Report by Belgium to the European Commission pursuant to Article 10(1) of Directive 2004/08/EC

Brussels-Capital Region Walloon Region

Institutional structure of Belgium

Belgium is a Federal State made up of three linguistic Communities and three Regions, each having executive and legislative bodies.

In Belgium, energy policy falls under federal and regional competences. The Federal Government has competence for "matters whose technical and economical indivisibility requires a homogeneous implementation nationally", namely gas and electricity tariffs, the organisation of the market for the major infrastructures for the storage, transportation and production of energy, the nuclear fuel cycle, and research and development of nuclear fusion and fission.

The main areas of competence for the regional governments (Flanders, Wallonia and Brussels-Capital) are the preparation and implementation of policies on energy efficiency, the research and development of new, non-nuclear sources of energy (including the promotion of cogeneration and renewable energies) and the organisation of the market for the distribution of electricity and gas through networks.

Table 1: Division of competences on energy issues between the Federal Government and the regions

Federal Government	**Regional Governments**
- National equipment programme in the electricity sector - Nuclear fuels cycle, R&D programmes and research into nuclear fusion - Major infrastructures for storage, transport and production of energy - Tariffs - Offshore energy production	- Distribution and supply of electricity through networks with a nominal voltage of 70 kV or less - Public distribution of gas - Use of methane and blast furnace gas - Urban heating systems and networks - Recycling of slag heaps - New and renewable sources of energy - Recovery of energy by the industry and other users - Rational use of energy

CONCERE/ENOVER is an official body which deals with consultation between the State and the Regions on energy matters.

National political objectives/ trends in development

I. Objectives for limiting CO2 emissions

Under the Kyoto Protocol, Belgium undertook to reduce its greenhouse gas emissions, in the period 2008-2012, by 7.5% compared with 1990. Given the federal structure of the State, national reduction efforts were distributed between the Federal Authorities and the Regions. The main aspects of this distribution are explained briefly below.

The Regions are responsible for managing the emission rights under the Kyoto protocol for an amount equal to the greenhouse gas emissions on their territory during the period 2008-2012 so that Belgium fulfils its obligations under the Kyoto protocol.
The Federal Authorities will take a series of supplementary measures with a view to reducing greenhouse gas emissions. These federal measures will be included in the National Climate Plan by way of a federal section in the plan . The estimate of the incidence of the reduction of emissions annually due to these measures for the period 2008-2012 is assumed to be at least 4 800 000 tonnes $CO_{2\text{-equivalent}}$. These measures will be evaluated annually and will, if necessary, be reviewed if economic growth exceeds the annual growth for the period 2003 -2008 as estimated by the Plan Federal Office.
The Regions are responsible for managing the emission rights under the Kyoto Protocol. They are granted emission rights on the basis of the following regulations:

- Walloon Region: the 1990 emissions reduced by 7.5%, or estimated today at 50.23 million tonnes $CO_{2\text{-equi.}}$

- Flemish Region: : the 1990 emissions reduced by 5.2%, or estimated today at 83.37 million tonnes $CO_{2\text{-equi.}}$

- Brussels-Capital Region: the 1990 emissions increased by 3.475%, or estimated today at 4.13 million tonnes $CO_{2\text{-equi.}}$

The above amounts mean that more emission rights are granted to the Regions than Belgium receives under the Kyoto Protocol. To offset this deficit, the Federal Authorities will obtain additional emission rights. Based on the latest inventory figures for 1990, this acquisition at federal level would represent a quantity of 2.46 million emission rights per annum for the five-year period 2008-2012.

II. National Plan for the allocation of emission rights

In Belgium, the Federal Authorities and the Regions both play a role in the creation of the Belgian National Allocation Plan.

The three Regions have competence for most of the installations in Belgium. The Federal Authorities have competence for installations of a particular type, namely safety and assistance installations in nuclear power stations.

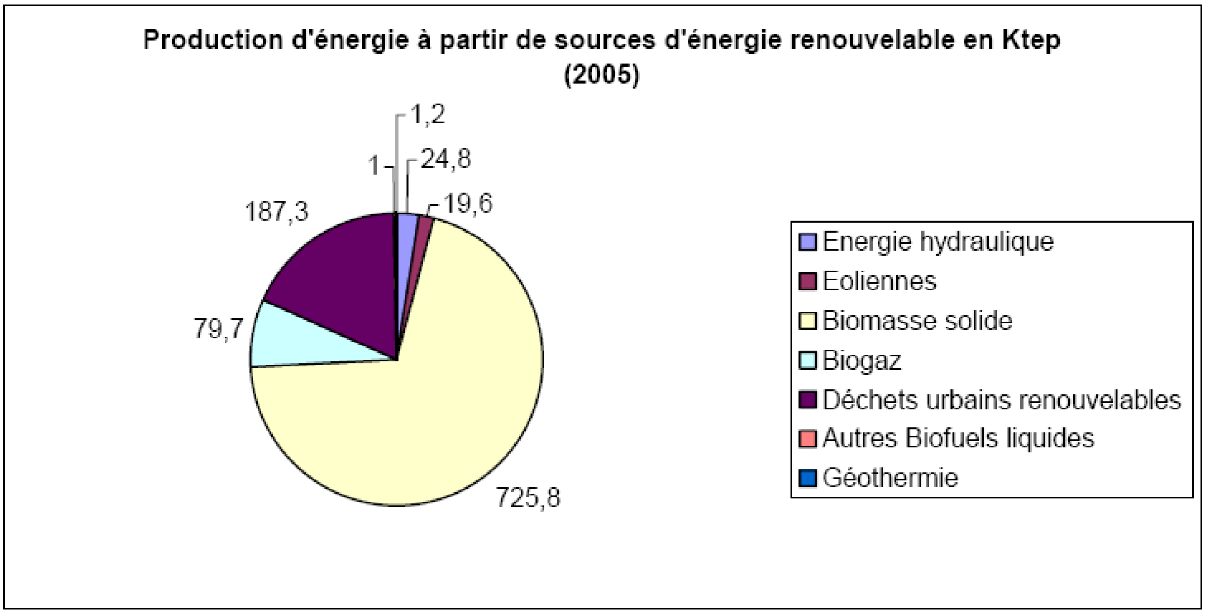
Each installation which discharges CO_2 is allocated a quantity of emission rights for the period 2005-2007 and 2008-2012. This allocation comes from the National Emission Rights Plan. The National Allocation Plan for 2008-2012 has yet to be approved by the European Commission.

