major international players in the market for gas appliances. The content of the figure is based upon a Eurostat trade database and is based on total exports of the countries under investigation. The most obvious development is the increasing trade share of China and Russia. These two economies gained substantial shares in international trade within the GAS. The statistical findings below can once again be supported by findings from field work which have shown that European based companies aim to increase their production activities in these countries, especially in China. As the industry is likely to see an increase in R&D costs, the production share is also likely to increase in low labour cost countries such as China. However, the ownership of companies is likely to remain European due to the large R&D costs.

Figure 7.8 Global GA export shares by country 1999-2007

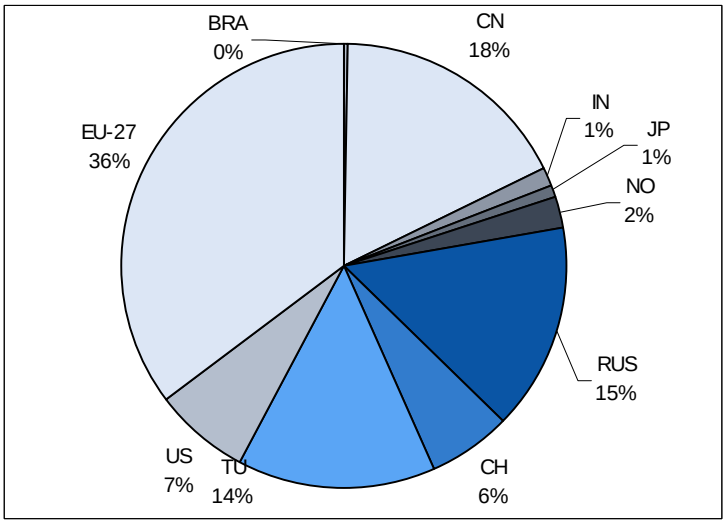
1999



2003



2007



Source: Eurostat; Comex database (percentages rounded)

Table 7.2 provides further insight into the GAS-M global shares on imports and exports.

China is the largest exporter of GAS-M in the world and holds almost 50% of global exports. However, this large share may be due to the fact that many European companies have established production facilities and joint ventures within China. A lot of products are therefore partly assembled in China and then exported for final assembly. That can also explain the large share the EU-27 hold within the category of global imports.

Another major exporter is Turkey, holding a share of ca. 20%. However, Turkey also ranks third as far as the share of global imports is concerned. Here Russia is ranked second after the EU-27.

Table 7.2 Per country share of global GA trade

Countries	1999	2003	2007	1999	2003	2007
	Share of global exports			Share of global imports		
BRAZIL	0.1%	0.2%	0.1%	2.2%	0.3%	0.5%
CHINA	29.2%	37.5%	47.9%	1.9%	5.5%	2.7%
INDIA	7.0%	5.8%	3.8%	0.2%	0.1%	0.3%
JAPAN	0.5%	0.5%	0.6%	0.5%	1.2%	0.9%
NORWAY	1.2%	1.5%	0.6%	1.6%	2.8%	3.0%
RUSSIA	0.2%	0.1%	0.3%	3.3%	8.2%	22.3%
SWITZERLAND	7.6%	7.1%	6.3%	9.4%	8.6%	5.8%
TURKEY	11.1%	26.6%	20.6%	10.7%	11.7%	11.5%
UNITED STATES	5.6%	4.7%	6.2%	7.7%	9.3%	7.4%
EU-27	37.7%	16.0%	13.6%	62.6%	52.3%	45.6%

Source: Eurostat; Comex database

It has surfaced above that the GAS-M markets in Turkey, China and the USA are characterized by large shares in global trade. Therefore these three markets deserve a more detailed description and analysis. Furthermore, the Japanese market and its structure is also characterized by some unique aspects which deserve to be addressed more in-depth. The present section provides further insight and analyses the market for gas appliances in Turkey, China, the US and Japan. This elaboration will provide insight in order to help to understand the trade analysis of the EU-27 with these countries to follow. Due to a lack of detailed data available, some market descriptions focus more on Gas appliances while others describe the characteristics of the HVAC sector in more detail.

7.3.2 Characteristics of the Turkish GAS

Market environment

Turkey has a population of around 75 million inhabitants and is strongly growing. This is a favourable environment for industries that manufacture goods for private households. And the Turkish market is perhaps the most promising European market for the manufacturers of gas appliances.

The Turkish GAS-M supply meets the requirements of the Mediterranean climate, with hot summers and cold winters, which presents a need for heating and air conditioning. However in more elevated areas far from the sea heating becomes more important. This is why the Turkish HVAC sector provides a broad range of products for different environmental requirements. In the domestic appliances sector Turkey has become a competitive international suppliers with numerous firms that have accessed foreign markets.

Table 7.3 Turkish trade with EU-27 in gas appliances (millions Euros at current prices)

Trade indicator	Million € 2007	Average annual growth rates in %		
		1999-2006	2003-2006	1999-2003
Export	€ 196.2	13.3	13.2	13.3
Import	€ 229,2	14.8	2.9	24.7
Trade Balance	-€ 32.9			

Source: Eurostat; Comex database

Companies' strategies

Since the 90's the number of Turkish companies in the GAS-M market has increased substantially. Turkish producers have established a strong market position in their domestic market but also gained market shares in foreign markets, especially in the EU. There are many Turkish brands, such as Arcelik, BEKO, Vestel, Profilo Altus and Demirdöküm in the market for domestic appliances. It can be assumed with regard to the markets served by these companies that gas appliances play a more important role for these Turkish firms than with the big international players.

Well-known international brands, such as Bosch and Siemens, command noteworthy shares in the market. They run local plants and manufacture products for the indigenous market as well as for foreign markets. Heavy investments have been carried out, not only to meet the indigenous demand but to export to European countries.

The Turkish Koc-group with its brands Arcelik and Beko has an outstanding position in the market and strongly expands abroad. Their products are delivered to the high income countries of the EU, but they only cover the low-end market segment. More of important for the Turkish manufacturers are the Mediterranean countries, Eastern Europe and Central Asia where the companies set up local manufacturing sites.

It is of note that many companies that have a stake in domestic appliances also are players in the market for HVAC. Important Turkish manufacturers are Arcelik, BEKO, Türk Demirdöküm, Baygan-Teba, Alarko, Vestel and Baymak. There are more than 70 companies in the market,OEM-manufacturers and specialized suppliers of components. The companies are about to strengthen their technological competency. Co-operations with research institutes and universities have gained importance in the efforts to catch up the international state of technology. Moreover joint ventures with internationally leading firms are launched. Alarco and the US manufacturer Carrier launched a joint-venture and command a market share of 25% with small airconditioning equipment. Since long products are designed to international standards and since 2003 compliance with the CE directives is obligatory for these products.

Manufacturers of the EU have tapped into the Turkish market. The German Vaillant started activities in 1992 and founded Vaillant Türkiye. In 2007 it acquired 78% of DemirDöküm. The Italian Ferroli has only recently invested in an own plant. The British Baxi group is in a co-operation with Baymark and has planned to relocate six plants from the EU to Turkey.[93] Japanese players are above all active in the market for air-conditioning

7.3.3 The Chinese GAS

Market environment

The Chinese market for GA has increased dramatically in the past two decades. This growth is reflected in appliance production and domestic ownership. China's appliance industry has become one of the largest in the world. The domestic demand for GA in China can be explained by the relatively low penetration rate, especially in comparison to the penetration rate of developed countries. In addition, the personal and household income gains and the large stock of appliances put into use over the last ten years will further boost the domestic market growth as many of these appliances need replacement. Gas cook tops remain the most popular cooking appliances in urban Chinese households as gas is available to great extent in cities. Urban residents in China make use of LPG, coal gas and natural gas to cook and heat. The picture of rural households is different. Only a small percentage of rural households is equipped with gas appliances. The most used sources of energy in rural households remain coal, straw and timber. Therefore the demand for gas appliances is foreseen to grow further at an above-average rate of 3.4% per year, reaching ca. 33.7 units sold in 2010. Gas appliances will account for over 95% of all conventional cooking appliances sales. It is interesting to note that the market for GA in China (especially for cooking devices) is only facing little competition as electric devices are not suitable for cooking some traditional Chinese meals. Moreover, there are often bottlenecks in the supply of electricity and in-house grids are insufficiently dimensioned. This is not only true for rural areas but also for urban areas.

Only in recent years the exports of HVAC has grown. Much of that development is due to the fact, that European manufacturers have launched subsidiaries in China. These companies tap in the market to exploit the growing purchasing power and interest in comfort. The target group is the new wealthy households in urban areas who own private real estate. These companies also erect local plants to meet the needs of the big indigenous market, but also to exploit the advantages in the labour market for their own value chain. The growing importance of China for the production of HVAC is reflected in trade figures. In the beginning of the period under investigation the Chinese imports of gas appliances strongly grew, the more recent past shows a slowing down due to the expansion of indigenous production by the transplants of European manufacturers. The opposite picture is depicted by the exports HVAC (see: Table 7.4, Figure 7.9).

[93] Germany Trade and Invest (ed.); Länder und Märkte – Türkischer Markt für Heizungs- und Klimatechnik expansiv; 19 2 2007 http://www.gtai.de/ext/Export-Einzelsicht/DE/Content/__SharedDocs/Links-Einzeldokumente-Datenbanken/fachdokument,templateId=renderPrint/MKT20070216105418.pdf

Companies' strategies

The Chinese economy has become a powerhouse for manufacturing industries and is massive involved in global markets by exports. However, there are only few companies that have direct access to the final consumer. They are subcontractors, strong in exports of parts and components. In final products much of the production is made for companies who own brands well-known by consumers in the mature industrialized countries. Within the domestic appliance sector gas appliances play an important role. This is not only based on the fact that this category of appliances is preferred by domestic clients but also the fact that Chinese appliances cover the lower end of the supply. Most of the production is in the costal area and Guangdong region is a cluster of the industry. Important companies with a stake in international markets are Zhongshan Chant Gas Appliance, Maozedongwenxue, Songyi, Guangdong Weston Gas Appliances, SANAU Gas-appliances, Asialord Electric Appliance and FireKing. Most of the exports concern domestic and portable appliances.

Among the important European companies with plants in China are Riello, Buderus, Viessmann. Their objectives are not only dedicated to serve the Chinese market but also other Asian market. In many cases the production of parts and components for Europe is dedicated to the marketing of low-end products.

In domestic appliances most of the big globally acting manufacturers run plants in China. The exports of gas appliances to Europe comprise 90% domestic appliances, only the remainder is HVAC (Figure 7.9).

Table 7.4 Chinese trade with EU-27 with gas appliances (millions Euros at current prices)

Trade indicator		Average annual growth rates in %		
	Million € 2007	1999-2007	2003-2007	1999-2003
Export	€ 456.4	24.1	27.5	20.8
Import	€ 53.7	5.4	1.9	9.0
Trade Balance	+€ 402.7			

Source: Eurostat; Comex database

7.3.4 The US GAS

Market environment

As the largest economy in the world, the US market for air conditioning, warm air heating and commercial industrial refrigeration comprises more than 800 U.S. manufacturing facilities around the country, having produced appliances with a value of slightly more than $35 billion in 2005 (Census of Manufacturers). The value of unitary equipment reported in the 2006 Current Industrial Report (MA333M) was 9.3 billion, exceeding heat transfer equipment with its value of 7.3 billion (AHRI).
The entire HVAC industry in the US had ca. 973,364 employees earning a payroll of more than $36 billion. The table below provides a more detailed overview of gas appliances market shares within the US.

Table 7.5 Market shares of specific gas appliances in the US

Appliance	Gas appliance market share (in %)				
	1999	2001	2003	2005	2007
Gas furnaces	51	52	52	52	51
Gas ranges	35	35	36	35	35
Gas water heaters	51	51	52	52	51
Gas clothes dryers	22	22	22	21	21

Source: US Gas appliance manufacturers association

Companies' strategies

The investigation in the supply side of the HVAC sector unveils a strong position of US manufacturers in air-conditioning. There are numerous manufacturers that supply a broad range of products run by different fuels or current. However, their international orientation is low. In residential heating warm-air circulation plays an important role. This technology is not widespread in Europe, it failed to attract consumers. The heating technology that is preferred in many European countries for residential central heating, wet systems with boilers is not yet wide spread in the US but has gained some importance in recent years as a more comfortable alternative. Most of the US owned companies in this market segment are medium-sized and not strongly involved abroad. Companies, such as Heatco, Wayne Combustion Systems, Carlin Combustion Technology distribute their products in North America and only few exports to the EU are reported (Table 7.6).

Many of the bigger European players have a stake in the US market and since long local production is carried out. Among them are well-known Italian companies like Riello, Polidoro, but also smaller companies like Bruciatori. Other big European players also run production sites in the US like BBT North-America and Viessmann. The European companies face noteworthy competition above all from Japanese firms.

Table 7.6 US trade with the EU-27 with GA (millions Euros at current prices)

Trade indicator		Average annual growth rates in %		
	Million € 2007	1999-2006	2003-2006	1999-2003
Export	€ 59.1	9.8	11.9	8.4
Import	€ 147.2	14.9	16.8	13.9
Trade Balance	-€ 88.1			

Source: Eurostat; Comex database

US firms command a strong position in fuel-cells, based on spill-over from the military and the space sector. It is expected that this technology will have a strong impetus on the HVAC market in the years to come (see: Chapter 7.4.1). If US firms succeed in an early introduction of heating applications in this market the European manufacturers will face a tough challenge in the American market.

In the sector of domestic appliances consumer preferences are quite different between the US and Europe. As far as manufacturers do not want to stay in market niches they have to design products for both markets. As a consequence the big players in the market run manufacturing sites and design offices in both markets.

7.3.5 The Japanese GAS

Market environment

The Japanese GA market is characterized by different challenges and opportunities for manufacturers and consumers. Despite the large city gas networks across large Japanese urban areas, so-called *All-electric homes* have been penetrating the market for household appliances in recent years. The concept introduces induction heating cooking appliances and CO2 heat pump water heaters. The Japanese Gas Association has introduced a counter concept called *With Gas*. The concept aims to promote the benefits of gas usage by highlighting aspects such as comfort, economic efficiency, environmental performance, assurance and safety. The last aspect is of crucial importance for Japanese companies as a lot of R&D activities are devoted to improve the appliances safeties with regard to earthquakes.

The Japanese national energy policy is also helping to drive the uptake of gas air conditioning. One reason is the ability of the gas systems to significantly reduce demand for electricity during the summer peak. The underlying reason lies in the reduction in seasonal fluctuations of gas demand due to an increased use of gas air conditioning (Japanese Gas Association).

Companies' strategies

In the domestic appliances sector Japanese companies do not play an outstanding role in global market, although there are some big companies such as Toshiba with worldwide activities. The reason for that abstinence is based on the fact that traditionally the needs of Japanese consumers are quite different from consumers in other industrialized countries. Other big Japanese manufacturers like Ocarina are not even known abroad by their name. Contrary to Europe gas appliances, ovens and cookers are more widespread in Japan, but even there they do not cover the high end supply. Manufacturers from the US and Europe dominate the global market and have even been able to attract Japanese consumers in recent years, as more advanced appliances are concerned.

In the sector of HVAC Japanese manufacturers play an outstanding role in the global market. The most prominent suppliers are Honda and Yanmar with their products ECOWILL and Genelight respectively. The Japanese manufacturers enjoy the advantage of joint initiatives between gas utilities, public authorities and appliance manufacturers. For a detailed discussion see chapter 7.4.1. They are in the lead in µ-CHP and fuel cells and attractive partners for the application of advanced know-how. Often joint ventures are created for the distribution of Japanese products or products that are based on Japanese key-components. These are important strategies for HVAC products that unlike consumer electronics cannot be sold over the counter. In the US Honda co-operates among others with Climate Energy LLC and in Europe with Vaillant.

The strength of the Japanese HVAC sector is not reflected in the bilateral trade figures with the EU. The trade with gas appliances is on a very low level. The co-operations between European and Japanese in the area of HVAC do not affect the bilateral trade markedly as is depicted in Table 7.7. This is explained by the fact that the predominant exports of Japanese manufacturers of HVAC are prime drives, such as internal combustion engines. They are not within the scope of gas appliances in the trade nomenclature and by that are not reported in the bilateral trade statistics.

Table 7.7 Japanese trade with EU-27 in GA (millions Euros at current prices)

Trade indicator	Million € 2007	Average annual growth rates in % 1999-2007	2003-2007	1995-2003
Export	€ 5.8	14.8	4.9	25.7
Import	€ 14.2	10.7	9.0	12.6
Trade Balance	-€ 8.4			

Source: Eurostat; Comex database

7.3.6 Comparison of the EU-27 with important competing nations

In order to properly compare the EU gas appliance sector with the main competing nations, Eurostat COMEX trade data has been analysed. Developments in trade flows reveal the performance of the EU, compared to the main competing nations. Figure 7.9 provides the trade balance of the EU-27 countries with the global key players, which were identified to be China and Turkey in terms of imports. Both countries have exhibited a sharp increase in export to the EU-27 area since 1999. China has focussed mainly on domestic appliances as far as exports are concerned. Whereas Turkey shows a more mixed export package to the EU and does exhibit an increase in HVAC products. The other established and emerging economies export rather little to the EU-27 area. The trade characteristics displayed in Figure 7.9.

The main export markets for the EU are Russia, the US, and its neighbouring countries, Turkey, Norway and Switzerland. In particular the rapid growth in exports to Russia is remarkable. Manufacturers located in the new Member States are heavily involved in the Russian and other markets of the former CMEA. They exploit their traditional strong business linkages and use their cost advantages in comparison with manufacturers of the old Member States. Some of these manufacturers are affiliated to companies from Western Europe. Almost all EU trade focuses on HVAC products. This is coherent with earlier production figures seen above. Exports to the US are driven by high performance appliances. With HVAC products energy efficiency and comfort attract consumer preferences. The same is true for the exports of domestic appliances.

China is a net exporter of GA to the EU, which can be seen an indication for increased competition by China on the global GA market. This is mainly due to the large domestic appliance imports from China. Close trade linkages with China are explained by different driving factors. Bulk electronic components are procured from China. The country has become an important production location for parts assembled in GA. Numerous European manufacturers run production sites in China. They serve the fast growing Asian economies with products designed in Europe. In particular, in domestic appliances final

goods are also delivered to Europe, in HVAC the deliveries focus more on semi assembled components.

The EU is a net exporter to Russia, the US and its neighbouring countries. These are likely to be the countries over which the EU has a competitive advantage. Field work has further shown that many European manufacturers of HVAC and domestic appliances are active in outsourcing parts of the production chain to China and India. However, until today large parts of the assembly lines as well as the R&D facilities remain in the EU.

Turkey, with its rapidly growing market, is an exceptional case. Figures do not expose a proportionately large increase in exports to the EU in comparison to the overall growth rate of Turkey. This suggests that the growth of the Turkish market is fed by local demand for GA. Turkey is not only a big market but it provides the highest growth potential in the long-run, beside the Asian economies. Numerous manufacturers of HVAC and domestic appliances have invested in this market. The industrial infrastructure is well developed and offers many opportunities for local procurement. This means that there is a potential to deliver more intermediary products to the EU as is currently the case. Moreover Turkey is a hub to get access to the Arabian Peninsula and central Asia. This makes the country even more attractive for foreign direct investment.

There is a net export of domestic appliances from Turkey to the EU. However, this export is similar to the size of Turkish net imports in the HVAC market. This suits to the fact that there are at least two Turkish manufacturers of domestic appliances that do not only enjoy indigenous growth but strategically invest in export markets. The market for HVAC is more difficult. There are some trade barriers that result from technical requirements, safety provisions, energy efficiency and consumer preferences, who tend to be more aware of environmental aspects of HVAC than of domestic appliances.

Based on these figures, it can be concluded that the EU's GA exports are mainly focussed on HVAC whereas its imports are focussed on domestic appliances. In earlier chapters, it has been concluded that the GA HVAC sector is bigger in terms of production than the GA domestic appliances. It is also interesting to review the trade figures as compared to the production figures. Table 7.8 provides an overview of the size of extra EU trade in GA products compared to the production in the EU. From the export ratios (Export divided by production) we see that the domestic appliance export ratio is significantly higher than the HVAC export ratio. Although overall exports to non-EU countries is dominated by HVAC, it export ratio is relatively small. Import ratios (Import divided by net demand (Production minus export plus import)) exhibit a similar pattern. High import ratios of domestic appliances compared to the HVAC sector. It can thus be concluded that GA domestic appliances have easier access to international markets. Potential reasons for this are fewer barriers to trade in terms of installation requirements and a higher level of standardization in domestic appliance group. Generally speaking, the subsector domestic appliances is strongly globalized, worldwide production networks and the big players have noteworthy stakes in the most important markets in America, Asia and Europe. This has had an impact on the structure of the subsectors. In domestic appliances global players are dominant and SMEs are the exception to the rule. In HVAC there are big European players with certain stakes in overseas markets and SMEs contribute much to the supply in the European market.

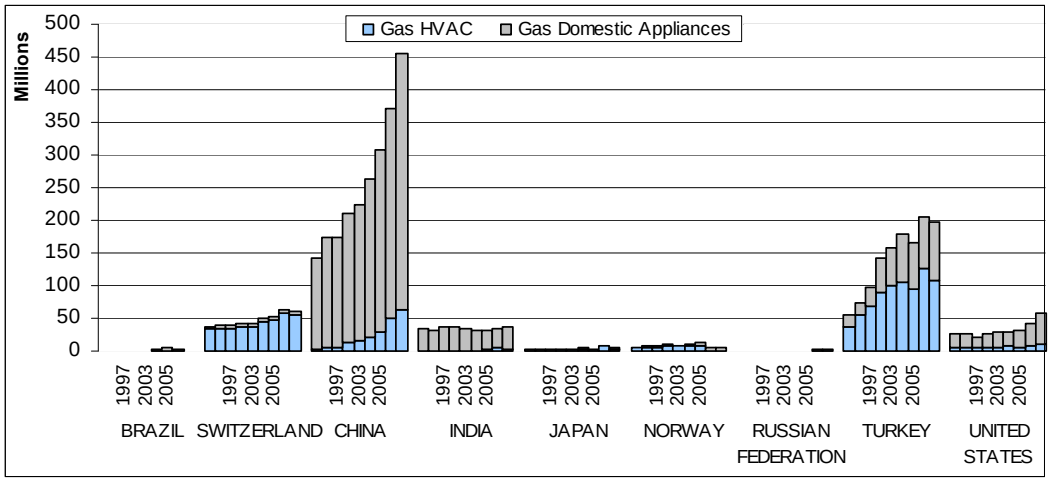
Table 7.8 Export and import ratios: Extra EU GA trade 1999-2007

Export ratios / Import ratios	Exports / Production in % / Imports / (Production - Exports + Imports) in %								
	1999	2000	2001	2002	2003	2004	2005	2006	2007
Export ratio HVAC	7.2%	8.4%	7.1%	6.7%	8.5%	11.0%	12.3%	17.7%	19.8%
Export ratio Domestic Appliances	21.8%	24.5%	25.7%	25.3%	26.7%	34.5%	37.8%	40.1%	43.6%
Import ratio HVAC	2.2%	2.7%	2.3%	2.7%	2.9%	3.2%	3.5%	4.2%	4.0%
Import ratio domestic appliances	21.7%	23.4%	21.2%	24.1%	26.5%	32.3%	32.5%	34.1%	39.9%

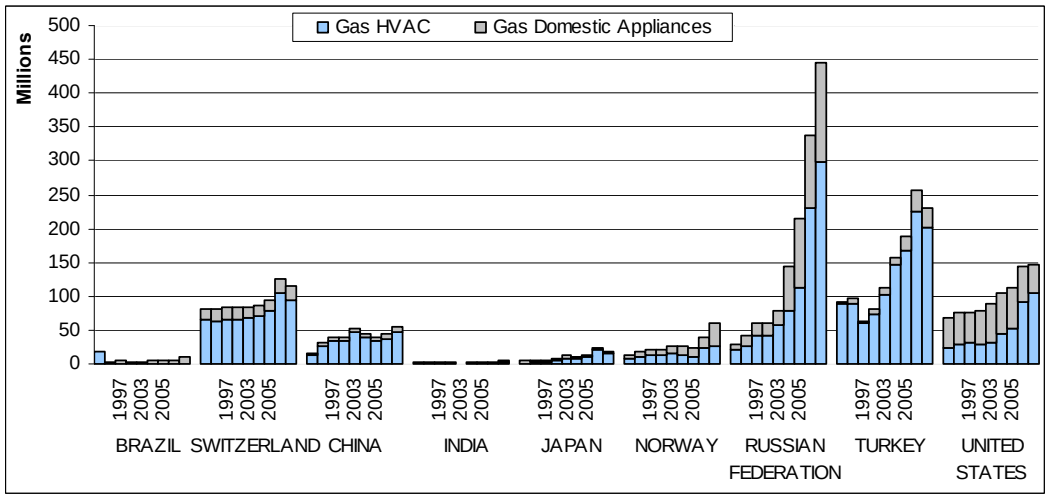
Source: Eurostat; Comex database

Figure 7.9 EU-27 GA Trade. Extra EU-27 Imports.and Exports (millions Euros at current prices)

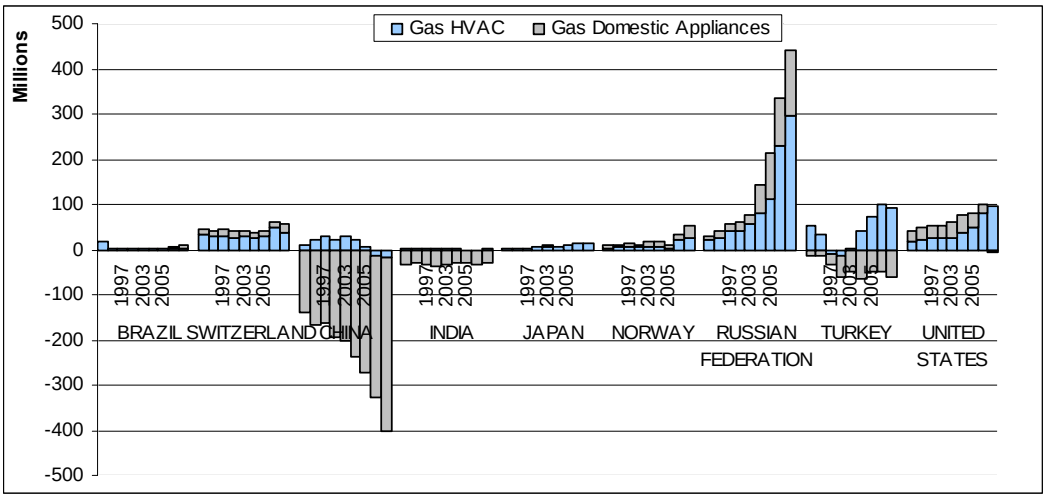
EU-27 Imports



EU-27 exports (millions Euros)



EU-27 Export – Import (millions Euros)



Source: Eurostat; Comex database

Table 7.9 provides insight in the export specialisation of the global players. The degree to which the countries in the table are specialized for export is calculated as follows: As a reference for the degree of export specialization, the sum of all countries exports in the table (the EU-27 regarded as one country) is set in relation to each particular country.