III. Use of renewable energies

1) Belgium

The White Paper on renewable energy set out an indicative European target of 12% in 2010 of gross internal energy consumption in the Community as a whole to be met by renewable sources of energy. Based on this overall target, Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in turn defines an overall Community target: the share of electricity produced from renewable energy sources in the gross consumption of electricity must reach 22.1% in 2010. Under this Directive, the indicative target which was fixed for Belgium is 6%.

In 2005, production from renewable energy sources contributed 1 038 Ktep. This corresponds to approximately 1.6% of the gross internal energy consumption.



Key:

Energie hydraulique	Hydraulic energy
Eoliennes	Wind turbines
Biomasse solide	Solid biomass
Biogaz	Biogas

Déchets urbains renouvelables	Renewable urban waste
Autres Biofuels liquides	Other liquid biofuels
Géothermie	Geothermal energy

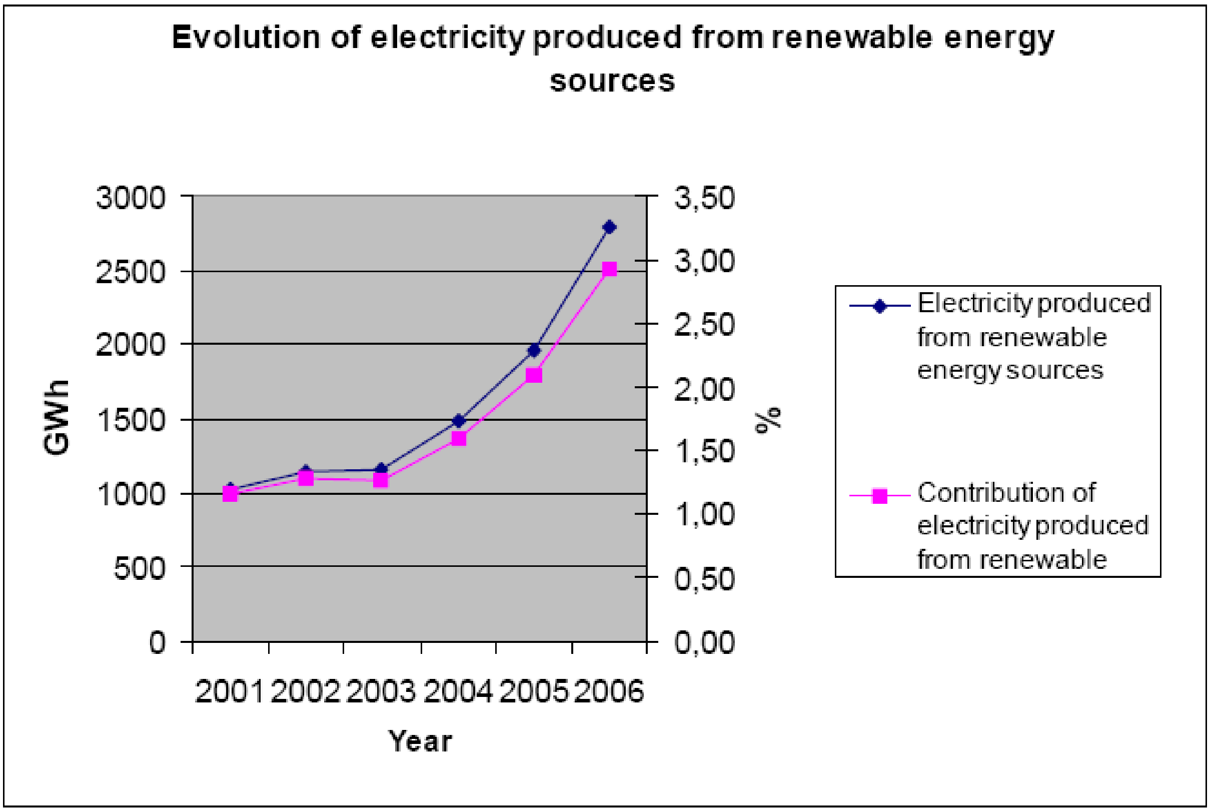
Production of energy from renewable energy sources in Ktep (2005)

Source: SPF Economie

In 2005, renewable energy sources contributed electricity production of 1 960 GWh, corresponding to a share of approximately 2.10% of gross internal consumption of electricity.

In 2006, the provisional data showed a renewable source electricity production of 2 790 GWh, or 2.93% of gross internal consumption of electricity.

The graph below shows the evolution of electricity produced from renewable energy sources since 2001.



2) Distribution between the federal authority and the regions

- <u>The Federal Authority</u>

The Federal Authority is responsible for the promotion of renewable energy in the offshore territory of the North Sea. For this purpose, it is responsible for granting the State concessions in the North Sea. Furthermore, the Federal Government has also set up a system of green certificates supplemented by a system of guaranteed minimum prices. In addition, financial intervention by the transport network body in the laying of underwater cables is planned. The green certificates will be issued by CREG (the federal regulator).

The first offshore turbines will be installed during 2007 and should be able to produce electricity during the course of 2008.

- <u>The Flemish Region</u>

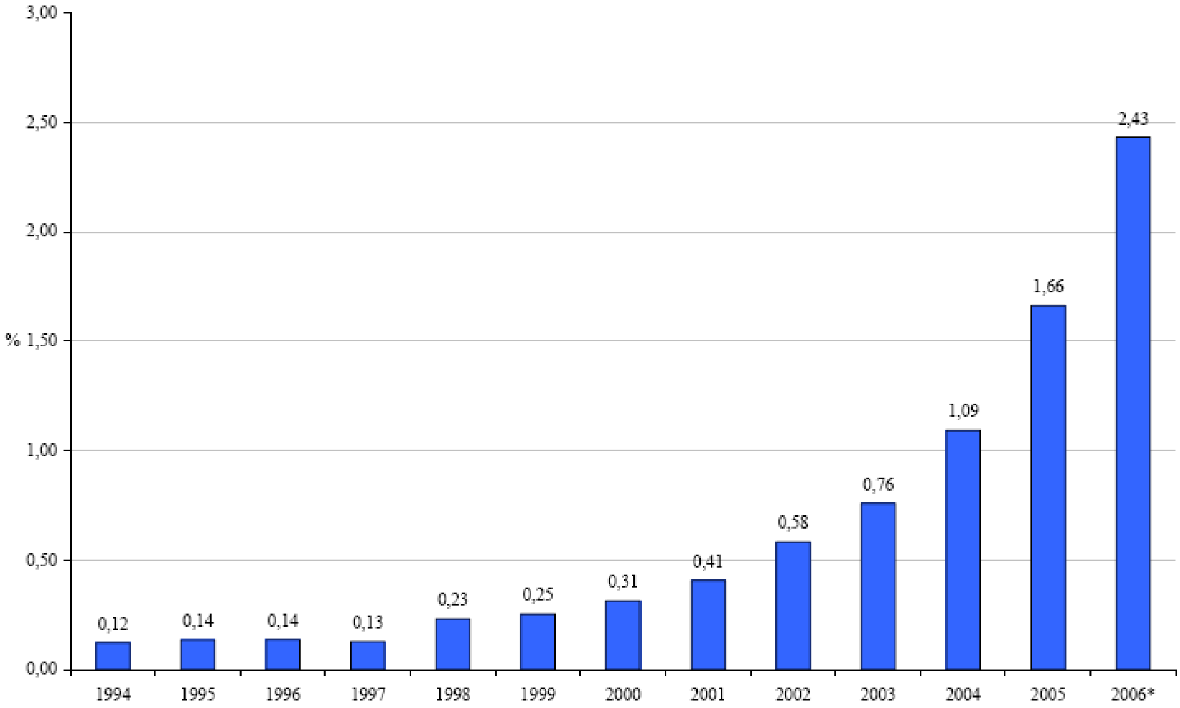
Flanders has targets for the market share of electricity obtained from renewable energy, in the form of quotas which are imposed on the suppliers who supply electricity through the transport or distribution network. The percentage of electricity that must be produced in this way from renewable energy sources amounted to 1.2% in 2003 and will increase gradually to 6% in 2010.

The system of green certificates came into force in 2002. For each 1000 kWh of electricity produced, a green certificate can be allocated to the producer. The producers can obtain additional income to cover the additional costs of green electricity by selling certificates to suppliers to meet their quota obligation.

If a supplier cannot meet the obligation of a minimum quota of green electricity, he must pay a fine of 125 euros per missing certificate. The fines are paid into an Energy Fund.

GWh	1998	1999	2000	2001	2002	2003	2004	2005	2006[1]
Solar energy	0	0.032	0.083	0.161	0.248	0.492	0.656	1.09	2.93
Hydropower	1.69	1.29	2.22	3.03	2.71	1.86	1.93	2.28	2.28
Wind energy	10.8	12.7	15.5	34.7	56.3	58.9	95.0	154.44	234.09
Biomass	0	0	0	11.3	71.6	110.0	182.0	413.40	829.38
Biogas	14.7	17.3	20.6	41.6	58.2	133.9	212.1	236.09	267.21
Residual waste	95.9	102.5	132.02	133.6	137.1	131.3	136.2	159.52	239
TOTAL	123	134	170	224	326	437	628	966.826	1430

Proportion of green electricity in the total electricity supply



More information on the support measures for renewable energy in the Flemish Region can be found on the website of Vlaams Energieagentschap of the Flemish Region:

[1] Provisional figures.

http://www.energiesparen.be and on the regulator's website www.vreg.be , the VITO website http://www.emis.vito.be and the ODE-Vlaanderen website (Organisation for Sustainable Energy): www.ode.be.

- The Walloon region

By 2010, the potential consumption of electricity produced from renewable energy sources in the Walloon Region is estimated at 8% (see the Walloon Region's Energy Administration website: http://energie.wallonie.be, its access to the "Sustainable Energy Control Plan" and its information relating to the installation of wind farms, and also Erel "Renewable Energy on line", http://users.skynet.be/apere/EREL/index.html , and APERe, which also gives a large amount of information, at http://www.apere.be).

Green certificates: as explained on the Walloon regulator's site (http://www.cwape.be), green certificates will be allocated to producers of green electricity for installations which have a guarantee of origin certificate, based on a level of carbon dioxide savings (one green certificate corresponds to a saving of 450 kg of CO2), and whether it concerns production from renewable sources or from quality cogeneration.

The electricity suppliers can obtain these green certificates from green elec tricity producers and must provide C WaPE with a certain quota of green certificates, which will rise from around 3% in 2003 to around 12% in 2012 (the later quotas still have to be determined). For green certificates granted outside Belgium, the Walloon Government will determine the conditions of acceptance.

If the imposed quotas are not complied with, the defaulting supplier or network manager must pay an administrative fine for the quarter in question. The profit from this will go to the Energy Fund. The fine is 100 euros per missing certificate.

Production aid: the decree of 12 April 2001 also provides for the possibility that producers can obtain a subsidy for production in exchange for green certificates, which will enable them to take on the addi tional costs linked to the production of green electricity. This aid could be 65 euros per green certificate exchanged, following procedures which are still to be determined.