The table shows that the EU-27 is neither specialized, nor lagging behind in terms of export specialization when compared to the reference group of countries.

China and Turkey have specialised in GA compared to the reference group. This is an explanation for the large the export from China to the EU-27. Exports from the EU-27 to the other countries are explained by the relative low export specialization.

Table 7.9 Export specialization 1999-2007 of GA -trade

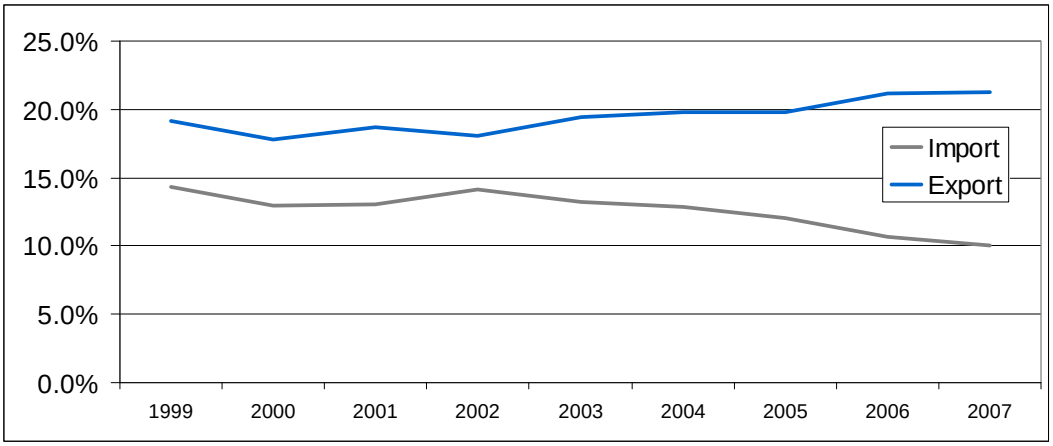
	1999-2001	2002-2004	2005-2007
EU-27	1.0	1.1	1.0
Brazil	1.4	0.9	1.1
Switzerland	1.0	1.0	0.9
China	2.9	2.6	1.2
India	0.9	0.6	0.6
Japan	0.2	0.4	0.6
Norway	0.3	0.4	0.4
Russia	0.6	0.7	1.0
Turkey	1.9	2.5	2.3
US	0.7	0.5	0.5

Source: Eurostat; Comex database

7.3.7 Comparison with important competing nations, GA versus other goods

The developments in extra EU trade in GA compared to the developments in trade with appliances of other feedstock are depicted in Figure 7.10. Appliances run by other feedstock are the appliances identified in the statistical definition of chapter 4.5. The share of GA in total appliances imports has decreased over time, while the share of GA in extra EU exports has increased. These figures provide a clear indication that GA is performing better than its non gas equivalents, in terms of extra EU exports. It can thus be said that GA appears to have a competitive advantage over the non-GA sector. As far as imports are concerned, the share of GA is declining, compared to the total EU appliances imports.

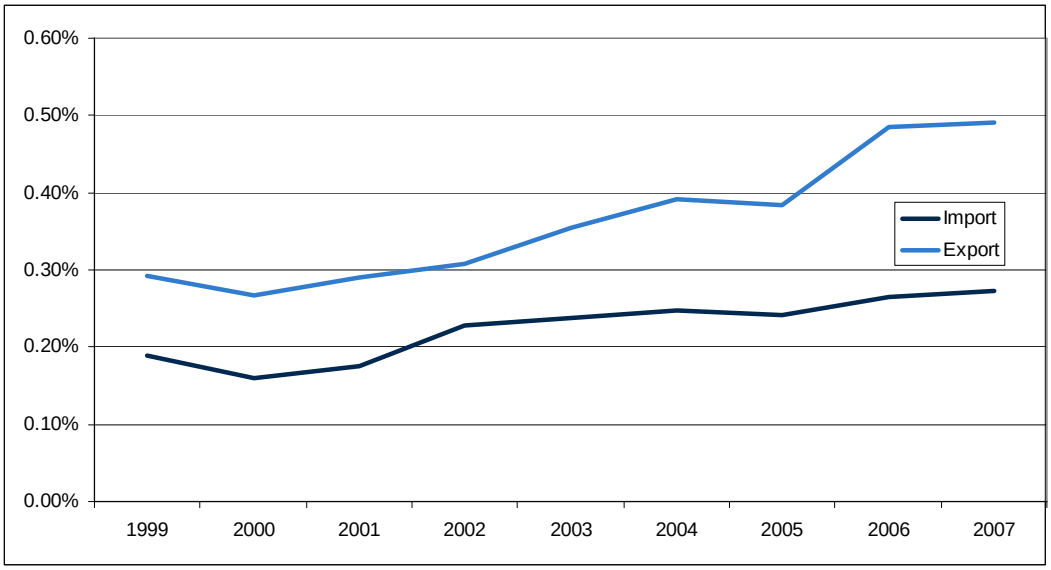
Figure 7.10 GA extra EU-27 trade as percentage of total EU-27 appliances trade



Source: Eurostat; Comex database

Figure 7.11 shows the extra EU trade of the GA sector compared to extra EU trade of manufacturing as a whole. Similar to the earlier analysis, this also shows an increase in importance of GA exports, compared to manufacturing. Similar to exports, the GA imports appear to be of increasing importance as well.

Figure 7.11 GA extra EU-27 trade as percentage of total EU-27 Manufacturing



Source: Eurostat; Comex database

7.3.8 Revealed Comparative Advantage intra EU-27 (RCA)

This paragraph is devoted to assess the comparative advantage of EU-27 countries with respect to intra EU-27 trade of GA. Only intra-EU trade flows of those products have been taken into consideration.

This measure is based on the notion that the development of a sector's exports is not the only decisive factor for the purpose of assessing the international competitive capacity of a sector in a country. Competitiveness can also be considered in terms of the extent to which foreign competition manages to establish a foothold on the domestic market. This measure thus employs the net exports, i.e. the difference between exports and imports. The net exports of the GAS-M are compared with the country's total net exports of appliances (electric or with other feedstock). This reference value is better than total exports, as it eliminates distortions which might arise as a result of trade with natural resources. The formula for the calculation of comparative competitiveness generally also incorporates a logarithmic function, as this improves the statistical properties of the employed indices with regard to symmetry and domain of definition. The formula which has been applied to calculate the RCA is presented below. Considering a sector *S* and a set of countries *C*, this index is built as follows:

$$RCA = \frac{X_c^s / X_c^S}{X_C^s / X_C^S}$$

Where *s* indicates a subsector of *S*, *c* a country of the set of countries *C* and X stands for exports. X_C^s would then be the exports of the set of countries *C* of products belonging to subsector *s*.

Positive results indicate competitive advantages, negative results indicate competitive disadvantages. It should be kept in mind that this measuring concept compares the sectors within the national context only. This also has its benefits, however. Differences from country to country with regard to general local conditions, trade policy or the level of development are unable to distort the results.

The revealed comparative advantage shows the performance of each country. Table 7.10 RCA at national level provides the results of the calculations. Negative figures indicate a comparative disadvantage for GAS in a country. The top 5 producers perform rather well, apart from the UK. Remarkable is that apart from these countries, no other country exhibits a comparative advantage. Even more remarkable is the fact that no EU-12 country exhibits a comparative advantage compared to other appliances.

Table 7.10 RCA at national level

	1999-2001	2002-2004	2005-2007
EU-15			
AT	-235	-284	-352
BE			136
DE	19	18	18
DK			
ES	-106	-116	-120
FIN			
FR	120	107	109
GR	-131	-126	-123
IE			
IT	5	4	4
LUX	-165	-156	-141
NL	209	227	174
PT	-37	-49	-57
SW	-331	-309	-304
UK	-133	-132	-125
EU-12			
BU	-248	-230	-221
CY	-173	-173	-171
CZ	-332	-413	
ET	-203	-199	-175
HU			
LV	-132	-133	-136
LT	-139	-139	-135
MT	-190	-186	-185
PL			
RO	-87	-67	-58
SK			
SL			

Source: Eurostat; Comex database

7.3.9 EU-27 Revealed Comparative Advantage (RCA) at global level

This paragraph is devoted to assess the comparative advantage of EU-27 countries with respect to global trade of GA. In assessing the performance of EU-27 GA trade, no national trade flows have been taken into account, but only the comprehensive trade flow of the EU-27 towards the following 9 economies: Brazil, China, India, Japan, Russia, United States, Turkey, Norway and Switzerland. The data used for the analysis range from 1999 to 2007.

Table 7.11 shows that China exhibits a strong comparative advantage in both GAS-M sectors which with regard to the trade balance is more competitive than other sectors of the total manufacturing industries. Furthermore, the comparative advantage India has in domestic appliances is remarkable, which matches the export figures shown in 7.3. Turkey's RCA also matches the trade pattern identified earlier. All other global player show a comparative disadvantage compared to other appliances.

Table 7.11 RCA at Global level

		1999-2001	2002-2004	2005-2007
Brazil	Gas HVAC	-211.7	-186.6	-204.8
	Gas Domestic Appliances	-77.5	30.7	-116.8
Switzerland	Gas HVAC	47.1	50.2	-0.3
	Gas Domestic Appliances	-35.2	-24.2	-172.2
China	Gas HVAC	-68.7	14.9	73.2
	Gas Domestic Appliances	486.2	480.5	349.3
India	Gas HVAC	-33.5	-59.8	143.4
	Gas Domestic Appliances	438.2	456.6	226.7
Japan	Gas HVAC	35.4	-27.4	-76.1
	Gas Domestic Appliances	43.8	-6.6	-94.1
Norway	Gas HVAC	35.0	46.4	-122.8
	Gas Domestic Appliances	-16.2	-53.9	-208.9
Russia	Gas HVAC	-388.8	-493.7	-497.0
	Gas Domestic Appliances	-198.1	-306.8	-530.5
Turkey	Gas HVAC	69.9	92.8	-4.2
	Gas Domestic Appliances	253.4	294.6	57.0
US	Gas HVAC	-56.3	-83.9	-173.9
	Gas Domestic Appliances	28.1	10.5	-85.5

Source: Eurostat; Comex database

7.4 General trends in product-design and product features

The GAS comprises a broad variety of products. The least common denominator of their applications is the use of the energy content of gas for heating, cooking, lighting, moving etc. Traditionally the combustion of gas was necessary to get the benefit. With fuel cells

an electrochemical process is exploited. This is currently the most advanced process with the highest efficiency ratio.

Once more it makes sense to distinguish between GA in the market segment HVAC and domestic appliances. In the recent past the pace of technological progress has been highest in the area of HVAC while for domestic appliances no major progress took place.

7.4.1 Technologies for HVAC

The first leap forward to more efficient heating of dwellings and the production of sanitary water was based on the introduction of condensing boilers. This technology uses the heat of exhaust gases which otherwise gets lost. In combination with the reduction of the flow temperature a significant increase of the efficiency has been reached.

With fuel cells other power generation processes are available and with heat pumps the energy content of the environment can be used for heating. Especially for fuel cells combined generation of heat and electricity seems to be the ultima ratio for the efficient use of energy. Currently field tests are being carried out. However, at present so-called micro-cogeneration is above all marketed with traditional combustion processes and modulating burners.

Here the state of the art in these new technologies is disclosed and the state-of-art in Europe is compared with Japan and the US where the most advanced competitors are located.

Heat pumps

A heat pump is an equipment to exploit differences of the heat density in different places. It moves energy from one place to another. It can be used for cooling and heating, if a heat pump with a reversible process is used. Heat pumps can be categorized by the process:

- Compression heat pumps and
- Absorption heat pumps.

Compression heat pumps use mechanical work to move energy from a cold source to a warmer heat sink. Predominantly they are run by electric motors, but other sources of energy are possible. Absorption heat pumps use thermal energy. This can be provided by electricity or other burnable fuels. Gas is a frequently used feedstock. However the market penetration is low.

The selection of the energy source is very important for the efficiency of a heat pump. Air, soil and ground water are most frequently used. The disadvantage of air is the seasonal fluctuation of the temperature that reduces the efficiency of a heat pump in particular during the winter. The simultaneous use of heating and cooling, for instance the cooling of a computer centre and the heating of bureaus increases efficiency much.

In the area of heating and hot-water production electric heat pumps are most widespread. Heat pumps run by gas are available, but most of the experts assess their reliability as not fully satisfying. However, the first gas heat pump was introduced in Japan in 1987 and today the number of installed units exceeds 400,000, annual sales come up to 50,000.[94] But these gas heat pumps are above all applied for cooling and air-conditioning. There are only few applications for primary heating. In Europe gas heat pumps are of minor importance. Beside some domestic production imports from Japan play a mentionable role.

The market for heat pumps in Europe is estimated to around 500,000 units in 2007. The market showed strong growth in the recent past. For eight countries statistics are available. Their market grew by 6% up to 370,447 units.[95] Most of the countries with the exception of Sweden – the biggest market that slumped by nearly a quarter - showed a double digit growth. The Swiss market stagnated. These differences in the growth momentum are explained by the maturity of the markets. In Sweden and Switzerland the market penetration is high. In Sweden around one third of one and two family houses are equipped with heat pumps. Nearly exclusively they are run by electricity. In the other European markets heat pumps are at a more early stage of adoption. The early and high dissemination of heat pumps in Sweden is explained by the extreme weather conditions and the absence of a well-developed gas grid.

The supply side of the market indicates a process of consolidation which is typical for a maturing industry. Up to now the market is fragmented and shows the typical characteristics of a market driven by high pace of technological innovations. There exist many small companies that spent considerable efforts to develop heat pump technologies and adapt them to market needs. In the more recent past bigger companies in the market for heating, ventilation and air-conditioning (HVAC) have gained interest in these technologies and acquired smaller players in the market, e.g. the German Buderus Bosch Thermotechnik (BBT) has taken over the Swedish IVT and the Danish Danfoss the Swedish Thermia and the French Avenir Energy. This indicates that market penetration will accelerate.

The dominance of electric heat pumps in Europe is underscored by a report of a French gas utility. Nearly all air conditioning installations in Europe are run by electricity, in the US around 5% of the applications are run by natural gas and in Japan the share comes up to 17%.[96] These figures imply that the market for gas heat pumps is underdeveloped in Europe. Due to experts this has not changed much in recent years.

Stirling engines

The stirling engine is an external combustion engine and was patented already in 1816. But it has never had a breakthrough comparable to the internal combustion engine. In recent years with growing concern on CO_2 emissions and higher energy prices the

[94] Colin Heap; The Gas Heat Pump (GHP), 19th March 2002, http://www.heatpumpnet.org.uk/files/gasengineheatpumps.pdf

[95] European Heat Pump Association (EHPA); European Heat Pump Statistics – Outlook 2008, http://www.ehpa.org/script/tool/forg/doc523/20080908-21%20heat%20pump%20outlook%202008.pdf

[96] Fidel Valle, Josö L. Bergadä; STATE-OF-THE-ART IN EUROPEAN GAS HEAT PUMPS: A DOUBLE TECHNOLOGY APPROACH - ABSORPTION & COMPRESSION, http://gasunie.eldoc.ub.rug.nl/root/1997/2039716/

advantages of the invention of Mr. Stirling have been rediscovered and several manufacturers of GA have developed stirling engines for micro-heating applications. The external combustion process heats gas in a cylinder that is pumped into a cold cylinder. The resultant contraction and expansion pushes pistons to move in sealed cylinders and results in a rotary movement. Stirling engines can produce heat and power simultaneously. However the efficiency in the generation of electricity is much lower than that of fuel cells.

Fuel Cells

Generally speaking, a fuel cell is a device that combines hydrogen and oxygen in an electrochemical process. In a direct way it produces electricity without the energy losses of traditional processes burning fuel with heat and water as by-products. Therefore fuel cells are esteemed as an ecological source of energy. However, pure hydrogen is not sufficiently available and its production requires high energy input. There are many different fuel cell technologies:

- Phosphoric Acid fuel cell (PAFC)
- Proton Exchange Membrane fuel cell (PEMFC)
- Molten Carbonate fuel cell (MCFC)
- Solid Oxide fuel cell (SOFC)
- Alkaline fuel cell (AFC)
- Direct Methanol fuel cell (DMFC)
- Regenerative fuel cell (PAFC)
- Phosphoric acid fuel cell (PAFC)
- Zinc Air fuel cell (ZAFC)
- Protonic Ceramic fuel cell (PCFC)
- Microbial fuel cell (MFC)

Numerous of these fuel cell technologies can use natural gas and other hydrocarbons. However, the higher the portion of carbon the more challenging is the task to run a fuel cell.

Fuel cells generate heat and current in a single process and by that are well suited for MCHPs. Of the different technologies above all PEMFCs and SOFCs are applied for HVAC.

Most advanced in the development of fuel cells is Japan. The manufacturers, Ebara-Ballard, Matsushita, Toshiba, Toyota and Sanyo started offering PEM (proton exchange membrane) fuel cell MCHP to private households in 2005, in a large field trial. Solid-oxide fuel cells (SOFC) are also being developed in Japan. Kyocera has demonstrated prototypes with an impressive electrical efficiency.

In the USA the initial R&D on fuel cells was stimulated by big public space projects and the needs of the defence industry, in particular submarines. Du Pont has a quasi monopolistic position in membranes for PEMFCs. Other North American players are in joint-ventures with Japanese companies. These manufacturers are on the cutting edge of technology.[97]

[97] John K. Olliver; Fuel Cells in the World, Paris 2000.

In Europe the pace of technological progress in fuel cell technologies has accelerated throughout the decade. Big engineering companies have invested in this technology. Siemens took over the Westinghouse business area and Alstom is in a joint-venture with Ballard of Canada. The European gas utilities are fostering the development in particular by field tests and the major European boiler manufacturers are actively working on adapting fuels cells to the needs of heating and hot-water production, to increase the efficiency and to create integrated systems with high operational reliability. Most of the fuel cells for heating and hot water production are based on SOFC technology, but also PEMFCs are available.

Future trends

Pace of innovation in boilers reduced

Since the 1990s the technological progress for GA was high in the market for HVAC. It was in the lead as compared to electric appliances and appliances run by other feedstock. Advanced GA with modulation of the combustion process and condensing boilers have been introduced to the market earlier than other appliances and stimulated the dissemination in the market. Energy efficiency increased much and approached the physical borderline. Appliances run by oil have caught up much of the lead of GA and losses in market shares will come to an end or at least slow down.

Future innovations in the now widely available combustion technologies will only provide marginal progress. High efforts would be necessary to further increase energy efficiency. However, only few of them will be of economic benefit for GA that fall under the scope of the GAD. Additional components will be used above all for heating and hot water production beyond 100 kW.

Progress by cogeneration

New concepts are necessary, such as the above discussed technologies, heat pumps, the stirling engine and the fuel cell. The last two mentioned technologies are closely related to cogeneration and can be used for micro-generation of heat and power (µCHP). Such products are well-suited to reduce losses in power generation by the use of thermal energy for heating and hot-water production. However with products that fall under the GAD there is a challenge to design small CHP that can be marketed by a satisfying price-performance ratio.

In recent years µCHP have been launched on the market. They are run by traditional internal combustion engines. The more advanced µCHP in the market are run by stirling engines. But experts expect them to be only an intermediary solution until fuel cells are supplied that are satisfyingly reliable and can be operated over a long period, at least a decade with few services, maintenance and repair. The availability of such fuel cells will provide further stimulus for HVAC run by gas.

The infeed of power generated in a µCHP into the electric grid is not only a by-product for the increase of the overall energy efficiency. Feed-in tariffs are an important tool to support the profitability of µCHP for the owner and to give impetus to the dissemination of this technology. This means that public policy and the acceptance of the utilities is of importance for the pace and level of dissemination of µCHP.

Multi-feedstock systems

Another development direction will be towards complex systems using different fuels. In particular the use of renewables is in the interest of public authorities that have obliged themselves to meet objectives for the reduction of CO_2 emissions. In many cases the combination of different forms of energy is a precondition for the use of renewables. Their supply is alternating or not sufficient to meet total demand for heating and hot water production. Examples are

- The use of solar thermal panels that are used overwhelmingly in the production of hot water. This may be sufficient in southern Europe. However in central and northern Europe additional thermal energy is required during winter times.
- In winter times heat pumps are not always sufficient to meet all of the demand.

Another reason of the use of multi-feedstock appliances might be the security of energy supply. One important advantage for the use of gas in combination with other feedstock is given by the fact that no investment in and additional space for a tank is necessary if a gas grid is available. The electric grid provides the same advantages and in case of only low additional power demand it may be even more suited.

Biomass HVAC

Biomass boilers have become an attractive option for the combustion of renewables. They are available for a broad range of feedstock,

- solid, such as wood waste, shavings, bark and specially prepared wooden pellets and grown energy crops,
- liquid, such as bio fuels and
- gaseous, land fill gases, wood gases, gas from purification plants, sewage gases.

The development is not driven by technological developments but by political objectives, such as reducing the dependency on energy imports, balancing the CO_2 balance and last but not least to give support to farmers who – as a result of the opening of agricultural markets to international competition – are facing more and more challenges.

Boilers that burn biogas fall under the GAD and have to be regarded as a specific market. These boilers face certain requirements which are caused by the quality of biogas, the caloric value alternates not within the narrow range as with LNG and LPG. Moreover, some generation techniques output gas with a low Wobbe Index only and pose high requirements on the control of the combustion processes. Specific measures have to be taken for an efficient and save burning of the fuel. Certain sensors are applied for this purpose, above all Lambda and SCOT sensors. Technical solutions for biomass burning GA could also contribute to the problems that will be raised by initiatives to liberalize the European energy market. The cross-border trade of gas shall be supported by the harmonization of the gas quality and this requires an expansion of the range for the Wobbe Index.

Innovation challenge

There are two further developments to be discussed that provide a challenge for gas appliances,

- the dissemination of heat pumps and
- the growing attractiveness of air-condition in southern Europe.

These days most of the heat pumps marketed are run by electric power. The dissemination started in Northern Europe with Sweden in the lead. In Germany already in the early 1970s heat pumps have been introduced but the market penetration did not develop that much, but is the most important market after Sweden. Currently heat pump sales are strongly growing in numerous European countries like Finland, Austria and France. In other countries noteworthy sales volumes are growing (e.g. Belgium, the Netherlands, Italy and Spain).[98] This broad development indicates that investment in electric heat pumps shapes the market and reduces opportunities for gas driven heat pumps.

There are several concepts for heat pumps run by gas that are currently developed. However, an area-wide introduction is not imminent. A noteworthy dissemination is expected in the coming three to five years. The concepts are – with regard to energy efficiency – promising. Another advantage for a late but dynamic dissemination of this kind of heat pumps lies in the fact that in contrast to electric heat pumps they do not need additional electric power. In particular in countries with low installed loads in residential buildings this is an advantage.