Renewable energy	***GWh-2000***	***%*** [3]	***GWh-2005***	***%*** [32]	***GWh-2010***	***%*** [3]
Hydro[1]	380	1.6	395	1.6	440	1.8
Onshore wind farm	1	0.0	100	0.4	370	1.5
Offshore wind farm [2]	0	0.0	50	0.2	370	1.5
Forest residues	149	0.6	200	0.8	370	1.5
Energy crops	0	0.0	55	0.2	225	0.9
Biomethane/Landfill gas	70	0.3	100	0.4	225	0.9
Total renewable energies	**600**	**2.6**	**900**	**3.7**	**2000**	**8**
Of which Biomass	219	0.9	355	1.5	820	3.4
Of which Wind farm	1	0.0	150	0.6	740	3.0

Quality cogeneration	*GWh-2000*	*%* [(3)]	*GWh*	*%* [(3)]	*GWh-2010*	*%* [(3)]
Industry	725	3.1	1210	5.0	2650	11
Tertiary	5	0.0	245	1.0	675	3
Residential	70	0.3	80	0.3	270	1
Total cogeneration	**800**	**3.4**	**1535**	**6.3**	**3595**	**15**
TOTAL RE+COGEN	**1400**	**6**	**2435**	**10**	**5595**	**23**

[(1)] Average over the last 3 years

[(2)] Based on 400 MW installed power in the North Sea, or an annual production of around 1200 GWh, of which 30% is allocated to th e Walloon Region

[(3)] % of total consumption: 23435 GWh in 2000, 24200 GWh in 2005 (estimate) and 24300 GWh in 2010 (estimate)

- <u>The Brussels-Capital Region</u>

The electricity decree for the region (www.ibgebim.be) provides for green electricity quotas for suppliers of electricity to customers in Brussels: 2.25% in 2005, 2.5% in 2006, 2007, 2008 and 2009, then 2.75% in 2010, 3% in 2011 and 3.25% in 2012. These quotas also include high efficiency cogeneration (it is difficult to conceive of installations producing electricity from renewable sources in the region's territory).

Green certificates: as explained on the Brussels regulator's website (http://www.brugel.be) green certificates are allocated to producers of green electricity on the basis of carbon dioxide savings (one green certificate corresponds to a saving of 217 kg of CO2). This applies both to production from renewable sources and high efficiency cogeneration.

Electricity suppliers can obtain green certificates from producers of green electricity and must provide the regulator with their quota of green certificates.

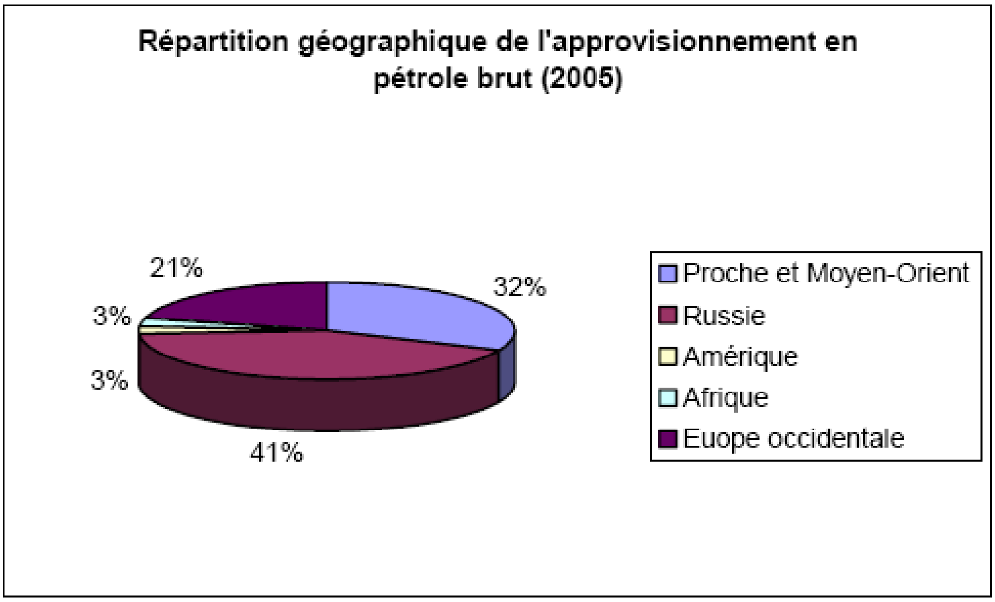
If the quotas imposed are not complied with, the defaulting supplier must pay an administrative fine. The profit from this will go to the Energy Fund. The fine is 100 euros per missing certificate.

All the details on support for electricity produced from renewable energy sources or from high efficiency cogeneration can be found on the Brugel websit e (www.brugel.be).

IV. Security of fuel supply

Belgium is a net importer of all its sources of primary energy (solid fuels, oil, natural gas, uranium, electricity) except for renewables and other rec overed fuels for which there are local resources. Dependency on foreign countries is therefore very high. Belgium's strategy on the security of supply consists mainly of diversifying its overall fuel mix, and for each fuel, diversifying the supply sources. A policy of strategic storage and electrical interconnection also enables these risks to be reduced.

The graphs below show the geographical diversification of the Belgian supply of oil and gas (2005).



Key:

Proche et Moyen -Orient	Near and Middle East
Russie	Russia
Amérique	America
Afrique	Africa
Europe occidentale	Western Europe

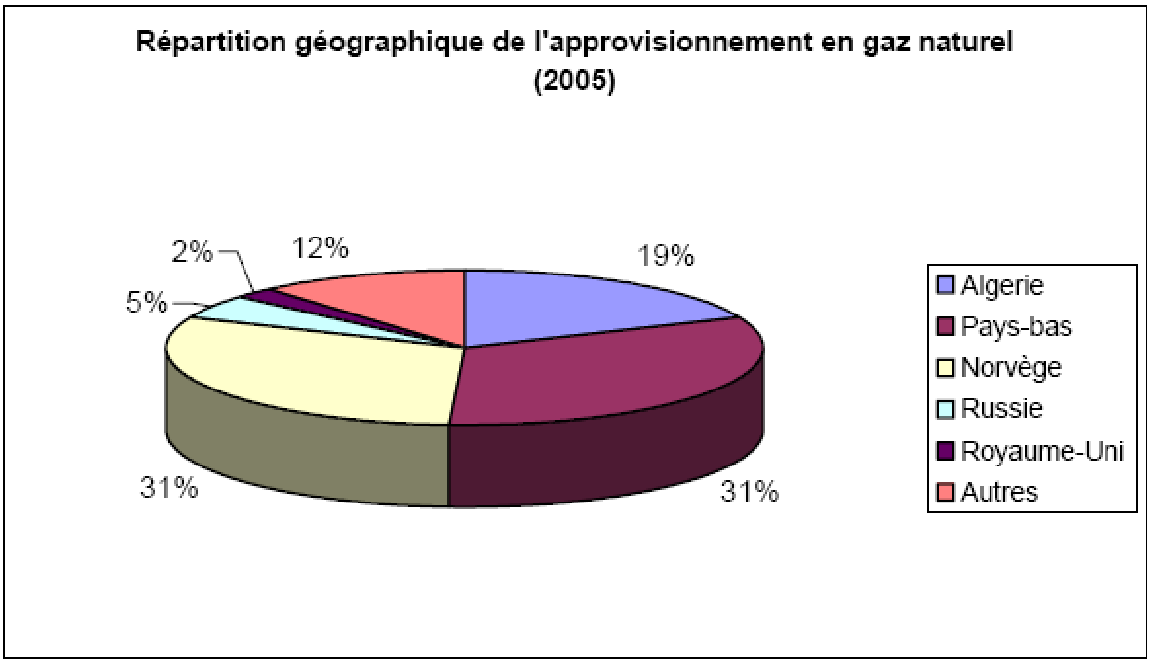
Geographical distribution of crude oil supply (2005)