The lag in the development of gas fired heat pumps as compared to its electric counterparts provides also an explanation deficit in the market for small air conditioning (AC) appliances. For this purpose reversible electric heat pumps are applied. Even air-to-air heat pumps are sufficient in southern Europe for heating during winter and in summer times they are applied for cooling. The interest in this kind of AC has been strongly growing in recent years. It is said that experience with AC in cars has induced this trend. Small adequate gas appliances for AC in residential buildings have not yet been made available.

Technological competitiveness

With regard to the market penetration Japan is on the leading edge in µCHP and fuel cells. One driver for this is a joint initiative of the government, the utilities and industrial manufacturers to introduce advanced technologies for HVAC.

Japan commands three quarter of the market for µCHP. They also command a noteworthy stake of the US market in line with the traditional close trans-pacific economic relationships. The US-market is more difficult than the Japanese and the European markets for µCHP. Electricity is much cheaper and there is a preference for warm air heating. The European market is more diversified. Beside the big manufacturers of HVAC there are many smaller companies in market niches that supply µCHP. Even Japanese manufacturers have a stake in the European market.

The major problem of fuel cells is long-term reliability. There are broad-range field tests underway in Japan, but a final solution has not yet been reached. This is why the stirling engine is perceived as the next step in improving µCHP until the fuel cell will have reached its final marketability. It is expected that R&D on fuel cells carried out by the car manufacturers will provide first solutions. High budgets are spent that cannot be allocated

[98] Business Research Group Ltd. (ed), The Boiler and Heating System Market in the European Union, Final Draft June 2006, pp 279.

by the manufacturers of HVAC. Even the big ones are compared to the big automotive groups medium-sized. With regard to this problem and the size of the task to come to long-term reliable fuel cells the fragmented R&D landscape in Europe is perceived as a disadvantage.

7.4.2 Domestic appliances

There are at least two advantages of appliances run by gas as compared to appliances run by electricity or other feedstock. Firstly, it is a primary energy source. There are no losses for power generation and the distribution of electric current. Secondly, gas is a clean primary energy and waste gases of the combustion processes are to a certain extent not hazardous. An exhaust duct is not necessary, the usual ventilation in a living room or a kitchen is sufficient.

These advantages have given impetus to the development of domestic appliances that are run by gas, cookers, ovens, refrigerators, washing machines and dryers. At the end of the 19thcentury even lamps were run by gas. However, the energy efficiency was low and production ended decades ago.

Appliances run by gas for heating, cooling, washing, drying are available in the market. Already in the late 1960s innovative products were developed in co-operation with gas utilities who were interested in the opening up of new markets. However, most of these products additionally need electric current. This makes GA more complex as appliances that can be run by the use of electric current only. Moreover the installation poses higher requirements on the qualification of the installer and access to gas and electricity is necessary simultaneously. GA for cooling, washing and drying do not play a noteworthy role in the market. There are only very few products available for the use in residential areas. Some applications for leisure time and other market niches are known. But with regard to the total market these products are not of importance.

Future trends

The only GA with a noteworthy portion in the market for domestic appliances are gas ovens and –cookers. The advantages of these products are not limited to energy efficiency, but they also have a favourable price-performance ratio as compared to electric appliances and allow for easy heat adjustment without a delay in response. There has always been interest in gas run appliances although technological progress and additional features in electric appliances have shifted some of the demand away from gas appliances. However, in the new Member States the demand for gas ovens and –cookers is high as a cheap alternative and traditions in cooking will contribute to stabilize the market. However, due to progress in electric appliances in particular the latest technology electric induction cooking and baking has removed the advantage of easy heat adjustment. Moreover, in newly erected residential buildings in-house gas grids are the exception and the option for private households to install gas appliances does not exist.

The advantages of GA with alternating usage sites are given by portable energy sources, such as gas cylinders and cartridges. However, more recent technological developments in solar cells, batteries and fuel cells suggest that the advantages in the niches are dwindling.

8 Strategic outlook

This final chapter builds upon the findings of the previous chapters and provides a strategic outlook for the gas appliances market in the EU-27. Medium- and long-term developments and trends are assessed and evaluated. Focus is on economic developments, and an outlook for the energy market and more specific for the future state of the gas market. Technological innovations are taken into account and possible obstacles for the further development for the market are assessed.

Following the insight into economic developments and the current economic and financial crisis, an outlook for the energy market is presented. A medium-term outlook until 2013 is followed by a long-term trend forecast until 2020. Furthermore, a SWOT-analysis summarizes the most eminent strengths, weaknesses, opportunities and threats for the gas appliances sector.

8.1 Market developments and trends for the EU gas appliance market

The perspectives for the European gas appliance market are to be described throughout this paragraph. In general, the time horizons until 2013 and 2020 reveal that the EU-27 market for gas appliances will continue to grow. However, certain regions and sectors within the industry will experience more growth than others; some are likely to face a decrease in sales.

In order to detect the developments until 2013 and 2020 certain aspects have to be assessed beforehand. Different factors will influence the market development. As this outlook builds upon quantitative estimations it is important to also outline the factors that are likely to influence these estimations in the medium- and long-term perspective. Before the quantitative outlook for the gas appliance market is provided this chapter will cover the following aspects:

- Economic development;
- Energy market development;
- Gas appliance market development

Under the last point a medium- and long-term outlook will be presented.

8.1.1 Economic development

The Ifo World Economic Climate indicator has worsened further in the first quarter of 2009 and has fallen to a new historic low. The decline is solely the result of more unfavourable assessments of the current economic situation; the expectations for the coming six months have improved somewhat. The deterioration of the Ifo World Economic Climate has affected all major economic regions: the economic climate

indicator is more unfavourable than the world average in Western Europe and Asia; in North America it corresponds to the world average; and in Latin America, Oceania, the CIS countries, Central and Eastern Europe and especially in the Near East countries the climate indicator is above the world average. The export and import expectations indicate a clear decline in world trade in the first half of 2009.

The Ifo Economic Climate in the euro area has worsened again in the first quarter of 2009 for the sixth time in succession. The economic climate indicator deteriorated in the first quarter of 2009 in all countries of the euro area and has now reached a historic low. The current economic situation worsened most markedly since the last survey in Germany and the Netherlands. But the most unfavourable assessments of the economic situation still come from France, Ireland, Portugal, Spain and Italy. The economic situation is clearly above the euro-area average especially in Finland and Austria, but also in the youngest euro member states, Slovakia and Slovenia. In the coming six months, in the opinion of the CESifo-World-Economic-Survey (WES) experts, the weakening of the economy will continue in the euro area albeit at a slower pace.

The financial crisis triggered by the bursting of the US real-estate bubble has spread over the entire world to different degrees and markedly slowed down world economic growth in 2008. This year, all major regions in the world will be in recession. In the second half of 2008, economic growth in the United States became persistently negative. The economic slowdown which started to emerge already in 2004 turned into a full-blown recession. For the first time since 1991, private consumption growth turned negative on a quarterly and annual basis. The crisis in the US banking sector reached a new level in September when the US government decided not to bailout Lehman Brothers. Although authorities were able to prevent a bank run, they could not stop the sharp deterioration in business and consumer sentiment. Combining the severity of the financial crisis with the structurally too low national saving rate and the associated too high current account deficits, it is most likely that the US economy will continue to underperform relative to other parts of the world and its own history in the years to come.

As in many parts of the world, the sharp hike in commodity prices pushed inflation in the European Union higher than expected. Along with the continuing international financial market crisis, this led to a significantly worse economic situation in Europe. This situation was compounded by the strength of the euro and the sharp downturn in property markets in Ireland, Spain and the United Kingdom. The downturn during the second half of 2008 started to become quite pronounced especially in the large European economies. Quarterly GDP growth in Germany, Italy and Spain all declined during the third quarter of 2008 and basically stagnated in France. Both orders and production in manufacturing sectors fell dramatically during recent months. Also future business outlook and consumer confidence plummeted during this time. The faltering expansion of the world economy, the continuing fall of property prices in some European economies and the financial market problems will continue to have negative effects on all European countries. Both the euro area and the European Union will go through a deep recession this year. Not until 2010 do we expect quarterly growth rates to turn positive again.

Table 8.1: The economic framework conditions for the EU-27

Indicators	Change rates in percent									Aagr[1)]
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012 - 2020
Gross domestic product	1.3	2.3	2.1	3.2	2.9	0.8	-3.4	0.9	1.6	1.6
Private consumption	1.7	1.9	1.9	2.3	2.1	0.7	-0.7	0.7		
Gross fixed investment	1.1	2.7	3.4	6.4	5.4	0	-9.9	-0.5		
Residential building			-0.1	4.4	0.3	-7.3	-7.3	-0.6	1.9	1.7

1) Aagr = annual average change rate in %.

Source: Goldman Sachs, March 2009, EUROCONSTRUCT, December 2008, own calculations.

The overall economic development will definitely influence the GAS. Two channels are of importance, the development of the household income and the investment propensity in the economy. The current deepening recession has an impact on both of these aggregate. Most pronounced is the development with the investment, while private consumption will show only a slight reduction. The currently available forecasts do not expect a turnaround in 2009, only in 2010. The years after the situation will improve and the European economies come back on the track to potential growth. However, in contrast to past recessions most experts see only a moderate recovery and not a dynamic uptake. (Table 8.1)

The impact on the GAS is expected to be different for both of the subsectors. Generally speaking, the market environment for domestic appliances is likely to be somewhat less affected by the downswing than the HVAC market environment as this subsector is expected to be directly affected by the decline in new residential building. Admittedly domestic appliances are also stimulated by new housing construction but the impact is expected not to be as strong as for HVAC, due to the fact that the bulk of the business is replacement in existing buildings and upgrading of the equipment in kitchens etc. In the recent past the market for gas cooking and ovens had experienced a noteworthy stimulus in new Member States that currently suffer more than many other European countries from the crisis. As a consequence the domestic appliances subsector, already affected by the long-term trend in electric appliance substitution, is expected to experience a stronger impact in those new Member States.

8.1.2 European housing market

The building market is a major market segment for the GAS. It comprises two segments, the residential and the non-residential sector[99]. For the assessment of the perspectives for the GAS the expected developments for the European construction activity are

[99] Euroconstruct, European Construction: Market, Brussels 2008

investigated. There is no outlook for the total EU available, only for the EU-19 countries.[100] In 2007 the volume of the total building market was €1, 203 billions of which 59.8% was residential and 40.2% non-residential. € 654 Bill. (54.4%) were spent for the construction of new buildings, € 549 Bill. (45.6%) were devoted to renovation and maintenance (R&M). With regard to residential construction the share of R&M is still higher (48.9%).

In Eastern Europe[101] in 2007 the building market amounted to € 160 Bill. of which 54.0 % was residential and 46.0% non-residential. The figures show the different stages of development in Western and Eastern Europe. In Eastern Europe a greater share of building construction output was commercial buildings. Unlike Western Europe the share of new buildings was much higher and represented 89%. Only 11% of the building market based upon R&M. In addition to the fact that the structure of the building market is different in the EU and Eastern Europe, the other big difference between these two parts of Europe relates to the level of development of construction. On average, construction expenditure per capita is 3 to 4 times higher in the West than in the East.

In EU-15 about three-fourths of the residential construction market is concentrated in the five main West European Countries France, Germany, Italy, Spain and United Kingdom. In the past years from 2005 to 2007 the development of the residential construction market in Western Europe was characterised by growth rates in real terms, even though in 2007 residential construction nearly stagnated in total in the EU-15 countries. Since July 2008, the economic and financial climate has deteriorated permanently and the threat of a worldwide recession in the wake of the financial crisis has taken its toll. At the same time, the housing market, which had already begun to correct itself, is experiencing a dramatic reversal against the backdrop of a severe credit crunch. Investment in new buildings sharply drops in 2009 while R&M will come to a standstill only and bolsters the decline. The share of R&M of total residential construction comes up to around one half. (Table 8.2)

As an indication for the development of residential construction in the new Member States the evolution in the four countries mentioned in the table are taken. The slump is of similar size, however, due to higher trend growth only a slight minus is expected for the current year and investment will uptake during 2010. However the strong growth that stimulated demand for gas appliances in the new Member States will come to an end. Only in 2011 a higher growth momentum can be expected.

[100] EU 15 plus Czech Republic, Hungary, Poland, Slovak Republic.

[101] The three Baltic States, Bulgaria, Romania, Slovenia, Croatia, Serbia, Turkey, Ukraine, Russia (Although the bigger of the new Member States are missing the development in this group of countries is used as an indicator to better understand the construction activity in this country group)

Table 8.2: The European market for residential construction

Indicators	Billion €	Change rates in percent (constant prices)						
	2007	2005	2006	2007	2008	2009	2010	2011
EU-15	**701.5**	**2.5**	**4.4**	**0.3**	**-7.3**	**-7.3**	**-0.6**	**1.7**
New	355.3	4.5	6.3	-1.7	-14.3	-13.8	-1.9	2.2
Renovation	346.2	0.4	2.5	2.5	0.0	-1.5	0.5	1.3
EU-4[1)]	**18.4**	**3.7**	**6.3**	**13.7**	**9.2**	**-2.0**	**2.5**	**6.8**
New	12.9	2.3	6.3	17.5	11.2	-3.1	1.7	7.9
Renovation	5.5	6.7	6.3	5.7	4.5	0.7	4.5	4.3
EU-19	**719.9**	**2.5**	**4.4**	**0.7**	**-6.8**	**-7.1**	**-0.5**	**1.9**
New	368.2	4.4	6.3	-1.0	-13.3	-13.2	-1.7	2.5
Renovation	351.7	0.5	2.6	2.6	0.1	-1.5	0.6	1.4

1) Czech, Republic, Hungary, Poland, Slovak Republic.

Source: EUROCONSTRUCT, December 2008, own calculations.

According to the EUROCONSTRUCT forecast a significant downturn in new construction will take place. After the climax in 2007, the number of newly completed housing units is expected to drop by ca 860,000 between 2008 and 2010 (Table 8.3). As usual, the steepest decline will occur in the more sensitive multi-family housing sector. Western Europe could have lost therefore 800,000 housing units in 2008 and 2009 together, 500,000 of which are in Spain. In absolute terms, Italy, the UK, Ireland, France and Germany have also seen sharp decreases; in relative terms, Portugal and the four Nordic countries will suffer a significant decline.

Table 8.3: The European housing stock and completions

Indicators	1000 units						
	2005	2006	2007	2008	2009	2010	2011
EU-15							
Housing Stock	183986	186061	188042	190056	191895	193268	194599
Housing completions	2175	2354	2385	2094	1579	1490	1523
EU-4[1)]							
Housing Stock	23480	23684	23869	24082	24284	24543	24730
Housing completions	203	194	228	267	246	257	276
EU-19							
Housing Stock	207466	209745	211911	214138	216179	217811	219329
Housing completions	2378	2547	2613	2361	1825	1747	1799

1) Czech, Republic, Hungary, Poland, Slovak Republic.

Source: EUROCONSTRUCT, December 2008, own calculations.

The outlook regarding R&M of existing homes will also be affected by the macroeconomic environment. The main reason for this is lower disposable household income. In Western Europe for the next years stagnation could turn out to be the best case

scenario. Again the most hard-hit country will be Spain, followed with obvious distance by the UK and after it by Italy. France and Germany might be the first countries to experience a significant recovery.

This market's development will depend mainly on the stimulus measures taken by governments to encourage energy-saving improvements in homes. All European countries have assessed the implications of these measures, which pertain to over 200 million housing units in 2008 for EU-19 zone, in terms of energy consumption, greenhouse gas reduction and jobs in the construction sector. These measures can help limit the housing crisis now and in the future by offering the construction sector and the related manufacturing industry a major alternative in terms of demand and jobs.

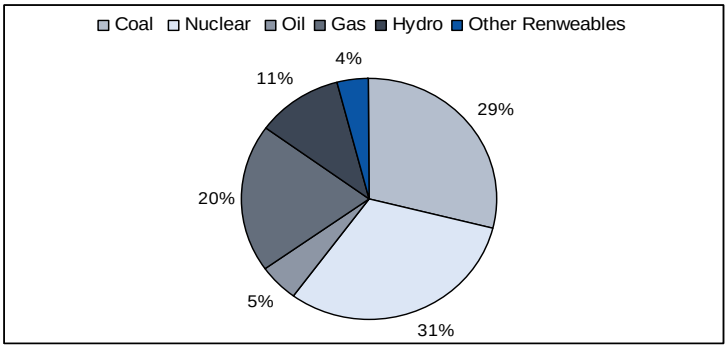
Especially due to the current economic and financial crisis the economic environment has to be assessed in order to sketch the future development of the gas appliance industry. Even though the economic recession might have a negative impact on the gas appliance industry, public economic stimulus packages may also enhance the market for gas appliances and enhance sector growth. In many EU Member States governments have put forward economic policy packages which enhance the building of new houses and are likely to also enhance the demand for gas appliances.

8.1.3 Energy market development

In order to better place the perspectives of the gas appliance industry in an overall context, it is also crucial to highlight future trends in the energy markets, especially the market for natural gas. Following the recent developments in energy commodity markets described earlier in the report, an examination of future trends completes the picture and enables an assessment of how prices and market shares for gas are likely to develop.

The future development of EU and world energy markets has been studied by various international institutions. Scenarios created by the EU or IEA for instance all show a considerable increase in world total primary energy consumption, with more or less similar proportions of oil, gas and coal in the energy mix (see figure below). As can be seen in the figure 8.1 below, new policies aim to significantly increase the share of other sources of renewable energy in the European energy mix for power generation. Similarly, all forecasts assume that electricity demand will increase in the EU.

Figure 8.1: Overview of power generation composition in the EU



Source: ECORYS, EURACOAL 2005 data.

According to the IEA, the projected rate of growth in global gas demand is lower than over the past quarter of a century. Warmer winter weather across the northern hemisphere, coupled with higher prices, largely offset the impact of relatively rapid economic growth worldwide over that period (IEA, 2008).With a presumed straight annual growth rate of 1%, total primary demand in Europe will have reached approximately 517 million tons of gas.

It has been elaborated above that the prices for natural gas have experienced the highest increase among other energy commodities since 2006. As prices for heating oil have decreased and those for LPG stayed more or less stable, only natural gas and electricity prices have increased. Concerning a long-term perspective, natural gas prices are assumed to broadly follow the trend in oil prices, because of the continuing widespread use of oil-price indexation in long-term gas supply contracts and because of inter-fuel competition (IEA, 2008). Consumers of gas vary in their ability to reduce gas consumption due to higher prices. In many EU-27 countries households do not have a back up for central heating and cooking and are therefore forced to accept higher prices. Furthermore, the change to another fuel may not be possible on short notice and cause further costs (IEA, 2008). The share of domestic gas use is likely to stay stable until 2020. However, the possibility of gas gaining shares is also not too likely if prices remain high.

8.1.4 Gas appliance market development

The medium- and long-term perspectives for the EU-27 gas appliances market are presented in this section. The medium-term outlook to 2013 builds upon a market research database. These statistics, covering the period from 2004 to 2013, focus on the production of GA and non-gas products in million pieces.

The market data statistics for the forecasted trends to 2013 differ from the Prodcom database providing ex-post data until 2007. The Prodcom database focuses on production values in Euro while the market research database is based on production volumes in million pieces. Minor differences in developments between the two databases regarding the overlapping period 2004-2007 could be explained by the differences in category definitions and scope. Nevertheless for the sake of clarification the ex-ante data from the market database has been applied to forecast the developments from 2007 until 2013.

Market developments until 2013

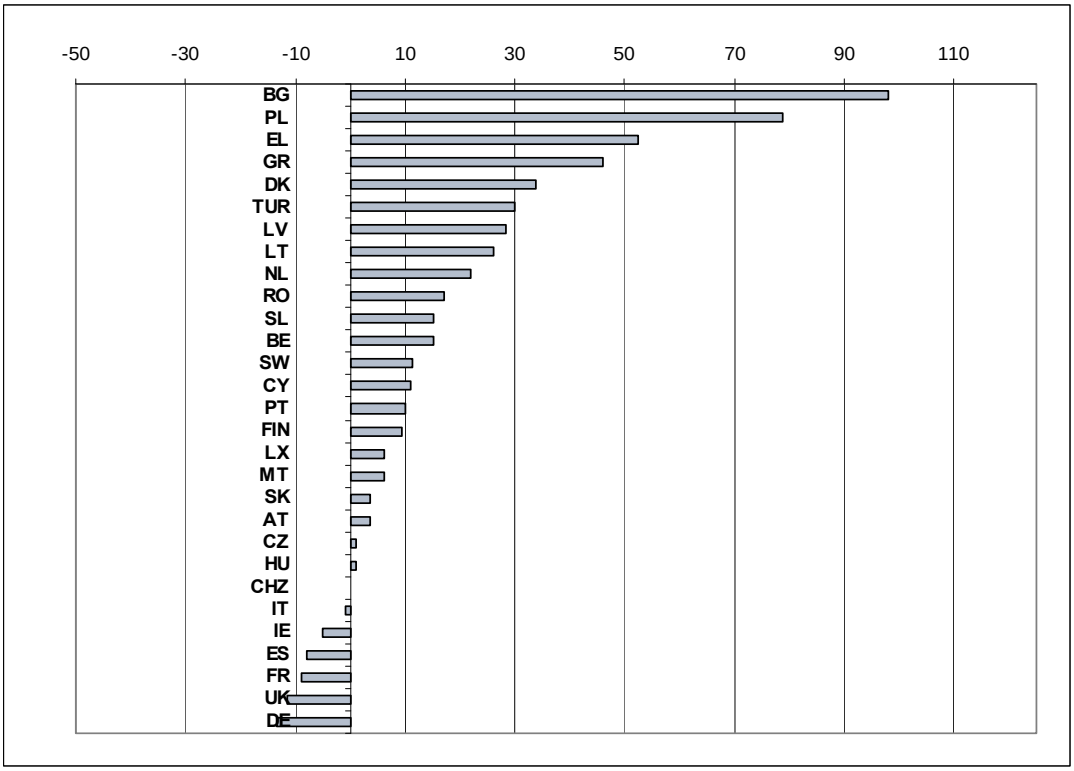
In order to gain further insight in the developments of the GAS over time, an analysis of the evolution of market sizes of the EU-27 countries is presented. The analysis focuses on the following two aspects, taking into account HVAC and domestic appliances for the two categories, gas and non-gas;

- The development of average annual growth rates; and
- The development of total percentile growth of GA compared to non-gas appliances

Figures present EU-12, EU-15 and EU-27 findings. In order to pay attention to developments in individual Member States, a market growth forecast includes developments prior to 2007.

The expected GA market growth in each of the EU-27 Member States is presented in Figure 8.2 (with the base year 2004 equal to 100). Amongst the growing markets are Bulgaria, Poland, Estonia, Greece, Denmark and Turkey. Italy, France, the UK, Spain, Ireland and Germany, on the other hand side, are expected to face a decline in their GA market size. This is remarkable, given the fact that, apart from Ireland, these countries are amongst the largest producers of GA. This is caused by demand side effects, such as demography and investment needs .These developments can be linked to the observations made earlier in Chapter 7. Many of the EU-12 Member States are likely to experience further market growth, due to the above mentioned backlog demand.

Figure 8.2: Expected indexed market growth 2007-2013 for GA



Source: market database

Table 8.4 provides an insight on the expected average annual market growth developments in different industry sections until 2013 in the EU-27, the EU-15 and the EU-12. The data shows the market for domestic gas appliances is likely to experience stagnation in terms of growth in the entire EU-27. However, the situation differs to a great extent in the EU-15 and EU-12. While the annual growth rates are likely to be negative in the EU-15, the backlog demand in the EU-12 is expected to allow for further growth in that region. The product group of HVAC Gas will continue to experience little growth in the entire EU-27. Higher average annual growth rates can also be observed for the EU-12 in comparison with the EU-15. Gas appliances are still cheaper and easier to afford for households in the EU-12. This forecasted growth can be due to the ongoing modernization in the EU-12 and the lack of, as yet, price competitive non-gas HVAC in the years to come. However, the bulk of the growth is expected to be generated by non-gas HVAC and domestic appliances. HVAC non-gas products are foreseen to experience

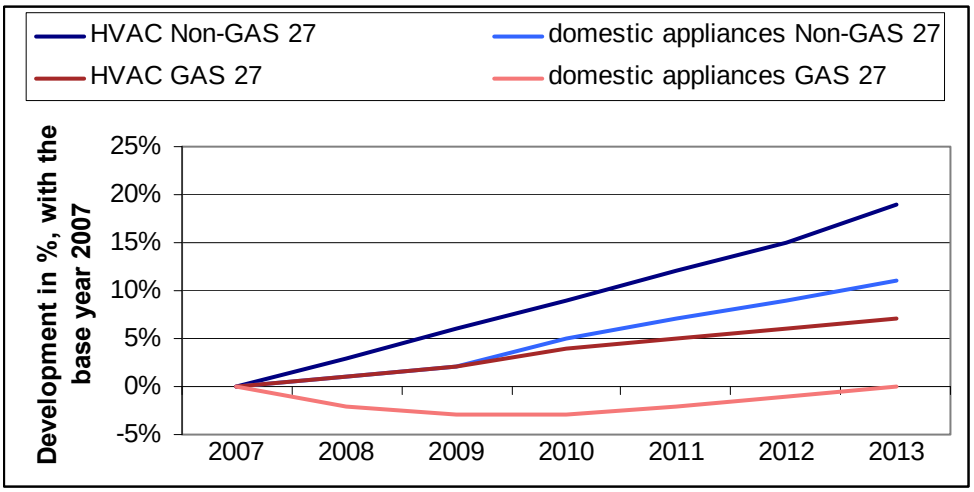
average annual growth rates of ca. 2.9% from 2007 until 2013. Non-gas domestic appliances will also see an annual market growth of ca. 1.8% until 2013.