Source: SPF Economie

31.7% of the country's crude oil supply is covered by the Near and Middle East (of which 16.5% comes from Saudi Arabia), 42.0% by Russia (compared with 40.6% in 2004) and 2.5% by the American continent (Venezuela).

Africa provides only 3.0% of these imports and Western Europe (with Norway) 20.7%.

OPEC countries represent 35.3% (35.7% in 2004) of the total of our crude oil imports in 2005 compared with 86.6% in 1979.



Key:

Algérie	Algeria
Pays-bas	Netherlands
Norvège	Norway
Russie	Russia
Royaume-Uni	United Kingdom
Autres	Others

Geographical distribution of natural gas supply (2005)

Source: SPF Economie

The country's gas supply is currently provided by three main suppliers, i.e.: the Netherlands with 32.2%, Norway with 30.7% and Algeria with 18.6%. The contracts concluded with these suppliers are of the long-term "Take or Pay" type. However, it should be noted that the contract with Algeria expires in 2006.

Russia, which through Germany also supplies our market, has a share representing 4.9% of our total imports, compared with 2.2% in 2004.

Our supply also includes short-term purchases for a sum which in 2005 amounted to 11.5% of our total imports.

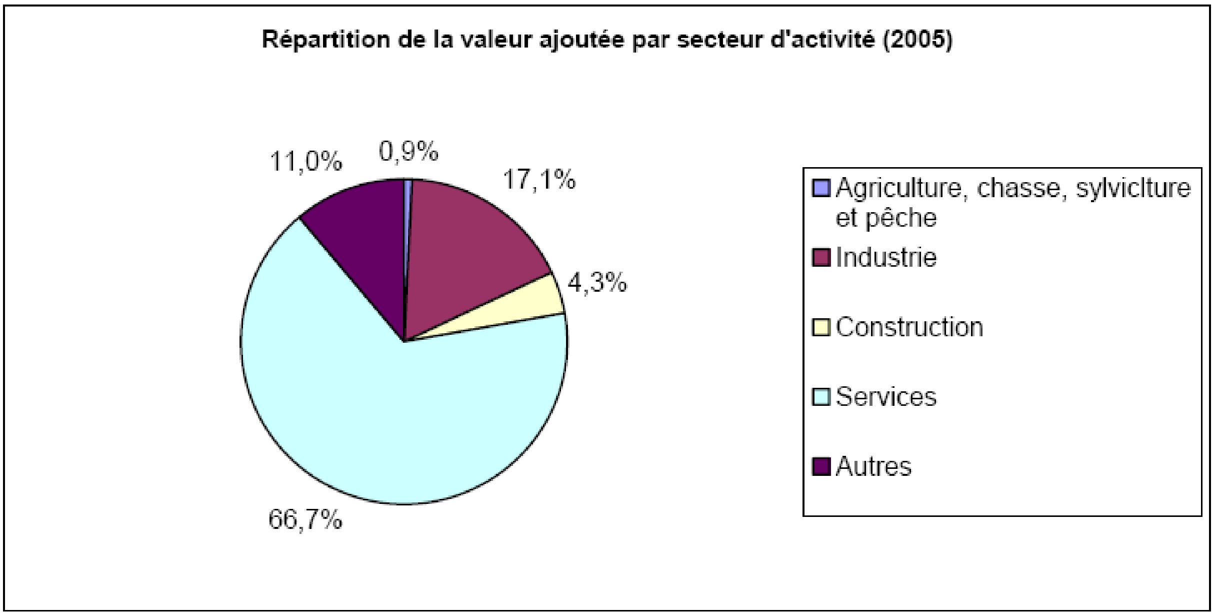
Our supply, based mainly on long-term contracts, is likely to be supplemented increasingly by short-term contracts in future with the aim of ensuring a more flexible management of gas flows responding to variations in demand.

V. General economic situation

1) Belgium

Belgium is a country with an area of 32 545 km², bordering the Netherlands to the north, Germany and the Grand Duchy of Luxembourg to the east, and France to the south and west, not forgetting the maritime border with the North Sea. It has 10 445 852 inhabitants (2005) and three national languages: Dutch, French and German.

The gross domestic product amounted to 298 180 billion EUR in 2005. The figure below shows its distribution between the different sectors of activity.