Table 8.4 Forecasted average annual growth rates from 2007 until 2013

Categories	Average annual growth rate from 2007 to 2013 in %		
	EU-27	EU-15	EU-12
HVAC Gas	1.1	1	2.4
HVAC Non-Gas	2.9	2.8	4.6
Domestic Appliances Gas	+/- 0	-2.3	5.9
Domestic Appliances Non-Gas	1.8	1.3	5.4

Figure 8.3 summarizes the above made statements in total percentile developments. The figure clearly outlines the EU-27 market developments in absolute terms from 2007 until 2013. The product group of HVAC Non-Gas is forecasted to see a total percentile increase of 19% in 2013, compared to 2007. The market for domestic appliances Non-Gas will have increased by 11%. Coherent with the annual growth rates presented above are the findings that the HVAC Gas product group will see an overall increase of 7% by 2013, compared to 2007 and that the domestic gas appliances will stagnate at +/- 0% after experiencing a decline until 2010 and recovering afterwards.

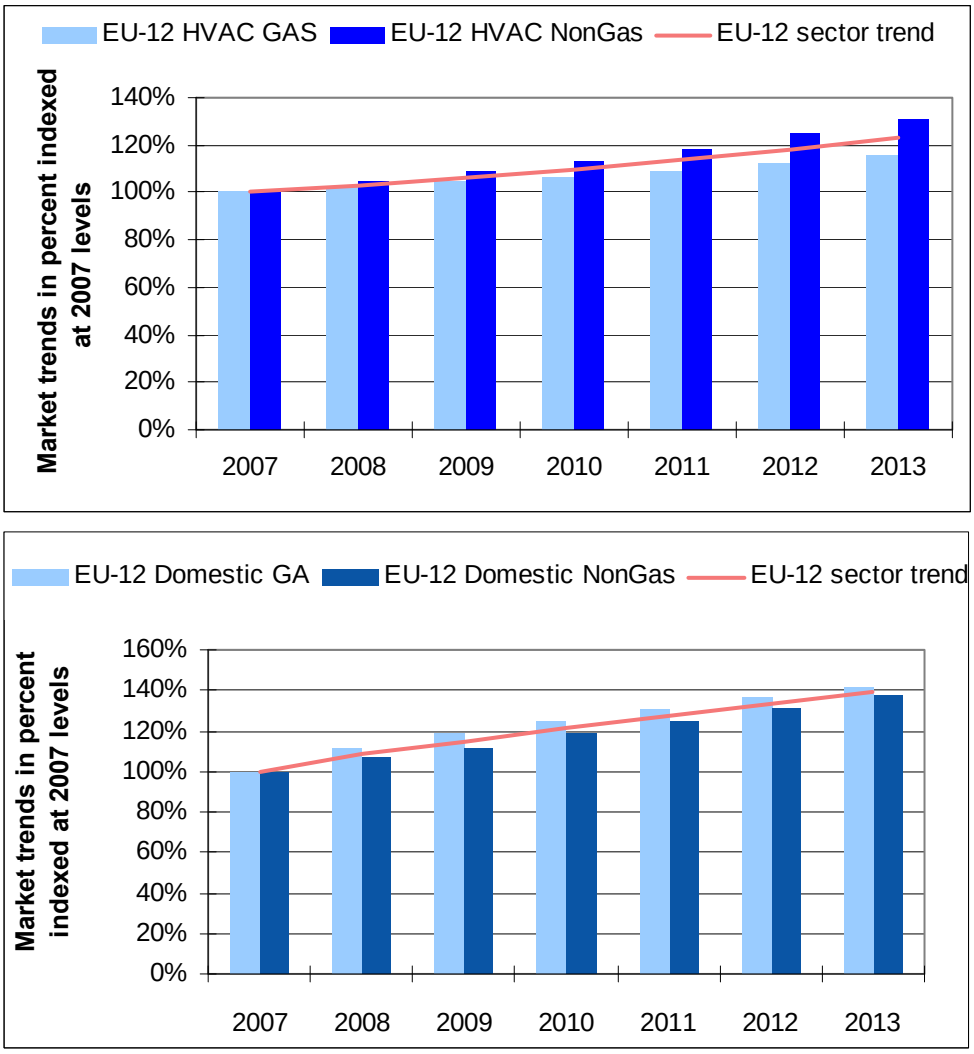
Figure 8.3: EU-27 market developments for selected appliance categories from 2007 to 2013



Source: market database.

A more detailed analysis of forecasted developments in the EU-12 and the EU-15 is given below. The developments in the EU-12 are presented in Figure 8.3. Results show the EU-12 is likely to experience a market growth for all product categories. Even the domestic gas appliances, which are foreseen to experience stagnation on the EU-27 level, will still experience an additional growth of up to ca. 41% in 2013 compared with 2007 levels.

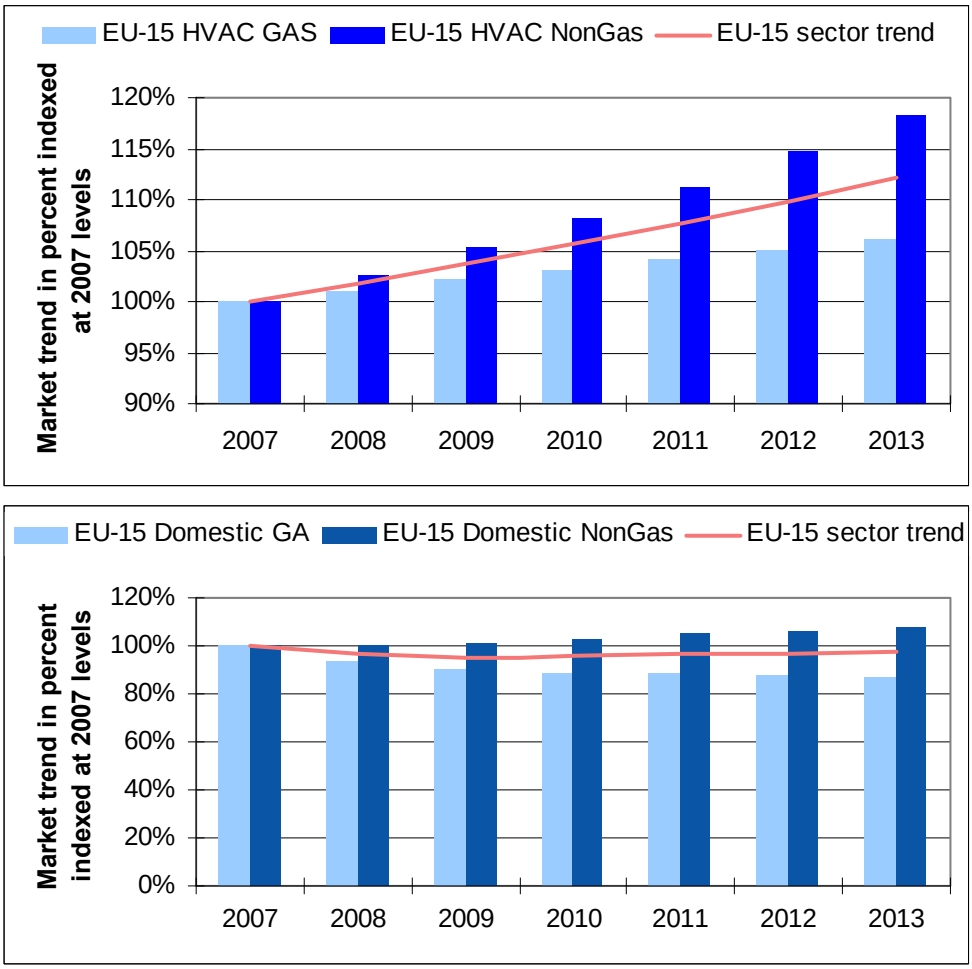
Figure 8.4: EU-12 market developments for selected appliance sectors until 2013



Source: market database.

Figure 8.5 provides an overview of the market developments and trends in the EU-15. The figure shows that the EU-15 growth rates are smaller when compared to the EU-12 and that the market for domestic gas appliances is likely to face substantial decreases of up to approximately -13%. All other listed appliances are likely to experience growth for the forecasted time horizon until 2013.

Figure 8.5: EU-15 market developments for selected appliance sectors until 2013



Source: market database.

Besides the fact that the market for HVAC and domestic appliances continues to grow, driven by growth in the HVAC sector, the market shares for gas-fired appliances are likely to decrease over the 2013 time horizon.

In order to be able to set the above presented developments in relation with presented ex-post developments from earlier chapters, Table 8.5 provides an overview of ex-post average annual growth rates in terms of value produced from 1995 to 2007, and ex-ante average annual growth rates in terms of volume to be produced from 2007 until 2013. Figure 8.6 tries to illustrate ex-post developments and ex-ante projections. It displays the total growth until 2007 and the forecasted growth, applying the foreseen average annual growth rates until 2013.

The following developments can be stated:

- The annual average growth rate of HVAC Gas has been the highest among all four product groups from 1995 to 2007. This growth will continue, but at much lower annual rates.
- The annual average growth rate of HVAC Non-gas products has been positive in the past. This product group will continue to grow and although the rate will decrease in

absolute terms, the product group will experience the highest growth rates in comparison to the other three product groups.

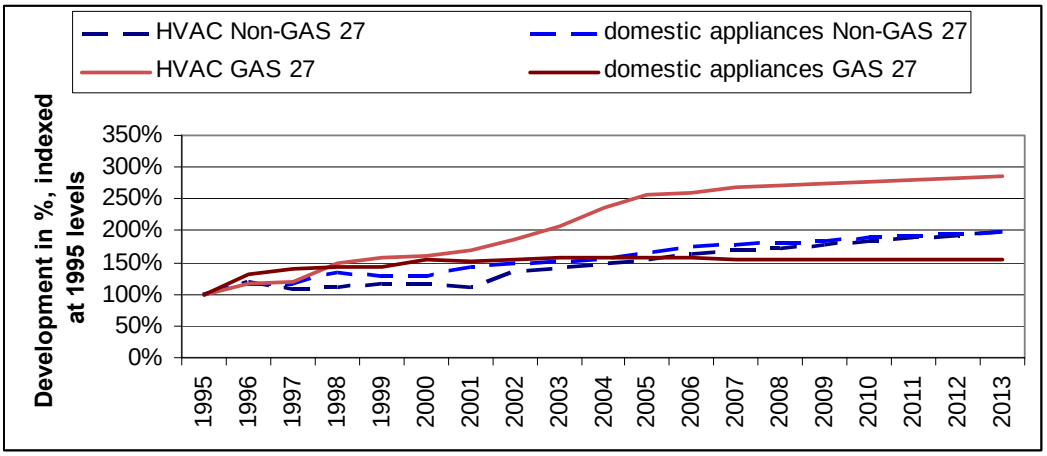
- Domestic GA have experienced positive annual growth rates from 1995 to 2007. As it has already been depicted in Table 5.1 in chapter 5 the growth has been stagnating from 2003 onwards. The projections until 2013 confirm this stagnation for domestic GA.
- The product group of domestic Non-GA will also continue to grow, although not at as high an average annual growth rates as was the case from 1995 to 2007.

Table 8.5 EU-27 average annual growth rates from 1995 to 2007 and from 2007 to 2013

	Average annual growth rate in %	
Year	1995-2007	2007-2013
EU-27 HVAC GAS	8.6	1.1
EU-27 HVAC NonGas	4.4	2.9
EU-27 Domestic GA	3.8	+/- 0
EU-27 Domestic Non-GA	4.9	1.8

Source: Prodcom database, market database.

Figure 8.6 EU-27 combined Ex-Post and Ex-Ante developments



Source: Prodcom database, market database

As for EEA Member States Norway and Iceland, the share of all four appliances together makes up around 1.3% of the total EEA market. The above described developments also account for Iceland and Norway, whereas the market share of gas HVAC products and gas appliances may remain higher in Norway in the medium term, due to large gas resources within the country.

Market developments beyond 2013 until 2020

A medium-term forecast has already been provided above. To what extent these trends will continue in the long-term also depends on economic, technological and political developments. This section will therefore outline a qualitative assessment of the role certain factors are likely to play in the market development until 2020.

As far as a possible depletion of the natural gas resources and the resulting supply scarcity are concerned, a time horizon until 2020 is still too short in order to anticipate such a scenario. Natural gas reserves will be able to serve the demand in Europe at least for another 30 to 40 years. The ability to secure gas supply is therefore unlikely to cause a drastic decrease in gas appliance production and use up to 2020. Notwithstanding, as natural gas resource decrease, prices are therefore likely to increase. This fact, together with the political instability in many supply nations, may cause alternative appliances using other energy sources to become more price competitive. The share of gas appliances is therefore likely to further decrease in the long-term.

Further attention has to be paid to new energy efficiency and climate regulations on EU level. A Post-Kyoto agreement might put even more emphasis on energy efficiency and renewable energy policies; a factor that may further shift market shares towards non-gas appliances.

In addition, the current investigation into the benefits of gas quality and interoperability harmonisation across the EU, if implemented, might offer opportunities for additional market growth in conjunction with a higher degree of competition among actors.

An additional factor, which has surfaced throughout the above data assessments and the conducted field-work, is the backlog demand in many EU-12 Member States. This additional demand will be the driver for gas appliances in the medium-term. Once this demand is met the gas markets will reach a mature stage and further gas market developments are likely to be moderate overall and even negative in some areas.

The business strategies which many companies already follow demonstrate the awareness of the sector of the various degree of maturity of the gas appliances market in Europe. A diversification of the product portfolio can be regarded as a preparation of the industry for a decreasing demand for gas appliances in order to enable them to participate in new market developments thanks to new products offers.

8.2 SWOT-analysis

This section presents the SWOT-analysis for the EU gas appliances market. It draws upon findings generated throughout the entire report and information gathered from fieldwork. The analysis aims to structure and outline certain strengths, weaknesses of the GAS in the EU. This refers to the internal conditions and the performance of the sector, including the manufacturing and the service companies. The opportunities and threats are derived from the framework conditions for the GAS. They comprise the European framework conditions for the GAS, set by the regulatory environment, the non-GAS sector offering products that have the potential to be substituted or substitute GA and the non-EU competitors to the European suppliers of GAS. Table 8.6 provides the overview of the results.

Strengths and weaknesses

The following assessment discriminates between manufacturing of and services for gas appliances (GA), GAS-M and GAS-S respectively.

The GAS-M performed well as compared to the non-GAS-M. Since the mid-1990s – for the period with satisfying statistics – the subsector HVAC gained in market share. In the subsector domestic appliances this was different. The by far most important GA, ovens and cookers, lost shares to their electric counterparts. The underlying reason for these different developments is the technological development. In HVAC the introduction of condensing boilers took place first with GA, appliances with other feedstock followed suit. Condensing boilers were on the leading edge of energy efficiency as compared to boilers run by other feedstock and demand strongly grew. The replacement of old gas appliances by new ones accelerated, stimulated not only by a higher economic efficiency but by public investment incentives. Additionally a substitution of appliances run by other feedstock or electricity took place as far as consumers were able to shift to gas.

In contrast in the area of domestic appliances, there was not a noteworthy technological progress in gas appliances. Quite the opposite with cookers and ovens there was some technological progress in electric appliances. Moreover the manufacturers put much emphasis on additional features to be integrated in electric appliances to increase their attractiveness to clients. The advantages of gas appliances as compared to electric appliances with regard to manageability and functionality got lost. However, gas appliances are reasonably priced and therefore remain attractive in the less wealthy Member States.

The advantage of GA in the subsector HVAC has been fading away in the recent past. The optimization of the combustion processes has come close to physical boundaries and non-GA have caught up the lead. As a consequence further gains in market shares cannot be expected. The competition will become harder with appliances run by other feedstock. Moreover the current trend in energy efficiency is led by heat-pumps. In this area, electric appliances are in the lead whereas gas run heat-pumps are lagging behind in the market penetration. Their technology has not yet become sufficiently mature.

In the subsector domestic appliances the situation for GA will not change much. Gas appliances will not catch up the technological lead of electric appliances that has been strengthened once more with the introduction of induction heating. They are losing their former advantages in energy efficiency and quick response control of the cooking process that they had enjoyed. However, gas appliances will remain attractive for consumers in some countries. In the new Member States the reasonably priced cookers and ovens remain preferred alternatives. Likewise in countries with bottlenecks in the supply of electricity, gas appliances reduce the risk of a current supply breakdown and the dependency from a fragile energy source. This refers to countries such as Belgium, Italy and Spain, where often the in-house grid does not meet advanced requirements.

Table 8.6 The SWOT-analysis for the GAS

	Internalities	Externalities	
	Strengths	**Opportunities**	
Strong	• GA have been the technological driver of energy efficient combustion • GA can be adapted to biogas • GA can easily be combined with appliances run by other feedstock • Breakthrough in fuel cell technology will give an edge to gas • GA are price competitive	• GAD allows free trade in the EU and ensures safety	Strong
Neutral	• Competitive industrial structure • Specialized suppliers of key components • Intra-European division of labour in line with comparative advantages	• Harmonisation of gas quality standards • Ability for households to sell electricity surplus to the grid (related to use of micro-CHP) • Developments in gas infrastructures, increased diversification in gas supply and higher cross-border capacity means a secure gas supply to the EU • Gas will remain an important energy source in the EU for the next decades due to the long lasting built infrastructures • The potential development of biofuel supply via the grid may give rise to “green gas” choice for end-customers.	Neutral
Neutral	• Low investment expenditure in GA compared to other feedstock (except electric appliances) • Energy efficiency of GA • Communication discloses low GHG emissions of certain types of GA versus electricity grid-fed appliances, depending on energy mix of the country.		
	Weaknesses	**Threats**	
Neutral	• GAS-S shows national differences	• Gas prices are expected to remain relatively high • High cost of new grid infrastructure • The EU is increasingly dependent on third countries for most of its gas supply • In the long term, gas resources are to deplete • Moderate EU27 future population growth • EU gas markets mostly mature or near saturation	Neutral
	• Qualification of installers not sufficient to meet the requirements for more complex systems • Gas appliances designed to operate within a certain gas quality specification range	• Concurrent jurisdiction by overlapping of GAD and CPD • GA are affected by EPBD and EuP which raises the threat of conflicting assessment procedures	
	• Investment in GA often proves more difficult and expensive than for electric appliances	• Disperse R&D support in Europe • Strong joint initiatives of all stakeholders in Japan	
Strong	• Pace in technological progress for GA loses momentum (HVAC) • No breakthrough innovations GA (DA) • EU is lagging the Japanese market introduction for fuel cells and µCHP	• Market penetration in heat pumps (electric); gas run heat pumps are lagging • Small AC, run by electric power are on the rise • Focus of manufacturers on innovation in electric DA (new features and techniques) • Progress in renewable energies and battery technologies will reduce advantages of portable GA	Strong

The foreseeable technological progress in HVAC will follow different trends that provide an edge to GA

- Systems are developed that combine the use of different feedstock. The combustion of fossil fuels will be linked to different kinds of renewables. The advantage of GA in this context will be that investment will be less costly as far as a gas grid is available and no additional tank is needed. However, electric appliances can be even more advantageous if they are only needed to provide heat for residual demand.
- Development of μCHP provides the opportunity to reduce heat losses by the production of electricity. Gas and other feedstock can be used. However, for use with the Stirling engine gas is more suitable than other feedstock and the recently available technology is expected to prove a success in the market as compared with conventional internal combustion engines.
- The fuel cell will not be of relevance in the European market in the medium-term although broad field tests are carried out currently. Further progress is necessary for a broad dissemination. However, this technology is perceived as promising. In the long-run the fuel cell will give impetus to the GAS. This technology is most adequate for the design of μCHP because it produces simultaneously heat and electricity. The energy efficiency will be higher than for μCHP with a Stirling engine

Much effort is needed to give impetus to these technologies. European companies are working hard to innovate in the GA area. It is, however, obvious that the Japanese competitors are in the lead in μCHP and fuel cell technology. This conclusion is based on the Japanese manufacturers' experience from numerous field tests and their activity in Europe.

With regard to primary energy consumption and the emission of greenhouse gases (GHG) GA are advantageous as compared to most other fossil energy consuming appliances. This is not only caused by high energy efficiency but by the fact that the share of carbon in gaseous hydrocarbons is much lower than in liquid hydrocarbons. When compared to electricity the advantage is dependent on the primary energy source for power generation. Only nuclear, wind and to a certain extent solar energy provide an edge. As a consequence GA are attractive for public policies dedicated to the reduction of CO_2 and energy savings.

The GAS-M is well integrated in the European economy. It has exploited regional comparative advantages and the new Member States have become part of the European production network. Their strengths lie in the processing of metal and the manufacture of parts and assembled components. Many independent companies owned by domestic entrepreneurs that manufacture and market final products exits there. They sell their appliances primarily in the former Eastern Bloc. Their products are reasonably priced which is an important feature and advantage in competition with manufacturers from Western Europe in these markets. However, the companies from the new Member States face difficulties to sell their products in the old Member States. Missing distribution channels and the technological state-of-the-art hamper market access. Many of these companies suffer from a lack of capital and know-how. The sustainability of their independent existence is not secured.

Many of the privatized companies during the transformation process have become immediately, or in the meantime, affiliates or subcontractors of Western firms. Together they exploit their comparative advantages. Usually a division of labour took place with a relocation of parts of the production to the new Member States, above all the manufacture of metal parts and components. The production locations in Western Europe focus more on control technology and system integration.

The division of labour along the value chain in the EU is characterized by the availability of manufacturers of key-components for GA. The supply of technologically advanced elements of high quality is a precondition for the manufacture of high performance GA. The major manufacturers of burners and heat exchangers are located in the old Member States above all in Italy and Germany. These components are produced in large batches and sold to gas appliance manufacturers all over Europe. With the integration of the new Member States in the European economy the manufacturers of gas appliances in the accession countries take the advantage of the assemblage of these advanced components into their final products.

A real European market for GA has emerged over the past two decades. This is reflected in the structure of the industry. The big manufacturers have stakes in most of the Member States via their own brand or via regional brands that have been acquired in the past. To a certain extent the integration of smaller manufacturers into big groups has enabled them to exploit economies-of-scale. However, there remain opportunities for the common development and design of final products that will lead to additional scale effects.

Nevertheless, numerous manufacturers exist who are successful in their market segments with strengths in regional distribution channels or in certain technologies. Within this group of firms some have become drivers in advanced technologies and contributed to the pace of progress in the market with their products. Some of the big players of the industry who strongly focus on market share strategies pursue follow-up strategies in the area of technologies. As a consequence permanently new, more efficient products are introduced in the market. As long as this race to stay on the leading edge of technology exists progress will take place.

However, the current pattern of the technological progress in the subsector HVAC is a step-by-step innovation with marginal improvements. Basic innovations are in the pipeline but for gas appliances are not yet that relevant in the market. This puts growing pressure on the technologically oriented companies to maintain their lead in competition with the big European market leaders that are able to allocate more resources and have a better access to the financial market. It is of important to have a close look on this structural peculiarity that has proven to be productive with regard to the pace of technology.

Within the group of SMEs - with less than 250 employees - there are manufacturing companies that have become specialized subcontractors or OEM-manufacturers in narrow market niches. The latter pursue product strategies that meet specific needs of clients. Systems that combine different kinds of feedstock for heating and hot-water production are of major importance. Such business models are dependent on clients' interest in technologically advanced and green solutions.

Most of the small manufacturing companies are in an unsettled environment and will have to adapt their strategies to changes in clients' requirements and emerging competition from other Member States or outside the EU.

Within the group of SMEs there are companies with a focus on the development of advanced technologies. The manufacturing of these companies concerns above all prototypes and products for field tests. In recent years these research intensive companies have attracted the big players in the market for gas appliances. They have invested in these smaller players to get access to know-how, in particular in heat-pumps and in fuel cells. This is an indication of technologies that will reach the state of market introduction in the years to come.

For the bigger companies it will be decisive if they are able to allocate sufficient resources to exploit the opportunities of these advanced technologies at an early stage. Most of the big groups that pursue market share strategies have acquired stakes in these new technologies in the recent past. It will be of importance for the structure of the GAS-M if those companies who always have been technology oriented will be able to maintain their leading position with these upcoming advanced technologies. They will have to carry out heavy investments. If they fail they will lose their leading edge and come under growing price pressure.

In the subsectors domestic and portable appliances a similar development has not taken place. With domestic appliances the situation is different to HVAC. The manufacturers focus strongly on the innovation and production of electric appliances. Gas appliances do not have a noteworthy share in the market, with the exception of cookers and ovens. They meet the requirements of the lower end of the market and substantial technological progress in these products did not take place. As a consequence, the industrial structure of this subsector does not show relationships between groups of companies of similar importance for the change of technology as have been stated for the subsector HVAC.

The GAS-S is more heterogeneous and characterized by national particularities. There are cross-border activities, but they are exceptions to the rule. To a certain extent this can be explained by the fact that many of the services have to take into account regional particularities and require short response times, in particular in the case of repair and maintenance. But even in areas close to neighbouring Member States cross-border activities of GAS-S are not often carried out. The reason is that in spite of the free movement of services within the Single Market there are different national framework conditions that de facto constitute barriers to trade. In some countries the safety of operation of gas appliances is ensured by a restricted access to services by qualified/accredited employees only. In other countries, where access is not restricted, the installation and the operation of gas appliances are subject to third party approval and external checks. As a consequence, cross-border services between two Member States with such a regulatory discrepancy could raise safety risks.

The heterogeneity of the GAS-S has not been perceived as a noteworthy disadvantage by the big manufacturers of GA who have stakes in different markets. They have not had major problems to adapt their market strategies to national needs. However, the

qualification is to a certain extent a weakness. Manufacturers of HVAC overcome this problem by product specific qualification that adds to distribution contracts with service companies. In particular the general qualification of service staff is not satisfying if one thinks of the installation of more complex system (e.g. multi feedstock, µCHP) and advanced technologies, such as heat pumps and fuel cells. Initiatives as launched by the European Heat Pump Association can be taken as a guide for other knowledge areas that need additional qualification.

For the subsectors domestic appliances related services play a minor role only. Those gas appliances can easily be installed. Many of them are plug-in appliances and do not need regular maintenance.

Consumers perceive gas as a feedstock with a certain risk potential, although statistics show the opposite. However, initiatives dedicated to change this perception are suited to give some impetus to the dissemination of GA that provide advantages as compared to other appliances. A basic qualification of installers with regard to safety aspects could be helpful. This should refer above all to insufficient airing of rooms with GA. Those accidents are one point of concern due to statistics of MARCOGAZ. With regard to the view of consumers it would support the acceptance of gas as a feedstock that not only gas appliances are due to harmonized European safety provisions but the service personnel concerned with installation, maintenance and repair (ANEC).

Opportunities and threats

Generally speaking, the regulatory framework conditions are advantageous for the GAS. In particular since the GAD has come into effect there is no barrier to the free circulation of GA. However, national regulations hamper their installation and the start of operation. The problems exist in areas for which no European regulation exists and national authorities are allowed to set their own provisions. But there are also areas that fall under European jurisdiction and provoke disputes. This refers to the scopes of the GAD and the CPD. There are some overlaps that create confusion. GA-systems certified under the GAD and CE marked have not been approved for installation in buildings in some Member States. A clear-cut and explicit interface between both of the directives could contribute to overcome these frictions. However, stakeholders do not expect that the currently discussed recast of the CPD will solve the problem.

There are other directives of importance for the GAS that ask for specific variants of GA, because these directives provide some leeway for national provisions. This is once more the CPD that gives authorities the possibility to introduce provisions that take into account national boundary conditions of the construction industry. But also other directives, such as the BED that fall under § 175 EC Treaty allow national authorities to introduce provisions if they are stricter than European law. The differing provisions create a multidimensional problem that the manufacturers have to meet by the production of several variants of one of GA for national markets. Otherwise they do not get access with their products to all Member States.

The EPBD and the EuP have an impact on the design and the opportunities to standardize GA. An important theme is calculation methods for the assessment of energy efficiency. The BED is falling under the framework directive EuP regarding minimum energy

efficiency performance. As a consequence there is one energy efficiency assessment necessary for GA. Likewise the EPBD requires an energy assessment procedure for a complete building. This means that the energy efficiency of a GA will be assessed from two different standpoints, as a standalone system and for a second time as part of a bigger system. As a consequence the regulatory framework conditions are complex and ask for different solutions that can not easily be predicted. There is a risk that non-adjusted calculation methods of the EPBD and the EuP aggravate the situation which cannot easily be met. Different national boundary conditions for construction add further imponderability.

Some products were mentioned earlier that are not in the scope of the GAD. Notified bodies highlighted this problem. Most of the products are commercially used and national authorities require safety assessment. This not an easy task because the manufacturer does not know in advance which provisions are of relevance for the design and this aggravates the task for the notified body.

Technological developments in the subsector HVAC and consumer preferences have led to a shift in the competitiveness of GA and non-GA. Currently electric heat pumps are in the lead whereas heat pumps run by gas only play a very small role in the market. Moreover, there are public schemes in some countries to stimulate the dissemination of this technology. This means that GA face a disadvantage in the market and will only follow the dissemination of electric heat pumps with considerable delay. In Southern Europe small AC have attracted consumers and most of them are run with electric heat pumps. This gives additional impetus to non-GA.

As in past years the technological development in the subsector domestic appliances will focus on electricity. Beside the opportunity to easily integrate additional features the in-house infrastructure becomes more important. Only few new residential buildings are equipped with an in-house gas grid making it nearly impossible to install GA in living areas without noteworthy construction activity.

The advantage of portable GA is not only a clean combustion process but the opportunity to have a portable energy source. This advantage is diminishing because of technological progress in power generating with renewables and advanced battery technologies. This implies that these more recent technological developments will shift away some demand for portable GA to appliances with other feedstock. Some compensation is derived from outdoor heating that became more widespread in recent years.

The Japanese manufacturers of GA are in the lead with the most advanced products, heat pumps and fuel cells. This cannot be explained by initiatives carried out by the sector itself. Japanese manufacturers enjoyed strong support from other sectors. The Japanese Ministry of Industry and the big utilities together with the manufacturers of GA merged their efforts to increase the pace of technological progress. Beyond joined R&D efforts the execution of broad field-tests contributed to the experience with these technologies. This is a real threat to the European GAS that does not enjoy a comparable innovation friendly environment. R&D activities in Europe are not co-ordinated and national schemes incorporate the risk of duplication. This remains true despite of isolated cross-border initiative.

Finally, the developments in the energy sector indirectly affect the GAS and represent both an opportunity and a threat. Natural gas accounts for 25% of primary energy use in the European Union, and will remain an important energy source in the next few decades as gas infrastructures have a long life. In the EU new infrastructure is under development, such as the construction of LNG terminals, LNG vessels, new storage capacity as a response to the diversification of the gas supply and the new demand by gas-fuelled power plants. New supply contracts have been signed with Libya, Algeria and countries in the Middle East. In addition, the grid infrastructure in many EU Member States is good or improving, and efforts have been made to increase cross border capacity. In addition, as larger volumes of gas from various sources and thus quality are used, the need to agree on a definition of and measurement of natural gas arises to address the issue of gas interchangeability. The CEN is working on a reference standard to serve as a basis for the elaboration of standards for gas appliances in order to foster the free circulation of gas appliances in Europe. The stock of installed GA may be affected by the establishment of such a standard and might undergo an accelerated renewal or upgrading. This might constitute an opportunity for further growth of the GAS, as well as increased competition.

Furthermore, the development of micro-CHP is particularly dependent on the possibility to sell the surplus of electricity produced to the grid operator, together with the right framework and incentives for a mass-market scale. The second generation of biogas might also present an opportunity for the sector by opening up the possibility to feed biogas in the grid and offer end-customers the choice between natural gas and “green” gas.

However the EU 27 population growth is expected to be moderate in the future and the market penetration of gas is already high or near saturation in most European countries. Gas distribution is very capital intensive, and can represent, for a country with no indigenous production, 70% to 80% of the total investment in the supply chain to the end user. Big customers such as the gas-fuelled power plants are leading the growth in gas demand in Europe. Relatively high prices are expected in the future, due to several factors. Unbundling and the dismantlement of vertically integrated large incumbents has not fundamentally occurred in the EU, and there is still a high level of market concentration. Illiquid markets and a lack of infrastructure also limit the access of new entrants to the market for gas, and cross border sales do not generate significant competitive pressure. The EU is also becoming more and more dependent on the gas supply from countries outside the EU, which creates a certain degree of geopolitical uncertainty. Over the long-term gas resources are also expected to deplete.
In addition, the expected rise in global energy demand over the long term, despite the current crisis, the impacts of climate change mitigation policies and the continued indexation on oil prices despite a nascent LNG market plays in favour of high gas prices. The combination of those factors points to a moderate future growth of the GAS.

9 ANNEXES

Annex A

Statistical Definitions

1) Gas sector

2) Non-gas sector

Production of gas appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
Domsestic Appliances	Cooking	29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
		29.72	**Manufacture of non-electric domestic appliances**	**27.52**	**Manufacture of non-electric domestic appliances**
HVAC	Heating	29.12	Manufacture of pumps and compressors	28.13	Manufacture of other pumps & compressors
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
HVAC	Hot water production	**28.22**	**Manufacture of central heating radiators and boilers**	**25.21**	**Manufacture of central heating, boilers & radiators**
		28.22	**Manufacture of central heating radiators and boilers**	**25.21**	**Manufacture of central heating, boilers & radiators**
		28.22	**Manufacture of central heating radiators and boilers**	**25.21**	**Manufacture of central heating, boilers & radiators**
		28.22	**Manufacture of central heating radiators and boilers**	**25.21**	**Manufacture of central heating, boilers & radiators**
Domsestic Appliances	Refrigeration	-	-	-	-
Domsestic Appliances	Washing	-	-	-	-
Domsestic Appliances	Lighting	31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment

Production of gas appliances

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
Domsestic Appliances	Cooking	29.72.11.13	Iron/steel gas domestic cooking appliances and plate warmers, with an oven (including those with subsidiary boilers for central heating, separate ovens for both gas and other fuels)
		29.72.11.15	Iron or steel gas domestic cooking appliances and plate warmers (including those with subsidiary boilers for central heating, for both gas and other fuels; excluding those with ovens)
		29.72.20.00	**Iron/steel parts for iron/steel stoves, ranges, grates, cookers, barbecues, brazers, gas-rings, plate warmers and similar non-electric domestic appliances for gas, liquid/solid fuels**
HVAC	Heating	29.12.24.17	Glandless impeller pumps for heating systems and warm water supply
		29.72.12.33	Iron or steel gas domestic appliances with an exhaust outlet (including heaters, grates, fires and braziers, for both gas and other fuels; excluding cooking appliances and plate warmers)
		29.72.12.35	Iron/steel gas domestic appliances (includingheaters, grates, fires and braziers, for both gas and other fuels radiators; excluding cooking appliances and plate warmers, those with an exhaust outlet)
		29.72.13.00	Air heaters or hot air distributors n.e.c., of iron or steel, non-electric
HVAC	Hot water production	**28.22.12.00**	**Boilers for central heating other than those of HS 8402**
		28.22.12.00	**Boilers for central heating other than those of HS 8402**
		28.22.13.00	**Parts of boilers for central heating**
		28.22.13.00	**Parts of boilers for central heating**
Domsestic Appliances	Refrigeration	-	-
Domsestic Appliances	Washing	-	-
Domsestic Appliances	Lighting	31.50.23.00	Non-electrical lamps and lighting fittings

Trade of gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
Domsestic Appliances	Cooking	7321.11.10	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Cooking appliances and plate warmers:For gas fuel or for both gas and other fuels:With oven, including separate ovens
		7321.11.90	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Cooking appliances and plate warmers:For gas fuel or for both gas and other fuels: − Other
		7321.90.00	**Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: - Parts**
HVAC	Heating	8413.70.30	Pumps for liquids, whether or not fitted with a measuring device; liquid elevators: − Other centrifugal pumps: − − Submersible pumps: − Glandless impeller pumps for heating systems and warm water supply
		7321.81.10	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Other appliances: − With exhaust outlet
		7321.81.90	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Other appliances: − Other
		7322.90.00	Radiators for central heating, not electrically heated, and parts thereof, of iron or steel; air heaters and hot-air distributors (including distributors which can also distribute fresh or conditioned air), not electrically heated, incorporating a motordriven fan or blower, and parts thereof, of iron or steel: − Radiators and parts thereof: − Other
HVAC	Hot water production	**8403.10.10**	**Central heating boilers other than those of heading 8402: − Boilers: − Of cast iron**
		8403.10.90	**Central heating boilers other than those of heading 8402: − Boilers: − Other**
		8403.90.10	**Central heating boilers other than those of heading 8402: − Parts: − Of cast iron**
		8403.90.90	**Central heating boilers other than those of heading 8402: − Parts: − Other**
Domsestic Appliances	Refrigeration	-	-
Domsestic Appliances	Washing	-	-
Domsestic Appliances	Lighting	9405.50.00	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Non-electrical lamps and lighting fittings

Production of non-gas appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
Domestic A	Cooking	29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
		29.72	**Manufacture of non-electric domestic appliances**	**27.52**	**Manufacture of non-electric domestic appliances**
HVAC	Heating	29. Dez	Manufacture of pumps and compressors	28.13	Manufacture of other pumps & compressors
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances

Production of non-gas appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
		29.72	Manufacture of non-electric domestic appliances	27.52	Manufacture of non-electric domestic appliances
HVAC	Hot water production	**28.22**	**Manufacture of central heating radiators and boilers**	**25.21**	**Manufacture of central heating, boilers & radiators**
		28.22	**Manufacture of central heating radiators and boilers**	**25.21**	**Manufacture of central heating, boilers & radiators**
		28.22	**Manufacture of central heating radiators and boilers**	**25.21**	**Manufacture of central heating, boilers & radiators**
		28.22	**Manufacture of central heating radiators and boilers**	**25.21**	**Manufacture of central heating, boilers & radiators**
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances

Production of non-gas appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
Domestic A	Refrigeration	29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances

Production of non-gas appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
Domestic A	Washing	29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
		29.71	Manufacture of electric domestic appliances	27.51	Manufacture of electric domestic appliances
Domestic A	Lighting	31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment

Production of non-gas appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment

Production of non-gas appliances

Product group	Product group	NACE Rev. 1 code	NACE Rev. 1 description	NACE Rev. 2 code	NACE Rev. 2 description
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment
		31.50	Manufacture of lighting equipment and electric lamps	27.40	Manufacture of electric lighting equipment

Production of non-gas appliances

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
		29.71.24.30	Domestic electric coffee or tea makers (including percolators)
Domestic A	Cooking	29.71.24.50	Domestic electric toasters (including toaster ovens for toasting bread, potatoes or other small items)
		29.71.24.93	Deep fat fryers
		29.71.24.97	Other domestic electrothermic appliances
		29.71.28.10	Domestic electric cookers with at least an oven and a hob (including combined gas-electric appliances)
		29.71.28.33	Domestic electric hobs for building-in
		29.71.28.35	Domestic electric cooking plates, boiling rings and hobs (excluding hobs for building-in)
		29.71.28.50	Domestic electric grills and roasters
		29.71.28.70	Domestic electric ovens for building-in

Production of non-gas appliances

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
		29.71.28.90	Domestic electric ovens (excluding those for building-in, microwave ovens)
		29.72.11.30	Iron or steel liquid fuel domestic cooking appliances and plate warmers (including those with subsidiary boilers for central heating)
		29.72.11.50	Iron or steel solid fuel domestic cooking appliances and plate warmers (including those with subsidiary boilers for central heating)
		29.72.20.00	**Iron/steel parts for iron/steel stoves, ranges, grates, cookers, barbecues, brazers, gas-rings, plate warmers and similar non-electric domestic appliances for gas, liquid/solid fuels**
		29.12.24.17	Glandless impeller pumps for heating systems and warm water supply
HVAC	Heating	29.71.14.00	Electric blankets
		29.71.26.30	Electric storage heating radiators
		29.71.26.53	Electric radiators (excluding storage heating apparatus, convection heaters)
		29.71.26.55	Electric convection heaters

Production of non-gas appliances

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
		29.71.26.57	Electric heaters or fires with built-in fans (excluding convection heaters)
		29.71.26.90	Other electric space heaters
		29.72.12.53	Iron or steel liquid fuel domestic appliances with an exhaust outlet (including heaters, grates, fires and braziers; excluding cooking appliances and plate warmers)
		29.72.12.55	Iron or steel liquid fuel domestic appliances (including heaters, grates, fires and braziers, radiators; excluding cooking appliances and plate warmers, those with an exhaust outlet)
		29.72.12.70	Iron or steel solid fuel domestic appliances (including heaters, grates, fires and braziers; excluding cooking appliances and plate warmers)
HVAC	Hot water production	**28.22.12.00**	**Boilers for central heating other than those of HS 8402**
		28.22.12.00	**Boilers for central heating other than those of HS 8402**
		28.22.13.00	**Parts of boilers for central heating**
		28.22.13.00	**Parts of boilers for central heating**
		29.71.24.30	Domestic electric coffee or tea makers (including percolators)

Production of non-gas appliances

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
		29.71.25.30	Electric instantaneous water heaters
		29.71.25.50	Electric water heaters (including storage water heaters) (excluding instantaneous)
		29.71.25.70	Electric immersion heaters (including portable immersion heaters for liquids, usually with a handle or a hook)
		29.71.11.10	Combined refrigerators-freezers, with separate external doors
Domestic A	Refrigeration	29.71.11.10	Combined refrigerators-freezers, with separate external doors
		29.71.11.33	Household-type refrigerators (including compression-type, electrical absorption-type) (excluding built-in)
		29.71.11.33	Household-type refrigerators (including compression-type, electrical absorption-type) (excluding built-in)
		29.71.11.33	Household-type refrigerators (including compression-type, electrical absorption-type) (excluding built-in)
		29.71.11.33	Household-type refrigerators (including compression-type, electrical absorption-type) (excluding built-in)
		29.71.11.33	Household-type refrigerators (including compression-type, electrical absorption-type) (excluding built-in)

Production of non-gas appliances

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
		29.71.11.35	Compression-type built-in refrigerators
		29.71.11.50	Chest freezers of a capacity â‰¤ 800 litres
		29.71.11.50	Chest freezers of a capacity â‰¤ 800 litres
		29.71.11.70	Upright freezers of a capacity â‰¤ 900 litres
		29.71.11.70	Upright freezers of a capacity â‰¤ 900 litres
		29.71.12.00	Household dishwashing machines
Domestic A	Washing	29.71.13.30	Fully-automatic washing machines of a dry linen capacity â‰¤ 10 kg (including machines which both wash and dry)
		29.71.13.30	Fully-automatic washing machines of a dry linen capacity â‰¤ 10 kg (including machines which both wash and dry)
		29.71.13.30	Fully-automatic washing machines of a dry linen capacity â‰¤ 10 kg (including machines which both wash and dry)
		29.71.13.50	Non-automatic washing machines of a dry linen capacity â‰¤ 10 kg (including machines which both wash and dry)
		29.71.13.50	Non-automatic washing machines of a dry linen capacity â‰¤ 10 kg (including machines which both wash and dry)

Production of non-gas appliances

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
		29.71.13.70	Drying machines of a dry linen capacity â‰¤ 10 kg
		29.71.13.70	Drying machines of a dry linen capacity â‰¤ 10 kg
		31.50.11.00	Sealed beam lamp units
Domestic A	Lighting	31.50.12.93	Tungsten halogen filament lamps, for a voltage > 100 V (excluding ultraviolet and infra-red lamps, for motorcycles and motor vehicles)
		31.50.12.95	Tungsten halogen filament lamps for a voltage â‰¤ 100 V (excluding ultraviolet and infrared lamps, for motorcycles and motor vehicles)
		31.50.13.00	Filament lamps of a power â‰¤ 200W and for a voltage > 100V including reflector lamps excluding ultraviolet and infrared lamps, tungsten halogen filament lamps - sealed beam lamp units
		31.50.13.00	Filament lamps of a power â‰¤ 200W and for a voltage > 100V including reflector lamps excluding ultraviolet and infrared lamps, tungsten halogen filament lamps - sealed beam lamp units
		31.50.14.93	Filament lamps for voltage >100V excluding ultraviolet and infrared lamps, tungsten halogen filament lamps; power â‰¤200W, for motorcycles and vehicles; sealed beam lamp units
		31.50.14.95	Filament lamps for voltage â‰¤100V excluding ultraviolet and infrared lamps, tungsten halogen filament lamps; power â‰¤200W, for motorcycles and vehicles; sealed beam lamp units
		31.50.15.10	Fluorescent hot cathode discharge lamps, with double ended cap (excluding ultraviolet lamps)

Production of non-gas appliances

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
		31.50.15.30	Fluorescent hot cathode discharge lamps (excluding ultraviolet lamps, with double ended cap)
		31.50.15.53	Mercury vapour discharge lamps (excluding ultraviolet lamps, dual lamps)
		31.50.15.56	Sodium vapour discharge lamps other than ultraviolet lamps
		31.50.15.59	Discharge lamps (excluding fluorescent hot cathode lamps, dual lamps, mercury or sodium vapour lamps, ultraviolet lamps)
		31.50.15.59	Discharge lamps (excluding fluorescent hot cathode lamps, dual lamps, mercury or sodium vapour lamps, ultraviolet lamps)
		31.50.21.00	Portable electric lamps worked by dry batteries, accumulators or magnetos (excluding for cycles or motor vehicles)
		31.50.22.00	Electric table, desk, bedside or floor-standing lamps
		31.50.22.00	Electric table, desk, bedside or floor-standing lamps
		31.50.22.00	Electric table, desk, bedside or floor-standing lamps
		31.50.22.00	Electric table, desk, bedside or floor-standing lamps
		31.50.22.00	Electric table, desk, bedside or floor-standing lamps
		31.50.22.00	Electric table, desk, bedside or floor-standing lamps

Product group	Product group	PRODCOM 2007 code	PRODCOM 2007 description
		31.50.25.30	Chandeliers and other electric ceiling or wall lighting fittings (excluding those used for lighting public open spaces or thoroughfares)
		31.50.25.30	Chandeliers and other electric ceiling or wall lighting fittings (excluding those used for lighting public open spaces or thoroughfares)
		31.50.25.30	Chandeliers and other electric ceiling or wall lighting fittings (excluding those used for lighting public open spaces or thoroughfares)
		31.50.25.30	Chandeliers and other electric ceiling or wall lighting fittings (excluding those used for lighting public open spaces or thoroughfares)
		31.50.25.30	Chandeliers and other electric ceiling or wall lighting fittings (excluding those used for lighting public open spaces or thoroughfares)
		31.50.25.30	Chandeliers and other electric ceiling or wall lighting fittings (excluding those used for lighting public open spaces or thoroughfares)
		31.50.32.00	Lighting sets for Christmas trees

Trade of non-gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
Domestic A	Cooking	8516.71.00	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other electrothermic appliances: − Coffee or tea makers
		8516.72.00	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other electrothermic appliances: − Toasters
		8516.79.20	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other electrothermic appliances: − Other: − Deep fat fryers
		8516.79.70	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other electrothermic appliances: − Other: − Other
		8516.60.10	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other ovens; cookers, cooking plates, boiling rings; grillers and roasters: − Cookers (incorporating at least an oven and a hob)
		8516.60.51	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other ovens; cookers, cooking plates, boiling rings; grillers and roasters: − Cooking plates, boiling rings and hobs: − Hobs for building in
		8516.60.59	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other ovens; cookers, cooking plates, boiling rings; grillers and roasters: − Cooking plates, boiling rings and hobs: − Other
		8516.60.70	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other ovens; cookers, cooking plates, boiling rings; grillers and roasters: − Grillers and roasters
		8516.60.80	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other ovens; cookers, cooking plates, boiling rings; grillers and roasters: − Ovens for building in

Trade of non-gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
		8516.60.90	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other ovens; cookers, cooking plates, boiling rings; grillers and roasters: − Other
		7321.12.00	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Cooking appliances and plate warmers: − For liquid fuel
		7321.19.00	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Cooking appliances and plate warmers: − Other, including appliances for solid fuel
		7321.90.00	**Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: - Parts**
HVAC	Heating	8413.70.30	Pumps for liquids, whether or not fitted with a measuring device; liquid elevators: − Other centrifugal pumps: − − Submersible pumps: − Glandless impeller pumps for heating systems and warm water supply
		6301.10.00	Blankets and travelling rugs: − Electric blankets
		8516.21.00	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Electric space-heating apparatus and electric soil-heating apparatus: − Storage heating radiators
		8516.29.10	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Electric space-heating apparatus and electric soil-heating apparatus: − Other: − Liquid-filled radiators
		8516.29.50	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Electric space-heating apparatus and electric soil-heating apparatus: − Other: − Convection heaters

Trade of non-gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
		8516.29.91	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Electric space-heating apparatus and electric soil-heating apparatus: − Other: − Other: - With fan built in
		8516.29.99	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Electric space-heating apparatus and electric soil-heating apparatus: − Other: − Other: − Other
		7321.82.10	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Other appliances: − For liquid fuel: − With exhaust outlet
		7321.82.90	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Other appliances: − For liquid fuel: − Other
		7321.89.00	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel: − Other appliances: − Other, including appliances for solid fuel
HVAC	Hot water production	**8403.10.10**	**Central heating boilers other than those of heading 8402: − Boilers: − Of cast iron**
		8403.10.90	**Central heating boilers other than those of heading 8402: − Boilers: − Other**
		8403.90.10	**Central heating boilers other than those of heading 8402: − Parts: − Of cast iron**
		8403.90.90	**Central heating boilers other than those of heading 8402: − Parts: − Other**
		8516.71.00	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Other electrothermic appliances: − Coffee or tea makers