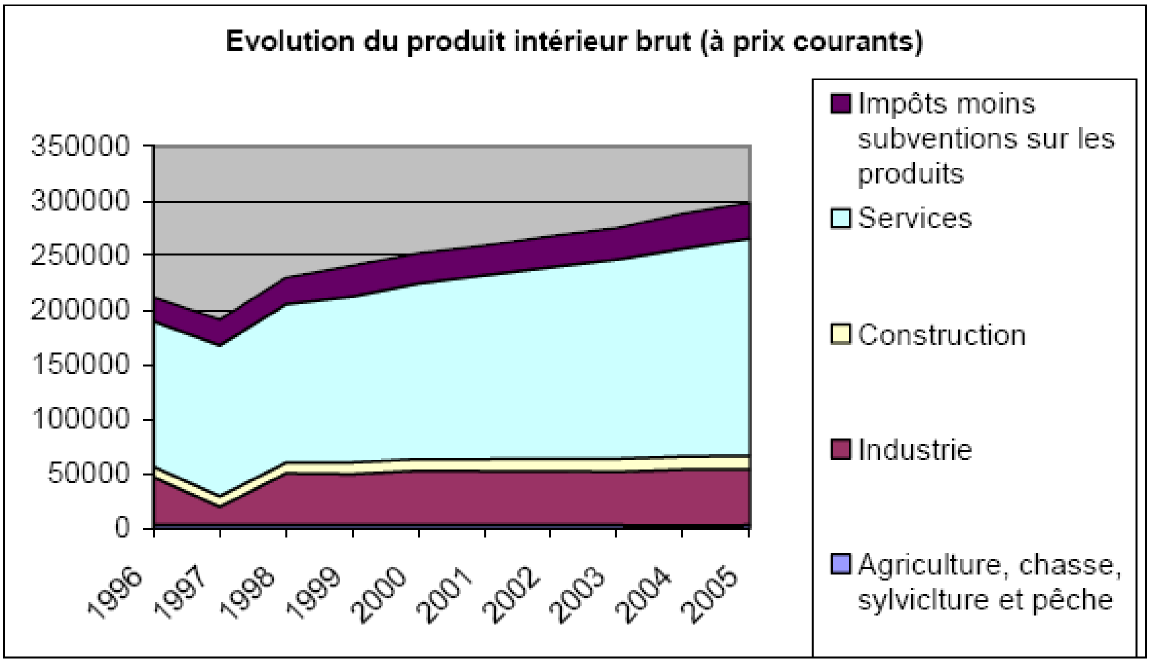


Key:

Agriculture, chasse, sylviculture et pêche	Agriculture, hunting, forestry and fishing
Industrie	Industry
Construction	Construction
Services	Services
Autres	Others

Figure 1: Distribution of added value b y sector of activity (2005)
Source: BNB

In the last ten years, Belgium has seen on average real economic growth of 2.1% compared with 2.0% for all of the EU, with its tertiary sector occupying an increasingly important position.



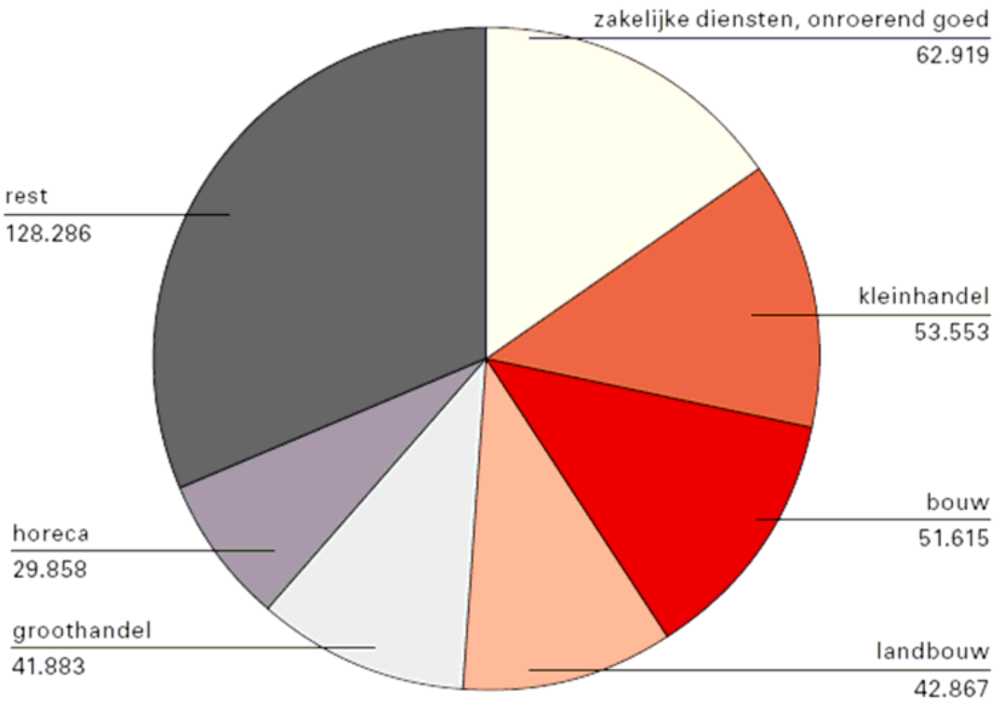
Key:

Impôts moins sub ventions sur les produits	Taxes less subsidies on products
Services	Services
Construction	Construction
Industrie	Industry
Agriculture, chasse, sylviculture et pêche	Agriculture, hunting, forestry and fishing

Evolution of gross domestic product (at c urrent prices)
Source: BNB

2) Regional features

- **<u>Flemish region</u>**



3.11 Aantal ondernemingen naar (voornaamste) sector, toestand eind 2005. Bron: Graydon, bewerking Studiedienst van de Vlaamse Regering.

Key:

zakelijke diensten, onroerend goed	services to business, real estate
kleinhandel	retail trade
bouw	building industry
landbouw	agriculture
groothandel	wholesale trade
horeca	Catering Industry
rest	other

3.11 Number of firms by (main) sector, as at end 2005. Source: Graydon, produced by the Flemish Government Research Department.

- Brussels-Capital region

See annex entitled *"RBC – Annexe 3 – Baromètre conjoncturel 2006.pdf" ("BCR – Annex 3 – Cyclical barometer 2006.pdf").*

VI. Expected development of the different industrial sectors

1) Belgium

According to the study entitled "Economic prospects 2006-2011", by the Plan Federal Office, the growth of the Belgian economy is likely to be greater than that of all of the euro zone during the period studied. According to this study, the growth rates by sector of activity are as follows:

GROWTH OF BRANCHES OF ACTIVITY

(Gross value added at base prices by volume)

								Average	
								2000	2006
	2005	2011	2007	2008	2009	2010	2011	2005	2011
Industry (total), including	1.0	1.9	1.7	1.8	1.9	1.9	1.9	1.4	1.8
- Manufacturing industries	0.6	2.2	2.0	2.0	2.1	2.0	1.8	1.1	2.0
- Construction	3.4	2.1	1.7	1.7	2.0	2.1	2.6	2.9	2.0
Market services, including	1.6	2.5	2.5	2.6	2.5	2.6	2.6	2.3	2.5
- Transport and communication	2.6	3.6	2.8	2.7	2.9	2.7	2.6	3.3	2.9
- Other market services	1.4	2.3	2.4	2.5	2.4	2.6	2.6	2.1	2.5
Non-market services	2.2	1.5	1.4	1.5	1.5	1.5	1.5	1.4	1.5

2) Regional features

- Flemish region

For industry, the calculations of value added show an annual average growth of 1.7% between 2000 and 2010, against 2.0% for the period 1995-2004. For services and the construction sector, we obtain an annual average growth of 2.3% and 1%, respectively, for the period 2000-2010, against 2.4% and 2.0%, respectively, in 1995-2004.

	historic	**BAU scenario**			
	1995-2004	**2000-2030**	**2000-2010**	**2010-2020**	**2020-2030**
industry	2.0%	1.3%	1.7%	1.2%	1.0%
services	2.4%	2.1%	2.3%	1.9%	2.1%
building trade	2.0%	1.5%	1.0%	1.9%	1.5%
Total sectors	**2.3%**	**1.9%**	**2.1%**	**1.7%**	**1.8%**

Table 3: annual increase in added value in the BAU scenario

- **Walloon region**
Industry

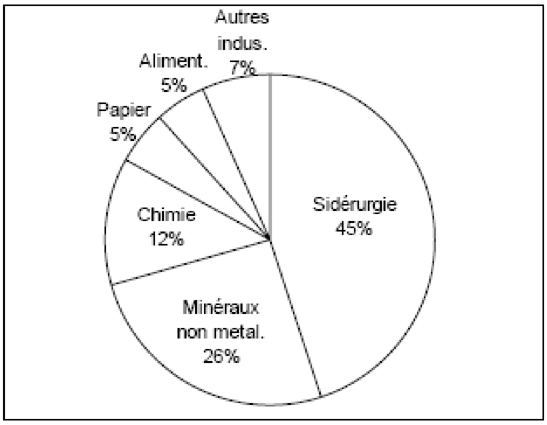
Characteristics of the sector

Industry represents a key sector: without taking into account the transportation of goods and persons that it generates, the Walloon industrial sector consumes 46% of the final energy absorbed by our region, well above the European average of 35%.

This situation is essentially due to iron and steel which today alone represents 45% of the energy consumption of industry. The chemical and non-metallic mineral industries (cement, lime, glass, etc.) also have an important influence on the final * consumption of this sector (figure 23).

There is a wide variety of consumption levels in different industries. A simple distinction (threshold) cannot be made between "large consumers" and "small consumers" of energy. Nevertheless, we can state that the companies for which consumption is mainly in buildings fall within the tertiary sector.

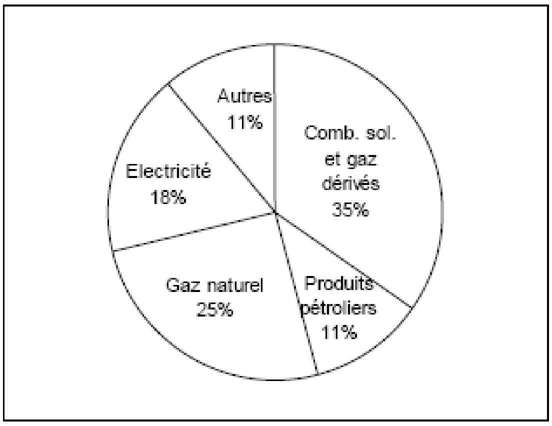
Walloon industry also remains a large consumer of solid fuels – coal, coke and derived gas – (35% compared with 46% in 1990), despite the trend for replacement by natural gas (25% compared with 19% in 1990) or the return to electricity (18% compared with 14% in 1990). Oil products also decreased their share (11% compared with 14% in 1990).



Key:

Autres industries 7%	Other industries 7%
Aliment. 5%	Food 5%
Papier 5%	Paper 5%
Chimie 12%	Chemicals 12%
Minéraux non metal. 25%	Non-metallic minerals 25%
Sidérurgie 45%	Iron and steel 45%

Figure 2: Distribution by sub-sector of final consumption (energy only) of industry, excluding transport (2000)



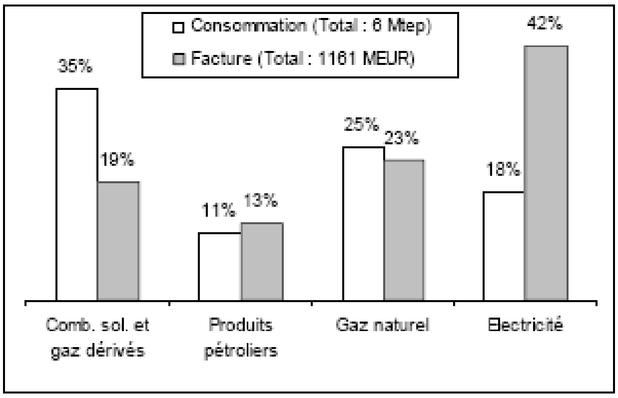
Key:

Autres 11%	Others 11%
Electricité 18%	Electricity 18%
Gaz naturel 25%	Natural gas 25%
Produits pétroliers 11%	Oil products 11%
Comb. sol. et gaz dérivés 35%	Solid fuels and derived gases 35%

Figure 3: Distribution by medium of final consumption (energy only) of industry, excluding transport (2000)

We can see a clear contrast between consumption and bills, mainly for electricity and solid fuels (figure 25): electricity, which represents only 18% of the consumption of industry, accounts for 42% of its energy bill, while solid fuels, which represent 35% of consumption, have only a 19% share.