Trade of non-gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
		8516.10.11	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Electric instantaneous or storage water heaters and immersion heaters: − Water heaters: − Instantaneous water heaters
		8516.10.19	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Electric instantaneous or storage water heaters and immersion heaters: − Water heaters: − Other
		8516.10.90	Electric instantaneous or storage water heaters and immersion heaters; electric space-heating apparatus and soil-heating apparatus; electrothermic hairdressing apparatus (for example, hairdryers, hair curlers, curling tong heaters) and hand dryers; electric smoothing irons; other electrothermic appliances of a kind used for domestic purposes; electric heating resistors, other than those of heading 8545: − Electric instantaneous or storage water heaters and immersion heaters: − Immersion heaters
Domestic A	Refrigeration	8418.10.20	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Combined refrigerator-freezers, fitted with separate external doors: − Of a capacity exceeding 340 litres
		8418.10.80	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Combined refrigerator-freezers, fitted with separate external doors: − Other
		8418.21.10	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Refrigerators, household type: − Compression-type: − Of a capacity exceeding 340 litres
		8418.21.51	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Refrigerators, household type: − Compression-type: − Other: − Table model
		8418.21.91	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Refrigerators, household type: − Compression-type: − Other: − Other, of a capacity: − Not exceeding 250 litres
		8418.21.99	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Refrigerators, household type: − Compression-type: − Other: − Other, of a capacity: − Exceeding 250 litres but not exceeding 340 litres
		8418.29.00	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Refrigerators, household type: − Other

Trade of non-gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
		8418.21.59	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Refrigerators, household type: − Compression-type: − Other: − Building-in type
		8418.30.20	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415:− Freezers of the chest type, not exceeding 800 litres capacity: − Of a capacity not exceeding 400 litres
		8418.30.80	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415:− Freezers of the chest type, not exceeding 800 litres capacity: − Of a capacity exceeding 400 litres but not exceeding 800 litres
		8418.40.00	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Freezers of the upright type, not exceeding 900 litres capacity: − Of a capacity not exceeding 250 litres
		8418.40.00	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air-conditioning machines of heading 8415: − Freezers of the upright type, not exceeding 900 litres capacity: − Of a capacity exceeding 250 litres but not exceeding 900 litres
Domestic A	Washing	8422.11.00	Dishwashing machines; machinery for cleaning or drying bottles or other containers; machinery for filling, closing, sealing or labelling bottles, cans, boxes, bags or other containers; machinery for capsuling bottles, jars, tubes and similar containers; other packing or wrapping machinery (including heat-shrink wrapping machinery); machinery for aerating beverages: − Dishwashing machines: − Of the household type
		8450.11.11	Household or laundry-type washing machines, including machines which both wash and dry: − Machines, each of a dry linen capacity not exceeding 10 kg: − Fully-automatic machines: − Each of a dry linen capacity not exceeding 6 kg: − Front-loading machines
		8450.11.19	Household or laundry-type washing machines, including machines which both wash and dry: − Machines, each of a dry linen capacity not exceeding 10 kg: − Fully-automatic machines: − Each of a dry linen capacity not exceeding 6 kg: − Top-loading machines
		8450.11.90	Household or laundry-type washing machines, including machines which both wash and dry: − Machines, each of a dry linen capacity not exceeding 10 kg: − Fully-automatic machines: − Each of a dry linen capacity exceeding 6 kg but not exceeding 10 kg
		8450.12.00	Household or laundry-type washing machines, including machines which both wash and dry: − Machines, each of a dry linen capacity not exceeding 10 kg: − Other machines, with built-in centrifugal drier
		8450.19.00	Household or laundry-type washing machines, including machines which both wash and dry: − Machines, each of a dry linen capacity not exceeding 10 kg: − Other

Trade of non-gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
		8451.21.10	Machinery (other than machines of heading 8450) for washing, cleaning, wringing, drying, ironing, pressing (including fusing presses), bleaching, dyeing, dressing, finishing, coating or impregnating textile yarns, fabrics or made-up textile articles and machines for applying the paste to the base fabric or other support used in the manufacture of floor coverings such as linoleum; machines for reeling, unreeling, folding, cutting or pinking textile fabrics: − Drying machines: − Each of a dry linen capacity not exceeding 10 kg: − Each of a dry linen capacity not exceeding 6 kg
		8451.21.90	Machinery (other than machines of heading 8450) for washing, cleaning, wringing, drying, ironing, pressing (including fusing presses), bleaching, dyeing, dressing, finishing, coating or impregnating textile yarns, fabrics or made-up textile articles and machines for applying the paste to the base fabric or other support used in the manufacture of floor coverings such as linoleum; machines for reeling, unreeling, folding, cutting or pinking textile fabrics: − Drying machines: − Each of a dry linen capacity not exceeding 10 kg: − Each of a dry linen capacity exceeding 6 kg but not exceeding 10 kg
Domestic A	Lighting	8539.10.00	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Sealed beam lamp units
		8539.21.92	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Other filament lamps, excluding ultraviolet or infra-red lamps: − Tungsten halogen: − Other, for a voltage: − Exceeding 100 V
		8539.21.98	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Other filament lamps, excluding ultraviolet or infra-red lamps: − Tungsten halogen: − Other, for a voltage: − Not exceeding 100 V
		8539.22.10	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Other filament lamps, excluding ultraviolet or infra-red lamps: − Other, of a power not exceeding 200 W and for a voltage exceeding 100 V: − Reflector lamps
		8539.22.90	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Other filament lamps, excluding ultraviolet or infra-red lamps: − Other, of a power not exceeding 200 W and for a voltage exceeding 100 V: − Other
		8539.29.92	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Other filament lamps, excluding ultraviolet or infra-red lamps: − Other: − Other, for a voltage: − Exceeding 100 V
		8539.29.98	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Other filament lamps, excluding ultraviolet or infra-red lamps: − Other: − Other, for a voltage: − Not exceeding 100 V
		8539.31.10	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Discharge lamps, other than ultraviolet lamps: − Fluorescent, hot cathode: − With double ended cap

Trade of non-gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
		8539.31.90	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Discharge lamps, other than ultraviolet lamps: − Fluorescent, hot cathode: − Other
		8539.32.10	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Discharge lamps, other than ultraviolet lamps: − Mercury or sodium vapour lamps; metal halide lamps: − Mercury vapour lamps
		8539.32.50	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Discharge lamps, other than ultraviolet lamps: − Mercury or sodium vapour lamps; metal halide lamps: − Sodium vapour lamps
		8539.32.90	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Discharge lamps, other than ultraviolet lamps: − Mercury or sodium vapour lamps; metal halide lamps: − Metal halide lamps
		8539.39.00	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infra-red lamps; arc lamps: − Discharge lamps, other than ultraviolet lamps: − Other
		8513.10.00	Portable electric lamps designed to function by their own source of energy (for example, dry batteries, accumulators, magnetos), other than lighting equipment of heading 8512: − Lamps
		9405.20.11	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Electric table, desk, bedside or floor-standing lamps: − Of plastics: − Of a kind used for filament lamps
		9405.20.19	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Electric table, desk, bedside or floor-standing lamps: − Of plastics: − Other
		9405.20.30	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Electric table, desk, bedside or floor-standing lamps: − Of ceramic materials
		9405.20.50	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Electric table, desk, bedside or floor-standing lamps: − Of glass
		9405.20.91	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Electric table, desk, bedside or floor-standing lamps: − Of other materials: − Of a kind used for filament lamps
		9405.20.99	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Electric table, desk, bedside or floor-standing lamps: − Of other materials: − Other

Trade of non-gas appliances

Product group	Product group	CN(2008) code	CN(2008) description
		9405.10.21	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Chandeliers and other electric ceiling or wall lighting fittings, excluding those of a kind used for lighting public open spaces or thoroughfares: − Of plastics: − Of a kind used for filament lamps
		9405.10.28	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Chandeliers and other electric ceiling or wall lighting fittings, excluding those of a kind used for lighting public open spaces or thoroughfares: − Of plastics: − Other
		9405.10.30	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Chandeliers and other electric ceiling or wall lighting fittings, excluding those of a kind used for lighting public open spaces or thoroughfares: − Of ceramic materials
		9405.10.50	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Chandeliers and other electric ceiling or wall lighting fittings, excluding those of a kind used for lighting public open spaces or thoroughfares: − Of glass
		9405.10.91	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Chandeliers and other electric ceiling or wall lighting fittings, excluding those of a kind used for lighting public open spaces or thoroughfares: − Of other materials: − Of a kind used for filament lamps
		9405.10.98	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Chandeliers and other electric ceiling or wall lighting fittings, excluding those of a kind used for lighting public open spaces or thoroughfares: − Of other materials: − Other
		9405.30.00	Lamps and lighting fittings including searchlights and spotlights and parts thereof, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like, having a permanently fixed light source, and parts thereof not elsewhere specified or included: − Lighting sets of a kind used for Christmas trees

Annex B

Directive 90/396/EEG on Gas Appliances (consolidated version)

and

Harmonized Standards

►**B**

COUNCIL DIRECTIVE

of 29 June 1990

on the approximation of the laws of the Member States relating to appliances burning gaseous fuels

(90/396/EEC)

(OJ L 196, 26.7.1990, p. 15)

Amended by:

		Official Journal		
		No	page	date
►**M1**	Council Directive 93/68/EEC of 22 July 1993	L 220	1	30.8.1993

▼**B**

COUNCIL DIRECTIVE

of 29 June 1990

on the approximation of the laws of the Member States relating to appliances burning gaseous fuels

(90/396/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100a thereof,

Having regard to the proposal from the Commission [1],

In cooperation with the European Parliament [2]

Having regard to the opinion of the Economic and Social Committee [3],

Whereas Member States are responsible for ensuring the health and safety on their territory of their people and, where appropriate, of domestic animals and goods in relation to the hazards arising out of the use of appliances burning gaseous fuels;

Whereas, in certain Member States, mandatory provisions define in particular the safety level required of appliances burning gaseous fuels by specifying design, operating characteristics and inspection procedures; whereas these mandatory provisions do not necessarily lead to different safety levels from one Member State to another but do, by their disparity, hinder trade within the Community;

Whereas different conditions as regards types of gas and supply pressures are in force in the Member States; whereas these conditions are not harmonized because each Member State's energy supply and distribution situation is peculiar to it;

Whereas paragraphs 65 and 68 of the White Paper on the completion of the internal market, approved by the European Council in June 1985, provide for a new approach to legislative harmonization;

Whereas Community law provides - by way of derogation from one of the fundamental rules of the Community, namely the free movement of goods - that obstacles to movement within the Community resulting from disparities in national legislation relating to the marketing of products must be accepted in so far as such obstacles can be recognized as being necessary to satisfy mandatory requirements; whereas, therefore, the harmonization of legislation in the present case must be limited to the provisions necessary to satisfy both the mandatory and essential requirements regarding safety, health and energy conservation in relation to gas appliances; whereas these requirements must replace the national provisions in this matter because they are essential requirements;

Whereas the maintenance or improvement of the level of safety attained in Member States constitutes one of the essential aims of this Directive and of safety as defined by the essential requirements;

Whereas the essential safety and health requirements must be observed in order to ensure that appliances burning gaseous fuels are safe; whereas energy conservation is considered essential; whereas these requirements must be applied with discernment to take account of the state of the art at the time of construction;

Whereas this Directive therefore contains only essential requirements; whereas, to facilitate proof of conformity with the essential requirements, it is necessary to have harmonized standards at European level in particular as to the construction, operation and installation of appliances

(1) OJ No C 42, 21. 2. 1989, p. 5 and OJ No C 260, 13. 10. 1989, p. 3.
(2) OJ No C 158, 26. 6. 1989, p. 218 and Decision of 13 June 1980 (not yet published in the Official Journal).
(3) OJ No C 194, 31. 7. 1989, p. 18.

▼B

burning gaseous fuels so that products complying with them may be assumed to conform to the essential requirements; whereas these standards, harmonized at European level, are drawn up by private bodies and must remain non-mandatory texts; whereas for that purpose the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (Cenelec) are recognized as the competent bodies for the adoption of harmonized standards in accordance with the general guidelines for cooperation between the Commission and those two bodies signed on 13 November 1984; whereas, for the purposes of this Directive, a harmonized standard is a technical specification (European standard or harmonization document) adopted by one or both of those bodies upon a remit from the Commission in accordance with Council Directive 83/189/EEC of 28 March 1983 laying down a procedure for the provision of information in the field of technical standards and regulations ([1]), as last amended by Directive 88/182/EEC ([2]), and the abovementioned general guidelines;

Whereas, pending the adoption of harmonized standards within the meaning of this Directive, conformity with the essential requirements and the free movement of appliances burning gaseous fuels should be facilitated by the acceptance, at Community level, of products conforming to the national standards whose conformity with the essential requirements has been confirmed by a Community checking procedure;

Whereas a check on compliance with the relevant technical requirements is necessary in order to provide effective protection for users and third parties; whereas the existing certification procedures differ from one Member State to another; whereas, in order to avoid multiple inspections, which are in effect barriers to the free movement of appliances burning gaseous fuels, arrangements should be made for the mutual recognition of certification procedures by the Member States; whereas, in order to facilitate mutual recognition of certification procedures, harmonized Community procedures should be set up and the criteria for appointing the bodies responsible for carrying out these procedures should be harmonized;

Whereas the Member States' responsibility on their territory for safety, health and energy conservation covered by the essential requirements must be recognized in a safeguard clause providing for an adequate Community procedure;

Whereas the addressees of any decision taken under this Directive must be informed of the reasons for such a decision and the legal remedies available to them;

Whereas the Council adopted, on 17 September 1984, a framework Directive on gas appliances (84/530/EEC) ([3]), as last amended by Directive 86/312/EEC ([4]), and a separate Directive on gas water heaters (84/531/EEC) ([5]), as last amended by Directive 88/665/EEC ([6]); whereas those Directives cover the same area as this Directive and should therefore be repealed;

Whereas the measures aimed at the gradual establishment of the internal market must be adopted by 31 December 1992; whereas the internal market consists of an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured,

([1]) OJ No L 109, 26. 4. 1983, p. 8.
([2]) OJ No L 81, 26. 3. 1988, p. 75.
([3]) OJ No L 300, 19. 11. 1984, p. 95.
([4]) OJ No L 196, 18. 7. 1986, p. 56.
([5]) OJ No L 300, 19. 11. 1984, p. 106.
([6]) OJ No L 382, 31. 12. 1988, p. 42.

▼B

HAS ADOPTED THIS DIRECTIVE:

CHAPTER I

Scope, placing on the market and free movement

Article 1

1. This Directive shall apply to:

— appliances burning gaseous fuels used for cooking, heating, hot water production, refrigeration, lighting or washing and having, where applicable, a normal water temperature not exceeding 105 °C, hereinafter referred to as 'appliances'. Forced draught burners and heating bodies to be equipped with such burners will also be considered as appliances,

— safety devices, controlling devices or regulating devices and sub-assemblies, other than forced draught burners and heating bodies to be equipped with such burners separately marketed for trade use and designed to be incorporated into an appliance burning gaseous fuel or assembled to constitute such an appliance, hereinafter referred to as 'fittings'.

2. Appliances specifically designed for use in industrial processes carried out on industrial premises are excluded from the scope defined in paragraph 1.

3. For the purposes of this Directive, 'gaseous fuel' means any fuel which is in a gaseous state at a temperature of 15 °C under a pressure of 1 bar.

4. For the purposes of this Directive, an appliance is said to be 'normally used' when it is:

— correctly installed and regularly serviced in accordance with the manufacturer's instructions,

— used with a normal variation in the gas quality and a normal fluctuation in the supply pressure, and

— used in accordance with its intended purpose or in a way which can be reasonably foreseen.

Article 2

1. Member States shall take all necessary steps to ensure that the appliances referred to in Article 1 may be placed on the market and put into service only if, when normally used, they do not compromise the safety of persons, domestic animals and property.

2. Member States shall communicate the types of gas and corresponding supply pressures used on their territory to the other Member States and the Commission before 1 January 1991. They shall also communicate all changes in good time. The Commission shall ensure that this information is published in the *Official Journal of the European Communities*.

Article 3

Appliances and fittings as referred to in Article 1 shall satisfy the essential requirements applicable to them set out in Annex I.

▼B

Article 4

▼M1

1. Member States may not prohibit, restrict or impede the placing on the market and the putting into service of appliances which comply with all the provisions of this Directive, including the conformity assessment procedures laid down in Chapter II, and which bear the CE marking provided for in Article 10.

▼B

2. Member States may not prohibit, restrict or impede the placing on the market of fittings as referred to in Article 1 accompanied by a certificate as referred to in Article 8 (4).

Article 5

1. Member States shall presume compliance with the essential requirements referred to in Article 3 of appliances and fittings when they conform to:

(a) the national standards applicable to them implementing the harmonized standards whose reference numbers have been published in the *Official Journal of the European Communities*.

Member States shall publish the reference numbers of these national standards;

(b) the national standards applicable to them referred to in paragraph 2 in so far as, in the areas covered by such standards, no harmonized standards exist.

2. Member States shall communicate to the Commission the texts of their national standards as referred to in paragraph 1 (b) which they regard as complying with the essential requirements referred to in Article 3. The Commission shall forward these national standards to the other Member States. In accordance with the procedure provided for in Article 6 (2), it shall notify the Member States of those national standards which are presumed to conform with the essential requirements referred to in Article 3.

Article 6

1. Where a Member State or the Commission considers that the standards referred to in Article 5 (1) do not entirely meet the essential requirements referred to in Article 3, the Commission or the Member State concerned shall bring the matter before the standing committee set up under Directive 83/189/EEC, hereinafter referred to as 'the committee', giving the reasons therefore. The committee shall deliver an opinion without delay.

In the light of the committee's opinion, the Commission shall inform the Member States whether or not it is necessary to withdraw those standards from the publications referred to in Article 5 (1).

2. After receipt of the communication referred to in Article 5 (2), the Commission shall consult the committee. Upon receipt of the latter's opinion, the Commission shall, within one month, inform the Member States whether or not the national standard(s) in question are to enjoy the presumption of conformity; if they are, the Member States shall publish the reference numbers of those standards. The Commission shall also publish them in the *Official Journal of the European Communities*.

Article 7

1. Where a Member State finds that normally used appliances bearing the ►M1 CE marking ◄ might compromise the safety of persons, domestic animals or property, it shall take all appropriate measures to withdraw those appliances from the market and prohibit or restrict their being placed on the market.

The Member State concerned shall immediately inform the Commission of any such measure, indicating the reasons for its decision and, in particular, whether non-compliance is due to:

▼B

(a) failure to meet the essential requirements referred to in Article 3, where the appliance does not correspond to the standards referred to in Article 5 (1);

(b) incorrect application of the standards referred to in Article 5 (1);

(c) shortcomings in the standards referred to in Article 5 (1) themselves.

2. The Commission shall enter into consultation with the parties concerned as soon as possible. Where, after such consultation, the Commission finds that any measure as referred to in paragraph 1 is justified, it shall immediately so inform the Member State that took the measure and the other Member States.

Where the decision referred to in paragraph 1 is attributed to shortcomings in the standards, the Commission, after consulting the parties concerned, shall bring the matter before the committee within two months if the Member State which has taken the measures intends to maintain them, and shall initiate the procedures referred to in Article 6.

3. Where an appliance which does not comply bears the ►M1 CE marking ◄, the competent Member State shall take appropriate action against whomsoever has affixed the mark and shall inform the Commission and the other Member States thereof.

4. The Commission shall ensure that the Member States are kept informed of the progress and outcome of the procedures.

CHAPTER II

Means of certification of conformity

Article 8

1. The means of certification of conformity of series-manufactured appliances shall be:

(a) the EC type-examination as referred to in section 1 of Annex II, and

(b) prior to their being placed on the market, at the choice of the manufacturer:

— the EC declaration of conformity to type referred to in section 2 of Annex II, or

— the EC declaration of conformity to type (guarantee of production quality) referred to in section 3 of Annex II, or

— the EC declaration of conformity to type (guarantee of product quality) referred to in section 4 of Annex II, or

— EC verification as referred to in section 5 of Annex II.

2. In the case of production of an appliance as a single unit or in small quantities, EC verification by single unit, as referred to in section 6 of Annex II, may be chosen by the manufacturer.

3. After completion of the procedures referred to in paragraphs 1 (b) and 2, the ►M1 CE marking ◄ of conformity shall be affixed to conforming appliances in accordance with Article 10.

4. The procedures referred to in paragraph 1 shall be applied in respect of fittings as referred to in Article 1 with the exception of the affixing of the ►M1 CE marking ◄ of conformity and, where appropriate, the drawing-up of the declaration of conformity. A certificate shall be issued declaring the conformity of the fittings with the provisions of this Directive which apply to them and stating their characteristics and how they must be incorporated into an appliance or assembled to assist compliance with the essential requirements applicable to finished appliances.

The certificate shall be supplied with the fitting.

▼M1

5. (a) Where the appliances are covered by other Directives dealing with other aspects and specifying the affixing of the CE

▼M1

marking, the latter shall indicate that the appliances are also presumed to conform to the provisions of those other Directives.

(b) However, where one or more of these Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the CE marking shall indicate conformity to the provisions only of those Directives applied by the manufacturer. In this case, particulars of the Directives applied, as published in the *Official Journal of the European Communities*, must be given in the documents, notices or instructions required by the Directives and accompanying such devices.

▼B

6. Records and correspondence relating to the means of certification of conformity shall be drawn up in the official language(s) of the Member State where the body responsible for carrying out these procedures is established or in a language accepted by it.

Article 9

▼M1

1. Member States shall notify the Commission and the other Member States of the bodies, which they have appointed to carry out the procedures referred to in Article 8 together with the specific tasks which these bodies have been appointed to carry out and the identification numbers assigned to them beforehand by the Commission.

The Commission shall, for information, publish in the *Official Journal of the European Communities*, a list of these bodies, and the identification numbers it has assigned to them and shall ensure that the list is kept up to date.

▼B

2. Member States shall apply the criteria set out in Annex V for assessing the bodies to be notified.

Bodies which satisfy the assessment criteria laid down in the applicable harmonized standards shall be presumed to satisfy the criteria set out in that Annex.

3. A Member State which has notified a body must withdraw approval if it finds that the body no longer meets the criteria referred to in paragraph 2. It shall immediately inform the Commission and the other Member States accordingly.

CHAPTER III

►M1 CE marking ◄ of conformity

Article 10

1. The ►M1 CE marking ◄ of conformity and the inscriptions set out in Annex III shall be affixed in a visible, easily legible and indelible form to the appliance or to a data plate attached to it. The data plate shall be so designed that it cannot be re-used.

▼M1

2. The affixing of markings on the appliances which are likely to deceive third parties as to the meaning and form of the CE marking shall be prohibited. Any other marking may be affixed to the appliance or to the data plate provided that the visibility and legibility of the CE marking is not hereby reduced.

▼B

Article 11

▼M1

Without prejudice to Article 7:

(a) where a Member State establishes that the CE marking has been affixed unduly, the manufacturer or his authorized representative established within the Community shall be obliged to make the product comply as regards the provisions concerning the CE

▼M1

marking and to end the infringement under conditions imposed by the Member State;

(b) where non-compliance continues, the Member State must take all appropriate measures to restrict or prohibit the placing on the market of the appliance in question or to ensure that it is withdrawn from the market in accordance with the procedures laid down in Article 7.

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CHAPTER IV

Final provisions

Article 12

Any decision taken pursuant to this Directive which includes restriction on the placing on the market and/or putting into service of an appliance shall state the precise grounds on which it is based. It shall be notified without delay to the party concerned, who shall at the same time be informed of the legal remedies available to him under the laws in force in the Member State in question and of the time limits to which such remedies are subject.

Article 13

Directives 84/530/EEC and 84/531/EEC are hereby repealed.

Article 14

1. Before 1 July 1991, Member States shall adopt and publish the laws, regulations and administrative provisions necessary to comply with this Directive. They shall inform the Commission thereof.

They shall apply such provisions from 1 January 1992.

2. However, in derogation from Article 2, Member States may, during the period up to 31 December 1995 and without prejudice to Articles 30 to 36 of the Treaty, permit the placing on the market and/or the putting into service of appliances and fittings which comply with the regulations in force in the Member States before 1 January 1992.

3. Member States shall communicate to the Commission the texts of the provisions of national law which they adopt in the field covered by this Directive.

Article 15

This Directive is addressed to the Member States.

▼B

ANNEXE I

ESSENTIAL REQUIREMENTS

Preliminary remark

The obligations resulting from the essential requirements for appliances in this Annex also apply to fittings where the corresponding risk exists.

1. GENERAL CONDITIONS

1.1. Appliances must be so designed and built as to operate safely and present no danger to persons, domestic animals or property when normally used as defined in Article 1 (4) of this Directive.

1.2. When placed on the market, all appliances must:
— be accompanied by technical instructions intended for the installer,
— be accompanied by instructions for use and servicing, intended for the user,
— bear appropriate warning notices, which must also appear on the packaging.

The instructions and warning notices must be in the official language or languages of the Member States of destination.

1.2.1. The technical instructions intended for the installer must contain all the instructions for installation, adjustment and servicing required to ensure that those operations are correctly performed and that the appliance may be used safely. In particular, the instructions must specify:
— the type of gas used,
— the gas supply pressure used,
— the flow of fresh air required:
  — for the combustion air supply,
  — to avoid the formation of dangerous unburned gas mixtures for appliances not fitted with the device referred to in point 3.2.3,
— the conditions for the dispersal of combustion products,
— for forced draught burners and heating bodies intended to be equipped with such burners, their characteristics, the requirements for assembly, to assist compliance with the essential requirements applicable to finished appliances and, where appropriate, the list of combinations recommended by the manufacturer.

1.2.2. The instructions for use and servicing intended for the user must contain all the information required for safe use, and must in particular draw the user's attention to any restrictions on use.

1.2.3. The warning notices on the appliance and its packaging must clearly state the type of gas used, the gas supply pressure and any restrictions on use, in particular the restriction whereby the appliance must be installed only in areas where there is sufficient ventilation.

1.3. Fittings intended to be part of an appliance must be so designed and built as to fulfil correctly their intended purpose when incorporated in accordance with the instructions for installation.

The instructions for installation, adjustment, operation and maintenance must be provided with the fittings concerned.

2. MATERIALS

2.1. Materials must be appropriate for their intended purpose and must withstand the technical, chemical and thermal conditions to which they will foreseeably be subjected.

2.2. The properties of materials that are important for safety must be guaranteed by the manufacturer or the supplier of the appliance.

3. DESIGN AND CONSTRUCTION

3.1. **General**

3.1.1. Appliances must be so constructed that, when used normally, no instability, distortion, breakage or wear likely to impair their safety can occur.

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3.1.2. Condensation produced at the start-up and/or during use must not affect the safety of appliances.

3.1.3. Appliances must be so designed and constructed as to minimize the risk of explosion in the event of a fire of external origin.

3.1.4. Appliances must be so constructed that water and inappropriate air penetration into the gas circuit does not occur.

3.1.5. In the event of a normal fluctuation of auxiliary energy, appliances must continue to operate safely.

3.1.6. Abnormal fluctuation or failure of auxiliary energy or its restoration must not lead to an unsafe situation.

3.1.7. Appliances must be so designed and constructed as to obviate hazards of electrical origin. In the area in which it applies, compliance with the safety objectives in respect of electrical hazards laid down in Directive 73/23/EEC [1] shall be equivalent to fulfilment of this requirement.

3.1.8. All pressurized parts of an appliance must withstand the mechanical and thermal stresses to which they are subjected without any deformation affecting safety.

3.1.9. Appliances must be so designed and constructed that failure of a safety, controlling or regulating device may not lead to an unsafe situation.

3.1.10. If an appliance is equipped with safety and controlling devices, the functioning of the safety devices must not be overruled by that of the controlling devices.

3.1.11. All parts of appliances which are set or adjusted at the stage of manufacture and which should not be manipulated by the user or the installer must be appropriately protected.

3.1.12. Levers and other controlling and setting devices must be clearly marked and give appropriate instructions so as to prevent any error in handling. Their design must be such as to preclude accidental manipulation.

3.2. **Unburned gas release**

3.2.1. Appliances must be so constructed that the gas leakage rate is not dangerous.

3.2.2. Appliances must be so constructed that gas release during ignition and re-ignition and after flame extinction is limited in order to avoid a dangerous accumulation of unburned gas in the appliance.

3.2.3. Appliances intended to be used in indoor spaces and rooms must be fitted with a special device which avoids a dangerous accumulation of unburned gas in such spaces or rooms.

Appliances which are not fitted with such devices must be used only in areas where there is sufficient ventilation to avoid a dangerous accumulation of unburned gas.

Member States may define on their territory adequate space ventilation conditions for the installation of such appliances, bearing in mind the features peculiar to them.

Large-scale kitchen appliances and appliances powered by gas containing toxic components must be equipped with the aforesaid device.

[1] OJ No L 77, 26. 3. 1973, p. 29.

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3.3. **Ignition**

Appliances must be so constructed that, when used normally:
— ignition and re-ignition is smooth,
— cross-lighting is assured.

3.4. **Combustion**

3.4.1. Appliances must be so constructed that, when used normally, flame stability is assured and combustion products do not contain unacceptable concentrations of substances harmful to health.

3.4.2. Appliances must be so constructed that, when used normally, there will be no accidental release of combustion products.

3.4.3. Appliances connected to a flue for the dispersal of combustion products must be so constructed that in abnormal draught conditions there is no release of combustion products in a dangerous quantity into the room concerned.

3.4.4. Independent flueless domestic heating appliances and flueless instantaneous water heaters must not cause, in the room or space concerned, a carbon monoxide concentration likely to present a danger to the health of persons exposed, bearing in mind the foreseeable duration of their exposure.

3.5. **Rational use of energy**

Appliances must be so constructed as to ensure rational use of energy, reflecting the state of the art and taking into account safety aspects.

3.6. **Temperatures**

3.6.1. Parts of appliances which are intended to be placed in close proximity to the floor or other surfaces must not reach temperatures which present a danger in the surrounding area.

3.6.2. The surface temperature of knobs and levers of appliances intended to be manipulated must not present a danger to the user.

3.6.3. The surface temperatures of external parts of appliances intended for domestic use, with the exception of surfaces or parts which are associated with the transmission of heat, must not under operating conditions present a danger to the user and in particular to children, for whom an appropriate reaction time must be taken into account.

3.7. **Foodstuffs and water used for sanitary purposes**

Without prejudice to the Community rules in this area, materials and components used in the construction of an appliance, which may come into contact with food or water used for sanitary purposes, must not impair their quality.

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ANNEXE II

PROCEDURE FOR CERTIFICATION OF CONFORMITY

1. EC TYPE-EXAMINATION

1.1. The EC type-examination is that part of the procedure by which a notified body checks and certifies that an appliance, representative of the production envisaged, meets the provisions of this Directive which apply to it.

1.2. The application for type-examination must be lodged by the manufacturer or his authorized representative established within the Community with a single notified body.

1.2.1. The application must include:
— the name and address of the manufacturer and, if the application is lodged by the authorized representative, his name and address,
— a written declaration that the application has not been lodged with any other notified body,
— the design documentation, as described in Annex IV.

1.2.2. The manufacturer must place at the disposal of the notified body an appliance, representative of the production envisaged, hereinafter called 'type'. The notified body may request further samples of the type if needed for the test programme.

The type may additionally cover variants of the product provided that those variants do not have different characteristics with respect to types of risk.

1.3. The notified body must:

1.3.1. examine the design documentation and verify that the type has been manufactured in conformity with the design documentation and identify the elements which have been designed in accordance with the applicable provisions of the standards referred to in Article 5 and the essential requirements of this Directive;

1.3.2. perform, or have performed, the appropriate examinations and/or tests to check whether the solutions adopted by the manufacturer meet the essential requirements where the standards referred to in Article 5 have not been applied;

1.3.3. perform, or have performed, the appropriate examinations and/or tests to check whether the applicable standards have effectively been applied where the manufacturer has chosen to do so, thereby assuring conformity with the essential requirements.

1.4. Where the type satisfies the provisions of this Directive, the notified body must issue an EC type-examination certificate to the applicant. The certificate must contain the conclusions of the examination, the conditions, if any, for its validity and the necessary data for identification of the approved type and, if relevant, descriptions of its functioning. Relevant technical elements such as drawings and diagrams must be annexed to the certificate.

1.5. The notified body must inform the other notified bodies forthwith of the issuing of the EC type-examination certificate and any additions to the said type as referred to in point 1.7. They may obtain a copy of the EC type-examination certificate and/or its additions and on a reasoned request may obtain a copy of the Annexes to the certificate and the reports on the examinations and tests carried out.

1.6. A notified body which refuses to issue or withdraws an EC type-examination certificate must inform the Member State which notified it and the other notified bodies accordingly, giving the reasons for its decision.

1.7. The applicant must keep the notified body that has issued the EC type-examination certificate informed of all modifications to the approved type which might affect conformity with the essential requirements.

Modifications to the approved type must receive additional approval from the notified body that issued the EC type-examination certificate where such changes affect conformity with the essential requirements or the prescribed conditions for use of the appliance. This additional approval is to be given in the form of an addition to the original EC type-examination certificate.

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2. EC DECLARATION OF CONFORMITY TO TYPE

2.1. The EC declaration of conformity to type is that part of the procedure whereby the manufacturer declares that the appliances concerned are in conformity with the type as described in the EC type-examination certificate and satisfy the essential requirements of this Directive which apply to them. ►M1 The manufacturer or his authorized representative established within the Community shall affix the CE marking on each appliance and draw up a written certificate of conformity. ◄ The declaration of conformity may cover one or more appliances and must be kept by the manufacturer. ►M1 The CE marking must be followed by the identification number of the notified body responsible for the random checks set out in point 2.3. ◄

2.2. The manufacturer must take all necessary measures to ensure that the manufacturing process, including final product inspection and testing, results in homogeneity of production and conformity of the appliances with the type as described in the EC type-examination certificate and with the requirements of this Directive which apply to them. A notified body, chosen by the manufacturer, must carry out random checks on the appliances as set out in point 2.3.

2.3. On-site checks of appliances must be undertaken at random by the notified body at intervals of one year or less. An adequate number of appliances must be examined and appropriate tests as set out in the applicable standards referred to in Article 5 or equivalent tests must be carried out in order to ensure conformity with the corresponding essential requirements of this Directive. The notified body shall in each case determine whether these tests need to be carried out in full or in part. Where one or more appliances are rejected, the notified body shall take the appropriate measures to prevent the marketing thereof.

3. EC DECLARATION OF CONFORMITY TO TYPE (guarantee of production quality)

3.1. The EC declaration of conformity to type (guarantee of production quality) is the procedure whereby a manufacturer who fulfils the obligations in point 3.2 declares that the appliances concerned are in conformity with the type as described in the EC type-examination certificate and satisfy the essential requirements of this Directive which applies to them. ►M1 The manufacturer or his authorized representative established within the Community must affix the CE marking to each appliance and draw up a written declaration of conformity. ◄ This declaration may cover one or more appliances and must be kept by the manufacturer. ►M1 The CE marking must be followed by the identification number of the notified body responsible for EC surveillance. ◄

3.2. The manufacturer shall apply a quality system that ensures conformity of the appliances with the type as described in the EC type-examination certificate and with the essential requirements of this Directive which apply to them. The manufacturer is subject to EC surveillance as specified in point 3.4.

3.3 **Quality system**

3.3.1. The manufacturer must lodge an application for approval of his quality system with a notified body of his choice for the appliances in question.

The application must include:

— the quality system documentation,

— an undertaking to carry out the obligations arising from the quality system as approved,

— an undertaking to maintain the approved quality system to ensure its continuing suitability and effectiveness,

— documentation relating to the approved type and a copy of the EC type-examination certificate.

3.3.2. All the elements, requirements and provisions adopted by the manufacturer must be documented in a systematic and logical manner in the form of measures, procedures and written instructions. This quality system documentation must permit a uniform interpretation of the quality programmes, plans, manuals and records. It shall contain, in particular, an adequate description of:

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— the quality objectives, the organizational structure and responsibilities of management and of their powers with regard to appliance quality,

— the manufacturing processes, quality control and quality assurance techniques and systematic actions that will be used,

— the examinations and tests that will be carried out before, during and after manufacture and the frequency with which they will be carried out,

— the method of monitoring attainment of the required appliance quality and the effective operation of the quality system.

3.3.3. The notified body shall examine and evaluate the quality system to determine whether it satisfies the requirements referred to in point 3.3.2. It will presume conformity with these requirements in respect of quality systems that implement the corresponding harmonized standard.

It must notify its decision to the manufacturer and inform the other notified bodies thereof. The notification to the manufacturer must contain the conclusions of the examination, the name and address of the notified body and the reasoned assessment decision in respect of the appliances concerned.

3.3.4. The manufacturer must keep the notified body that has approved the quality system informed of any updating of the quality system in relation to changes brought about by, for example, new technologies and quality concepts.

The notified body must examine the proposed modifications and decide whether the modified quality system complies with the relevant provisions or whether reappraisal is necessary. It must notify the manufacturer of its decision. The notification must include the conclusions of the inspection and the reasoned assessment decision.

3.3.5. A notified body that withdraws approval of a quality system must so inform the other notified bodies, giving the reasons for the decision.

3.4. **EC surveillance**

3.4.1. The purpose of EC surveillance is to ensure that the manufacturer duly fulfils the obligations arising out of the approved quality system.

3.4.2. The manufacturer must allow the notified body access for inspection purposes to the place of manufacture, inspection, testing and storage and must provide it with all necessary information, in particular:

— the quality system documentation,

— the quality records, such as inspection reports and test data, calibration data, reports on qualifications of the staff concerned, etc.

3.4.3. The notified body must carry out a check at least once every two years to ensure that the manufacturer is maintaining and applying the approved quality system and must supply a report of the check to the manufacturer.

3.4.4. Furthermore, the notified body may make unannounced visits to the manufacturer. During these visits, the notified body may carry out tests on appliances or have them carried out. It must supply the manufacturer with an inspection report and, if appropriate, a test report.

3.4.5. The manufacturer may supply the notified body's report on request.

4. EC DECLARATION OF TYPE CONFORMITY (guarantee of product quality)

4.1. The EC declaration of type conformity (guarantee of product quality) is that part of the procedure whereby a manufacturer who fulfils the obligations in point 4.2 declares that the appliances concerned are in conformity with the type as described in the EC type-examination certificate and satisfy the essential requirements of this Directive which apply to them. ►M1 The manufacturer or his authorized representative established within the Community must affix the CE marking to each appliance and draw up a written declaration of conformity. ◄ This declaration may cover one or more appliances and must be kept by the manufacturer. ►M1 The CE marking must be followed by the identification number of the notified body responsible for EC surveillance. ◄

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4.2. The manufacturer shall apply an approved quality system for the final inspection of the appliances and the tests, as specified in point 4.3, and is subject to EC surveillance as specified in point 4.4.

4.3. **Quality system**

4.3.1 Under this procedure, the manufacturer must lodge an application for approval of his quality system with a notified body of his choice for the appliances in question.

The application must include:

— the quality system documentation,

— an undertaking to carry out the obligations arising from the quality system as approved,

— an undertaking to maintain the approved quality system to ensure its continuing suitability and effectiveness,

— the documentation relating to the approved type and a copy of the EC type-examination certificate.

4.3.2. As part of the quality system, each appliance must be examined and appropriate tests as laid down in the applicable standard(s) referred to in Article 5 or equivalent tests carried out to check its conformity with the essential requirements relating to it in this Directive.

All the elements, requirements and provisions adopted by the manufacturer must be documented in a systematic and logical manner in the form of measures, procedures and written instructions. This quality system documentation must permit a uniform interpretation of the quality programmes, plans, manuals and records.

The quality system documentation shall contain, in particular, an adequate description of:

— the quality objectives, the organizational structure and responsibilities of management and of their powers with regard to appliance quality,

— the checks and tests to be carried out after manufacture,

— the method of verifying the effective operation of the quality system.

4.3.3. The notified body shall examine and evaluate the quality system to determine whether it satisfies the requirements referred to in point 4.3.2. It will presume conformity with these requirements in respect of quality systems that implement the corresponding harmonized standard. It must notify the manufacturer of its decision and inform the other notified bodies thereof. The notification to the manufacturer must contain the conclusions of the examination, the name and address of the notified body and the reasoned assessment decision for the appliances concerned.

4.3.4. The manufacturer must keep the notified body which approved the quality system informed of any adaptation of the quality system made necessary, e.g. by new technology and quality concepts.

The notified body must examine the proposed changes and decide whether the amended quality system satisfies the relevant provisions or whether a reassessment is necessary. It must notify the manufacturer of its decision. The notification must contain the conclusions of the inspection and the reasoned assessment decision.

4.3.5. A notified body which withdraws approval of a quality system must inform the other notified bodies that it has done so and give reasons for its decision.

4.4 **EC surveillance**

4.4.1. The purpose of EC surveillance is to ensure that the manufacturer duly fulfils the obligations arising out of the approved quality system.

4.4.2. The manufacturer must allow the notified body access for inspection to the place of inspection, testing and storage and must provide it with all necessary information, in particular:

— the quality system documentation,

— the quality files such as inspection reports and test data, calibration data, report on qualifications of the staff concerned, etc.

4.4.3. The notified body must carry out a check at least once every two years to ensure that the manufacturer is maintaining and applying the

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approved quality system and must supply a report on the check to the manufacturer.

4.4.4. Furthermore, the notified body may make unannounced visits to the manufacturer. During these visits, the body may carry out tests on appliances or have them carried out. It must supply the manufacturer with an inspection report and, if appropriate, a test report.

4.4.5. The manufacturer may supply the notified body's report on request.

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5. EC VERIFICATION

5.1. EC verification is the procedure whereby the manufacturer or his authorized representative established within the Community ensures and declares that the appliances subject to the provisions of point 3 are in conformity to the type as described in the EC type-examination certification and satisfy the requirements of this Directive that apply to them.

5.2. The manufacturer or his authorized representative established within the Community must take all measures necessary in order that the manufacturing process ensures conformity of the appliances to the type as described in the EC type-examination certification and to the requirements of this Directive that apply to them. The manufacturer or his authorized representative established within the Community must affix the CE marking to each appliance and draw up a written declaration of conformity. The declaration of conformity may cover one or more appliances and must be kept by the manufacturer or his authorized representative established within the Community.

5.3. The notified body must carry out the appropriate examinations and tests in order to check the conformity of the appliance to the requirements of this Directive by examination and testing of every appliance, as specified in point 5.4, or by examination and testing of appliances on a statistical basis, as specified in point 5.5, at the choice of the manufacturer.

5.4. **Verification by checking and testing of each appliance**

5.4.1. All appliances must be individually examined and appropriate tests, as set out in the relevant standard(s) referred to in Article 5, or equivalent tests, must be carried out in order to verify their conformity with the type as described in the EC type-examination certificate and the requirements of this Directive that apply to them.

5.4.2 The notified body must affix, or cause to be affixed, its identification number on each appliance and draw up a written certificate of conformity relating to the tests carried out. The certificate of conformity may cover one or more appliances.

5.4.3. The manufacturer or his authorized representative must ensure that he is able to supply the notified body's certificates of conformity on request.

5.5. **Statistical verification**

5.5.1. Manufacturers must present the appliances manufactured in the form of uniform batches and must take all necessary measures in order that the manufacturing process ensures the uniformity of each batch produced.

5.5.2. Statistical control is as follows:

Appliances are subject to statistical control by attributes. They should be grouped into identifiable batches consisting of units of a single model manufactured under the same conditions. A batch is examined at random intervals. The appliances constituting a sample are examined individually and appropriate tests, as laid down in the respective standard(s) referred to in Article 5, or equivalent tests are carried out to determine whether the batch is to be accepted or rejected.

A sampling system with the following characteristics is applied:

— a level of quality corresponding to a probability of acceptance of 95 %, with a non-conformity percentage of between 0,5 and 1,5 %,

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— a limit quality corresponding to a probability of acceptance of 5 %, with a percentage of non-conformity of between 5 and 10 %.

5.5.3. Where batches are accepted, the notified body must affix, or cause to be affixed, its identification number to each appliance and draw up a written certificate of conformity relating to the tests carried out. All appliances in the batch may be placed on the market except for those products from the sample which were found not to be in conformity.

Where a batch is rejected, the notified body must take appropriate measures to prevent the placing on the market of that batch. In the event of frequent rejection of batches the notified body may suspend the statistical verification.

The manufacturer may, under the responsibility of the notified body, affix the latter's identification number during the manufacturing process.

5.5.4. The manufacturer or his authorized representative must ensure that he is able to supply the notified body's certificates of conformity on request.

6. EC UNIT VERIFICATION

6.1. EC unit verification is the procedure whereby the manufacturer or his authorized representative established within the Community ensures and declares that the appliance concerned, which has been issued with the certificate referred to in point 2, conforms to the requirements of this Directive that apply to it. The manufacturer or his authorized representative must affix the CE marking to the appliance and draw up a written declaration of conformity which he must keep.

6.2. The notified body must examine the appliance and carry out the appropriate tests, taking account of the design documentation in order to ensure its conformity with the essential requirements of this Directive.

The notified body must affix, or cause to be affixed, its identification number to the approved appliance and must draw up a written certificate of conformity concerning the tests carried out.

6.3. The aim of the technical documentation relating to the design of the instrument, as referred to in Annex IV, is to enable conformity to the requirements of this Directive to be assessed and the design, manufacture and operation of the appliance to be understood.

The design documentation referred to in Annex IV must be made available to the notified body.

6.4. If deemed necessary by the notified body, the examinations and tests may be carried out after installation of the appliance.

6.5. The manufacturer or his authorized representative must ensure that he is able to supply the notified body's certificates of conformity on request.

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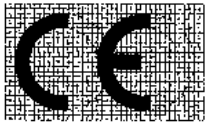
ANNEXE III

CE CONFORMITY MARKING AND INSCRIPTIONS

1. The CE conformity marking consists of the initials 'CE' as shown below:



The CE marking must be followed by the identification number of the notified body involved in the production control phase.

2. The appliance or its data plate must bear the CE marking together with the following inscriptions:
   — the manufacturer's name or identification symbol,
   — the trade name of the appliance,
   — the type of electrical supply used, if applicable,
   — the appliance category,
   — the last two digits of the year in which the CE marking was affixed.

   Information needed for installation purposes may be added according to the nature of the appliance.

3. If the CE marking is reduced or enlarged the proportions given in the above graduated drawing must be respected.

   The various components of the CE marking must have substantially the same vertical dimension, which may not be less than 5 mm.

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ANNEXE IV

DESIGN DOCUMENTATION

The design documentation must contain the following information, in so far as is required by the notified body for assessment:

— a general description of the appliance,

— conceptual designs and manufacturing drawings and diagrams of components, sub-assemblies, circuits, etc.,

— descriptions and explanations necessary for the understanding of the above, including the operation of the appliances,

— a list of the standards referred to in Article 5, applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements where the standards referred to in Article 5 have not been applied,

— test reports,

— manuals for installation and use.

Where appropriate, the design documentation must contain the following elements:

— attestations relating to the equipment incorporated in the appliance,

— attestations and certificates relating to the methods of manufacture and/or inspection and/or monitoring of the appliance,

— any other document making it possible for the notified body to improve its assessment.

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ANNEXE V

MINIMUM CRITERIA FOR ASSESSMENT OF NOTIFIED BODIES

The notified bodies designated by the Member States must fulfil the following minimum conditions:

— availability of personnel and of the necessary means and equipment,

— technical competence and professional integrity of personnel,

— independence in carrying out tests, preparing reports, issuing certificates and performing the surveillance provided for in this Directive, of management and technical staff in relation to all circles, groups or persons directly or indirectly involved in the field of the appliances,

— maintenance of professional secrecy by staff,

— possession of civil liability insurance unless that liability is covered by the State under national law.

Fulfilment of the conditions in the first two indents must be periodically verified by the competent authorities of the Member States or by bodies designated by the Member States.

Commission communication in the framework of the implementation of the Council Directive 90/396/EEC on the approximation of the laws of the Member States relating to appliances burning gaseous fuels

(Text with EEA relevance)

(Publication of titles and references of harmonised standards under the directive)

(2008/C 127/14)

ESO [1]	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 26:1997 Gas-fired instantaneous water heaters for sanitary uses production, fitted with atmospheric burners (Including Corrigendum 1998)	—	
	EN 26:1997/A1:2000	Note 3	Date expired (18.7.2001)
	EN 26:1997/A3:2006	Note 3	Date expired (30.6.2007)
	EN 26:1997/AC:1998		
CEN	EN 30-1-1:1998 Domestic cooking appliances burning gas fuel — Part 1-1: Safety — General	—	
	EN 30-1-1:1998/A1:1999	Note 3	Date expired (30.9.1999)
	EN 30-1-1:1998/A2:2003	Note 3	Date expired (29.2.2004)
	EN 30-1-1:1998/A3:2005	Note 3	Date expired (31.12.2005)
	EN 30-1-1:1998/A2:2003/AC:2004		
CEN	EN 30-1-2:1999 Domestic cooking appliances burning gas — Part 1-2: Safety — Appliances having forced-convection ovens and/or grills	—	
CEN	EN 30-1-3:2003 + A1:2006 Domestic cooking appliances burning gas — Part 1-3: Safety — Appliances having a glass ceramic hotplate	EN 30-1-3:2003	Date expired (30.6.2007)
CEN	EN 30-1-4:2002 Domestic cooking appliances burning gas — Part 1-4: Safety — Appliances having one or more burners with an automatic burner control system	—	
	EN 30-1-4:2002/A1:2006	Note 3	Date expired (30.6.2007)
CEN	EN 30-2-1:1998 Domestic cooking appliances burning gas — Part 2-1: Rational use of energy — General	—	
	EN 30-2-1:1998/A1:2003	Note 3	Date expired (10.12.2004)
	EN 30-2-1:1998/A2:2005	Note 3	Date expired (11.11.2005)
	EN 30-2-1:1998/A1:2003/AC:2004		
CEN	EN 30-2-2:1999 Domestic cooking appliances burning gas — Part 2-2: Rational use of energy — Appliances having forced-convection ovens and/or grills	—	

ESO [1]	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 88-1:2007 Pressure regulators and associated safety devices for gas appliances — Part 1: Pressure regulators for inlet pressures up to and including 500 mbar	EN 88:1991	31.5.2008
CEN	EN 88-2:2007 Pressure regulators and associated safety devices for gas appliances — Part 2: Pressure regulators for inlet pressures above 500 mbar up to and including 5 bar	—	
CEN	EN 89:1999 Gas-fired storage water heaters for the production of domestic hot water	—	
	EN 89:1999/A1:1999	Note 3	Date expired (17.10.2000)
	EN 89:1999/A2:2000	Note 3	Date expired (18.7.2001)
	EN 89:1999/A3:2006	Note 3	Date expired (30.6.2007)
	EN 89:1999/A4:2006	Note 3	Date expired (30.6.2007)
CEN	EN 125:1991 Flame supervision devices for gas burning appliances — Thermo-electric flame supervision devices	—	
	EN 125:1991/A1:1996	Note 3	Date expired (17.7.1997)
CEN	EN 126:2004 Multifunctional controls for gas burning appliances	EN 126:1995	Date expired (10.12.2004)
CEN	EN 161:2007 Automatic shut-off valves for gas burners and gas appliances	EN 161:2001	Date expired (31.7.2007)
CEN	EN 203-1:2005 Gas heated catering equipment — Part 1: General safety rules	EN 203-1:1992	31.12.2008
CEN	EN 203-2-1:2005 Gas heated catering equipment — Part 2-1: Specific requirements — Open burners and wok burners	EN 203-2:1995	31.12.2008
CEN	EN 203-2-2:2006 Gas heated catering equipment — Part 2-2: Specific requirements — Ovens	EN 203-2:1995	31.12.2008
CEN	EN 203-2-3:2005 Gas heated catering equipment — Part 2-3: Specific requirements — Boiling pans	EN 203-2:1995	31.12.2008
CEN	EN 203-2-4:2005 Gas heated catering equipment — Part 2-4: Specific requirements — Fryers	EN 203-2:1995	31.12.2008
CEN	EN 203-2-6:2005 Gas heated catering equipment — Part 2-6: Specific requirements — Hot water heaters for beverage	EN 203-2:1995	31.12.2008

ESO (1)	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 203-2-7:2007 Gas heated catering equipment — Part 2-7: Specific requirements — Salamanders and rotisseries	EN 203-2:1995	31.12.2008
CEN	EN 203-2-8:2005 Gas heated catering equipment — Part 2-8: Specific requirements — Brat pans and paëlla cookers	EN 203-2:1995	31.12.2008
CEN	EN 203-2-9:2005 Gas heated catering equipment — Part 2-9: Specific requirements — Solid tops, warming plates and griddles	EN 203-2:1995	31.12.2008
CEN	EN 203-2-10:2007 Gas heated catering equipment — Part 2-10: Specific requirements — Chargrills	EN 203-2:1995	31.12.2008
CEN	EN 203-2-11:2006 Gas heated catering equipment — Part 2-11: Specific requirements — Pasta cookers	EN 203-2:1995	31.12.2008
CEN	EN 257:1992 Mechanical thermostats for gas-burning appliances	—	
	EN 257:1992/A1:1996	Note 3	Date expired (17.7.1997)
CEN	EN 297:1994 Gas-fired central heating boilers — Type B11 and B11BS boilers fitted with atmospheric burners of nominal heat input not exceeding 70 kW	—	
	EN 297:1994/A3:1996	Note 3	Date expired (24.2.1998)
	EN 297:1994/A5:1998	Note 3	Date expired (31.12.1998)
	EN 297:1994/A2:1996	Note 3	Date expired (29.10.2002)
	EN 297:1994/A6:2003	Note 3	Date expired (23.12.2003)
	EN 297:1994/A4:2004	Note 3	Date expired (11.6.2005)
	EN 297:1994/A2:1996/AC:2006		
CEN	EN 298:2003 Automatic gas burner control systems for gas burners and gas burning appliances with or without fans	EN 298:1993	Date expired (30.9.2006)
CEN	EN 303-3:1998 Heating boilers — Part 3: Gas-fired central heating boilers — Assembly comprising a boiler body and a forced draught burner	—	
	EN 303-3:1998/A2:2004	Note 3	Date expired (11.6.2005)
	EN 303-3:1998/AC:2006		
CEN	EN 303-7:2006 Heating boilers — Part 7: Gas-fired central heating boilers equipped with a forced draught burner of nominal heat output not exceeding 1 000 kW	—	

ESO (1)	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 377:1993 Lubricants for applications in appliances and associated controls using combustible gases except those designed for use in industrial processes	—	
	EN 377:1993/A1:1996	Note 3	Date expired (11.6.2005)
CEN	EN 416-1:1999 Single burner gas-fired overhead radiant-tube heaters — Part 1: Safety	—	
	EN 416-1:1999/A1:2000	Note 3	Date expired (18.7.2001)
	EN 416-1:1999/A2:2001	Note 3	Date expired (31.1.2002)
	EN 416-1:1999/A3:2002	Note 3	Date expired (31.10.2002)
CEN	EN 416-2:2006 Single burner gas-fired overhead radiant tube heaters for non-domestic use — Part 2: Rational use of energy	—	
CEN	EN 419-1:1999 Non-domestic gas-fired overhead luminous radiant heaters — Part 1: Safety	—	
	EN 419-1:1999/A1:2000	Note 3	Date expired (18.7.2001)
	EN 419-1:1999/A2:2001	Note 3	Date expired (31.1.2002)
	EN 419-1:1999/A3:2002	Note 3	Date expired (9.9.2003)
CEN	EN 419-2:2006 Non-domestic gas-fired overhead luminous radiant heaters — Part 2: Rational use of energy	—	
CEN	EN 437:2003 Test gases — Test pressures — Appliance categories	EN 437:1993	Date expired (23.12.2003)
CEN	EN 449:2002 Specification for dedicated liquefied petroleum gas appliances — Domestic flueless space heaters (including diffusive catalytic combustion heaters)	EN 449:1996	Date expired (2.7.2003)
CEN	EN 461:1999 Specification for dedicated liquefied petroleum gas appliances — Flueless non-domestic space heaters not exceeding 10 kW	—	
	EN 461:1999/A1:2004	Note 3	Date expired (10.12.2004)
CEN	EN 483:1999 Gas-fired central heating boilers — Type C boilers of nominal heat input not exceeding 70 kW	—	
	EN 483:1999/A2:2001	Note 3	Date expired (31.1.2002)
	EN 483:1999/A2:2001/AC:2006		

ESO (1)	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 484:1997 Specification for dedicated liquefied petroleum gas appliances — Independent hotplates, including those incorporating a grill for outdoor use	—	
CEN	EN 497:1997 Specification for dedicated liquefied petroleum gas appliances — Multi purpose boiling burners for outdoor use	—	
CEN	EN 498:1997 Specification for dedicated liquefied petroleum gas appliances — Barbecues for outdoor use	—	
CEN	EN 509:1999 Decorative fuel-effect gas appliances	—	
	EN 509:1999/A1:2003	Note 3	Date expired (31.12.2003)
	EN 509:1999/A2:2004	Note 3	Date expired (30.6.2005)
CEN	EN 521:2006 Specifications for dedicated liquefied petroleum gas appliances — Portable vapour pressure liquefied petroleum gas appliances	EN 521:1998	Date expired (31.8.2006)
CEN	EN 525:1997 Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW	—	
CEN	EN 549:1994 Rubber materials for seals and diaphragms for gas appliances and gas equipment	EN 279:1991 EN 291:1992	Date expired (31.12.1995)
CEN	EN 613:2000 Independent gas-fired convection heaters	—	
	EN 613:2000/A1:2003	Note 3	Date expired (23.12.2003)
CEN	EN 621:1998 Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, without a fan to assist transportation of combustion air and/or combustion products	—	
	EN 621:1998/A1:2001	Note 3	Date expired (31.3.2002)
CEN	EN 624:2000 Specification for dedicated LPG appliances — Room sealed LPG space heating equipment for installation in vehicles and boats	—	
CEN	EN 625:1995 Gas-fired central heating boilers — Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kW	—	

ESO (1)	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 656:1999 Gas-fired central heating boilers — Type B boilers of nominal heat input exceeding 70 kW but not exceeding 300 kW	—	
CEN	EN 676:2003 Automatic forced draught burners for gaseous fuels	EN 676:1996	Date expired (8.4.2004)
CEN	EN 677:1998 Gas-fired central heating boilers — Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW	—	
CEN	EN 732:1998 Specifications for dedicated liquefied petroleum gas appliances — Absorption refrigerators	—	
CEN	EN 751-1:1996 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 1: Anaerobic jointing compounds	—	
CEN	EN 751-2:1996 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 2: Non-hardening jointing compounds	—	
CEN	EN 751-3:1996 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 3: Unsintered PTFE tapes EN 751-3:1996/AC:1997	—	
CEN	EN 777-1:1999 Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 1: System D, safety	—	
	EN 777-1:1999/A1:2001	Note 3	Date expired (31.8.2001)
	EN 777-1:1999/A2:2001	Note 3	Date expired (31.1.2002)
	EN 777-1:1999/A3:2002	Note 3	Date expired (31.10.2002)
CEN	EN 777-2:1999 Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 2: System E, safety	—	
	EN 777-2:1999/A1:2001	Note 3	Date expired (31.8.2001)
	EN 777-2:1999/A2:2001	Note 3	Date expired (31.1.2002)
	EN 777-2:1999/A3:2002	Note 3	Date expired (31.10.2002)
CEN	EN 777-3:1999 Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 3: System F, safety	—	
	EN 777-3:1999/A1:2001	Note 3	Date expired (31.8.2001)
	EN 777-3:1999/A2:2001	Note 3	Date expired (31.1.2002)
	EN 777-3:1999/A3:2002	Note 3	Date expired (31.10.2002)

ESO (1)	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 777-4:1999 Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 4: System H, safety	—	
	EN 777-4:1999/A1:2001	Note 3	Date expired (31.8.2001)
	EN 777-4:1999/A2:2001	Note 3	Date expired (31.1.2002)
	EN 777-4:1999/A3:2002	Note 3	Date expired (31.10.2002)
CEN	EN 778:1998 Domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 70 kW, without a fan to assist transportation of combustion air and/or combustion products	—	
	EN 778:1998/A1:2001	Note 3	Date expired (31.3.2002)
CEN	EN 1020:1997 Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, incorporating a fan to assist transportation of combustion air and/or combustion products	—	
	EN 1020:1997/A1:2001	Note 3	Date expired (31.3.2002)
CEN	EN 1106:2001 Manually operated taps for gas burning appliances	—	
CEN	EN 1196:1998 Domestic and non-domestic gas-fired air heaters — Supplementary requirements for condensing air heaters	—	
CEN	EN 1266:2002 Independent gas-fired convection heaters incorporating a fan to assist transportation of combustion air and/or flue gases	—	
	EN 1266:2002/A1:2005	Note 3	Date expired (28.2.2006)
CEN	EN 1319:1998 Domestic gas-fired forced convection air heaters for space heating, with fan-assisted burners not exceeding a net heat input of 70 kW	—	
	EN 1319:1998/A2:1999	Note 3	Date expired (17.10.2000)
	EN 1319:1998/A1:2001	Note 3	Date expired (31.3.2002)
CEN	EN 1458-1:1999 Domestic direct gas-fired tumble dryers of types B22D and B23D, of nominal heat input not exceeding 6 kW — Part 1: Safety	—	

ESO (1)	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 1458-2:1999 Domestic direct gas-fired tumble dryers of types B22D and B23D, of nominal heat input not exceeding 6 kW — Part 2: Rational use of energy	—	
CEN	EN 1596:1998 Specification for dedicated liquefied petroleum gas appliances — Mobile and portable non-domestic forced convection direct fired air heaters	—	
	EN 1596:1998/A1:2004	Note 3	Date expired (10.12.2004)
CEN	EN 1643:2000 Valve proving systems for automatic shut-off valves for gas burners and gas appliances	—	
CEN	EN 1854:2006 Pressure sensing devices for gas burners and gas burning appliances	EN 1854:1997	Date expired (4.11.2006)
CEN	EN 12067-1:1998 Gas/air ratio controls for gas burners and gas burning appliances — Part 1: Pneumatic types	—	
	EN 12067-1:1998/A1:2003	Note 3	Date expired (23.12.2003)
CEN	EN 12067-2:2004 Gas/air ratio controls for gas burners and gas burning appliances — Part 2: Electronic types	—	
CEN	EN 12078:1998 Zero governors for gas burners and gas burning appliances	—	
CEN	EN 12244-1:1998 Direct gas-fired washing machines, of nominal heat input not exceeding 20 kW — Part 1: Safety	—	
CEN	EN 12244-2:1998 Direct gas-fired washing machines of nominal heat input not exceeding 20 kW — Part 2: Rational use of energy	—	
CEN	EN 12309-1:1999 Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW — Part 1: Safety	—	
CEN	EN 12309-2:2000 Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW — Part 2: Rational use of energy	—	
CEN	EN 12669:2000 Direct gas-fired hot air blowers for use in greenhouses and supplementary non-domestic space heating	—	
CEN	EN 12752-1:1999 Gas-fired type B tumble dryers of nominal heat input not exceeding 20 kW — Part 1: Safety	—	

ESO [1]	Reference and title of the harmonised standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard (Note 1)
CEN	EN 12752-2:1999 Gas-fired type B tumble dryers of nominal heat input not exceeding 20 kW — Part 2: Rational use of energy	—	
CEN	EN 12864:2001 Low-pressure, non adjustable regulators having a maximum outlet pressure of less than or equal to 200 mbar, with a capacity of less than or equal to 4 kg/h, and their associated safety devices for butane, propane or their mixtures	—	
	EN 12864:2001/A1:2003	Note 3	Date expired (10.12.2004)
	EN 12864:2001/A2:2005	Note 3	Date expired (28.2.2006)
CEN	EN 13278:2003 Open fronted gas-fired independent space heaters	—	
CEN	EN 13611:2007 Safety and control devices for gas burners and gas burning appliances — General requirements	EN 13611:2000	31.5.2008
CEN	EN 13785:2005 Regulators with a capacity of up to and including 100 kg/h, having a maximum nominal outlet pressure of up to and including 4 bar, other than those covered by EN 12864 and their associated safety devices for butane, propane or their mixtures EN 13785:2005/AC:2007	—	
CEN	EN 13786:2004 Automatic change-over valves having a maximum outlet pressure of up to and including 4 bar with a capacity of up to and including 100 kg/h, and their associated safety devices for butane, propane or their mixtures	—	
CEN	EN 13836:2006 Gas fired central heating boilers — Type B boilers of nominal heat input exceeding 300 kW, but not exceeding 1 000 kW	—	
CEN	EN 14438:2006 Gas-fired insets for heating more than one room	—	
CEN	EN 14543:2005 + A1:2007 Specification for dedicated liquefied petroleum gas appliances — Parasol patio heaters — Flueless radiant heaters for outdoor or amply ventilated area use	EN 14543:2005	The date of this publication
CEN	EN 14829:2007 Independent gas-fired flueless space heaters for nominal heat input not exceeding 6 kW	—	
CEN	EN 15033:2006 Room sealed storage water heaters for the production of sanitary hot water using LPG for vehicles and boats	—	

[1] ESO: European Standardisation Organisation:
— CEN: rue de Stassart 36, B-1050 Brussels, Tel. (32-2) 550 08 11; fax (32-2) 550 08 19 (http://www.cen.eu)
— CENELEC: rue de Stassart 35, B-1050 Brussels, Tel. (32-2) 519 68 71; fax (32-2) 519 69 19 (http://www.cenelec.eu)
— ETSI: 650, route des Lucioles, F-06921 Sophia Antipolis, Tel. (33) 492 94 42 00; fax (33) 493 65 47 16 (http://www.etsi.eu).

Note 1 Generally the date of cessation of presumption of conformity will be the date of withdrawal ('dow'), set by the European Standardisation Organisation, but attention of users of these standards is drawn to the fact that in certain exceptional cases this can be otherwise.

Note 3 In case of amendments, the referenced standard is EN CCCCC:YYYY, its previous amendments, if any, and the new, quoted amendment. The superseded standard (column 3) therefore consists of EN CCCCC:YYYY and its previous amendments, if any, but without the new quoted amendment. On the date stated, the superseded standard ceases to give presumption of conformity with the essential requirements of the directive.

Note:

— Any information concerning the availability of the standards can be obtained either from the European Standardisation Organisations or from the national standardisation bodies of which the list is annexed to the Directive 98/34/EC of the European Parliament and of the Council [1] amended by the Directive 98/48/EC [2].

— Publication of the references in the *Official Journal of the European Union* does not imply that the standards are available in all the Community languages.

— This list replaces all the previous lists published in the *Official Journal of the European Union*. The Commission ensures the updating of this list.

More information about harmonised standards on the Internet at:

http://ec.europa.eu/enterprise/newapproach/standardization/harmstds/

[1] OJ L 204, 21.7.1998, p. 37.
[2] OJ L 217, 5.8.1998, p. 18.

Annex C

Status of Fieldwork

Interviews

Contact Person	Kind of contact	Country
Official institutions		
Vojtech Petrik, COSMT - Czech Office for Standardization, Metrology and Testing, Ministry of Trade and Industry, Prague	e-mail + phone Questionnaire face (planned)	CZ
Carsten Sorig, Sikkerhedsstyrelsen, Danish Safety Technology Authority, Esbjerg	e-mail face	DK
Ignaz Kozina, Ministry of the Economy, Ljubljana	e-mail + phone face (planned)	SI
Jiri Sobola, Technicky a Zkusebni Ustav Stavebni Praha S.P., Prague	e-mail Questionnaire	CZ
Standardization bodies		
Michele Ronchi, CIG – Comitatio Italiano Gas, San Donato Milanese	e-mail + phone Questionnaire face	I
Mark Crowther, Gastec	Questionnaire	UK
Instytut nafty i gazu	Questionnaire	PL
Technology research bodies / departments		
Onderek, Engineering Test Institute, Brno	e-mail	CZ
Rolf Albus, E.ON-Ruhrgas, Essen	phone	D
Guido Dubielzig, Gas-Wärme-Institut, Essen	phone	D
Ken T. Olesen, DBI - Danish Institute of Fire and Security Technology, Hvidovre	e-mail	DK
Peter Hinstrup, Danish Gas Technology Center, Hørsholm	e-mail	DK
Anna Ferrari, IMQ – Istituto Italiano del Marchio di Qualità S.P.A., Milano	e-mail + phone face	I

Claudio Soligon, Kiwa Italia S.P.A., Milano	e-mail	I
Daniele Zerbi, IRCM – Istituto di Ricerche e Collaudi Masini S.R.L., Rho	e-mail Questionnaire	I
Igor Jeromel, TCL – Testing and Certification Laboratories, Velenje	e-mail Questionnaire	SI
Andraž Legat, Zag Ljubljana, Ljubljana	e-mail	SI

Associations

Udo Wasser, EHI, Brussels	face	B
Martin Bergemann, AFECOR, Brussels	phone	B
Milos Kebrdle, Czech Gas Association, Prague	e-mail	CZ
Wilfried Linke, BDH, Köln	Questionnaire	D
F. Kienle, HKI, Frankfurt/Main	Questionnaire	D
Dieter Vass-Wolff, DVGW, Bonn	Questionnaire	D
Robert Schneiderbanger, DVFG, Berlin	Questionnaire	D
Carsten Mueller-Oehring, ZVSHK, St. Augustin	phone	D
Nils Lygaard, Tekniq, Glostrup	e-mail + phone	DK
Pierre Toledano, GFCC	e-mail + phone Questionnaire	FR
Patrick le Dévéhat, GIFAM	e-mail+ phone Questionnaire	FR
Yannick Onfroy, AFG	e-mail + phone Questionnaire	FR
Edgard Rérolle, CER	Questionnaire Interview	FR
Sonia Pomar, FEGECA	e-mail + phone Questionnaire	ES
Ana Maria Garcia, Concaif	e-mail	ES

Carlos Villalonga, Sedigas	e-mail	ES
Frederico Musazzi, Assotermica	e-mail Questionnaire	IT
Roger Webb, SBGI	Phone interview	UK
Bob Towse, HVCA, London	e-mail + phone	UK
Rob Bernsen, UNETO-VNI (services)	face (planned) Questionnaire	NL
W. Pem Kubbe, Papendrecht	e-mail + phone	NL
FHJ Steggink, VFK	Questionnaire	NL
Fred Vos, Uneto	telephone	NL
Polskie zrzeszenie Inzynierow i Technikow sanitarnych	Questionnaire	PL
Izba Gospodarcza Gazownictwa	Questionnaire	PL

Companies

Antonín Novotný, Centrum Stavebniho Inzenyrstvi A.S., Prague	e-mail	CZ
Winfried Schnur, Carl Capito Heiztechnik GmbH, Neunkirchen	phone	D
Karl-Heinz Backhaus, Vaillant GmbH, Remscheid	face	D
Michael Pittner, Bosch Thermotechnik GmbH, Wetzlar	face	D
Wolfgang Hormel, Viessmann Werke GmbH & Co. KG	face	D
Dr. Klaus-Dieter Fischer, BSH, Bretten	Questionnaire	D
Guiseppe Persano, Istituto Giordano S.P.A., Bellaria	e-mail	I
Mr. Zoeteman, Asogem (BEKO)	Questionnaire	NL
Polskie Górnictwo Naftowe i Gazownictwo SA	Questionnaire	PL
Martin Searle, Baxi Group, Preston	face	UK
Ignacio Leiva, Repsol Butano	telephone	ES

Monserrat Beltran, Gas natural		telephone	ES

Annex D

Inventory of the Literature

and

Internet Research

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Annex E

List of Acronyms

Abbreviations

ACS	Accreditation Certification Scheme
ANEC	European consumer voice in standardisation
BED	Boiler Efficiency Directive
CE	Conformité Européenne
CEN	European Committee for Standardization
CHP	Combined Heat and Power
CN-Code	Combined Nomenclature (CN) classification codes
CPD	Construction Products Directive
CPR	Construction Products Regulation
COM	Communication (from the European commission)
DGE	Directorate General Enterprise
DIY	Do it yourself
EC	European Commission
EEA	European Economic Area (Agreement)
EEC	European Economic Community
EFTA	European Free Trade Association
EMC	Electro-Magnetic Compatibility Directive
EPBD	Energy Performance of Buildings Directive
ETA	European Technical Approval
EU	European Union
EuP	Energy-Using Products Directive
FDI	Foreign Direct Investment
GA	Gas Appliances
GAD	Gas Appliances Directive
GADAC	Gas Appliance Directive Advisory Committee
GAS	Gas Appliances Sector (comprises GAS-M and GAS-S)
GAS-M	Manufacture of physical GAS products
GAS-S	Supply of downstream GAS services
GDP	Gross Domestic Product
hEN	Harmonised European Standard
HSE	Health and Safety Executive
HVCA	Heating, ventilation and air conditioning
IEA	International Energy Agency
IPR	Intellectual Property Rights
LED	Light-emitting diodes
LNG	Liquified natural Gas
LPG	Liquified Petroleum Gas
LVD	Low Voltage Directive
MDA	Major Domestic Appliances
MEEPS	Minimum Efficiency Performance Standards
Micro-CHP	Micro Combined Heat and Power (µCHP)
MRAs	Mutual Recognition Agreements
NACE	Classification of Economic Activities in the European Community
NB-GA	Notified Bodies Gas Appliances

OEM	Original equipment manufacturer (i.e. manufacturer of finished goods
QS	Quality and Security
PECAs	Protocols to the Europe Agreements on Conformity Assessment and Acceptance of Industrial Products
PED	Pressure Equipment Directive
PRODCOM	PRODuction COMmunautaire, Eurostat database
RAC	Room air conditioner
RoHS	Restriction of the use of certain Hazardous Substances
R&D	Research & Development
SAVE	Council Directive 93/76/EEC to limit carbon dioxide emissions by improving energy efficiency
SDA	Small Domestic Appliances
SIK	Danish Safety Technology Authority
SME	Small and medium sized enterprises
S/NVQ	Scottish and National Vocational Qualifications
TRGI	Technical rules for gas installations
WEEE	Waste from Electrical and Electronic Equipment
WES	CESifo World Economic Survey
WG-GA	Working Group Gas Appliances
WTO	World Trade Organisation

Country codes

Code	Country
AT	Austria
BE	Belgium
BG	Bulgaria
CR	Croatia
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EL	Greece
EN	Estonia
ES	Spain
FI	Finland
FR	France
HU	Hungary
IC	Iceland
IE	Ireland
IT	Italy
LT	Lithuania
LV	Latvia
LX	Luxembourg
MT	Malta
NL	The Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
SI	Slovenia
SK	Slovakia
SW	Sweden
UK	The United Kingdom