Between 1990 and 2000, the energy consumption of industry, excluding transport, slightly decreased (-1.4%), while consumption increased strongly in other sectors. This situation is partly due to a restructuring of the regional economic fabric, b ut also to an improvement in energy efficiency * in this sector. However we must recall that overall, including all sectors, energy efficiency * has not improved since 1990. Beyond this positive change in energy efficiency* in the industrial sector, an i mportant potential in terms of energy savings has nevertheless been shown in several companies in the Region by energy audits.



Key:

Consommation (Total 6 Mtep)	Consumption (Total 6 Mtep)
Facture (Total: 1161MEUR)	Bill (Total: 1161 MEUR)
Comb.sol. et gaz dérivés 35%; 19%	Solid fuels and derived gases 35%; 19%
Produits pétroliers 11%; 13%	Oil products 11%; 13%
Gaz naturel 25%; 23%	Natural gas 25%; 23%
Electricité 18%; 42%	Electricity 18%; 42%

Figure 4: Distribution by medium of final consumption and bill of Walloon industry, excluding transport (2000)

The actors

The actors who are able to influence energy management in the industrial sector are:
- the consumers:
    - large consumers: their energy consumption is high and above all generated by industrial processes intended for production. Given the proportion of their energy bill in their operating costs and their energy dependency, these large consumers are aware of the energy problem;
    - small consumers: they belong to a branch of activity which do es not require large-scale consumption of energy in the production phase. As the energy bill is not a sensitive issue, they are generally not very aware of the energy problem;
- energy supplier: apart from energy, the supplier offers a range of energy ser vices;
- process supplier: design and/or sale, maintenance of industrial process;
- provider of energy audits and/or consultancy (external consultants);
- federations of businesses: representatives of industr ies to the public authorities;
- public authorities.

Another actor who should not be neglected is the consumer of the goods produced by the manufacturers. He exercises pressure on industry by his demands: following the logic of profit, as long as there is demand for products with a heavy energy conten t, industries will be forced to meet it, whatever the environmental cost. The optimisation of the energy content of goods supplied should therefore be sought. This is the province of the Federal Government (product standards).

Actions

The strategy for this sector is to act with "large consumer" companies, which are already aware of the energy problem, within a stabilising framework (industry-wide agreements) and to raise the awareness of others so that they, in their turn, also act at their level. We note that the administrative departments of industries are based more on the strategies in place for the tertiary sector.

Four types of action are planned:

- put the industry-wide agreements with the "large consumer" companies into concrete form
- increase audits and energy accounting
- provide financial incentives
- ensure the awareness of and provision of information to "small consumers".

Conclude and implement industry-wide agreements

Industry-wide agreements are voluntary agreements between each industrial sector (branch) and the Walloon Region with the aim of improving energy efficiency*. These agreements do not restrict the growth of companies as they only aim to decrease the consumption of energy per product unit. Companies which become involved in the dynamics of industry-wide agreements benefit from financial advantages from the Walloon Region: preferential subsidy rate of 75% for energy audits. Furthermore, the companies, which know that they cannot avoid making energy savings and reducing greenhouse gas emissions, have a choice of ways in which they can achieve the targets defined by common agreement with the Walloon Region based on the results of an EPS audit (see below). They also work on arguments for obtaining in the future a partial or total exemption from the Energy/CO2 tax, under discussion at European and federal levels. Above all, the industry-wide agreements minimise the uncertainty of the parties as regards the future: the industry has a clear objective, while the public authorities find a responsible partner. This measure requires mutual trust between the public authorities and the companies.

In July 2000, a first phase in the process began with the signature of two declarations of intent with the industrial federations of chemicals (Fedichem Wallonie) and paper (Cobelpa). Today, all the major sub-sectors have followed in their footsteps: Fediex (extractive industries), Febelcem (cement works), Agoria (multi-sector federation of the technological industry – sector of non-ferrous metals, metal and electrical manufacturing and foundries), Fevia (agri-food industry), Fiv (glass industry) and the iron and steel industry group. Together these eight federations represent more than 90% of energy consumption in industry. Around 150 companies have undertaken the energy audit process which takes place prior to an industry-wide agreement. The paper and chemicals sectors, which were first to undertake the process, have completed their audits and presented a draft plan of action for the sector. They will now enter the operational phase.

For Cobelpa, the aim is to improve energy efficiency by 33% and reduce CO2 emissions by 35% between 2000 and 2012. The target for Fedichem Wallonie is 16%, for both energy and CO2.

The aim is to improve the overall industrial energy efficiency* compared with today by 10 to 20%. This improvement in energy efficiency* will be achieved substantially by implementing measures which enable heat to be recovered and use d, as well as by good management.

In order to ensure the reliability of these agreements in terms of the targets to be met, checks will be set in place and sanctions applied if the commitments to be defined are not fulfilled.

We should point out that the targets of a more efficient use of energy mu st not penalise economic activity. That is why the targets of the industry-wide agreements are expressed in relative terms (consumption of energy per product unit) and not in absolute terms.

With such a mechanism, economic growth remains possible. Of co urse, in the majority of cases, growth will lead to an increase in absolute emissions of greenhouse gases. In this case, and provided that the company concerned is the target of the European Directive on setting in place a European mechanism for emission q uotas, it will have to achieve these quotas on the market in order to meet its obligations. At the beginning of April 2003, the Walloon Government adopted guidance for granting emission quotas depending on the real potential for improvement as regards specific emissions of CO2. Thus a link is made with the industry-wide agreements on energy. As we can see, within such a framework, improving its energy efficiency contributes to improving the performance of the company. Energy efficiency and a mechanism for the exchange of quotas are therefore complementary to enable the industrial sector to contribute positively to the Kyoto targets.

Making audits and energy accounting more widespread

Energy audits can provide an in-depth understanding of how energy is consumed in a company, enable potential improvements to be identified and projects to be organised according to criteria of financial profitability, and availability and feasibility of the technology. A study [2] was carried out between the end of 1997 and the end of 2000 to test the EPS (Energy Potential Scan), applied successfully for many years in the Netherlands. The originality of this method, compared with conventional energy audits, is the active participation of representatives of the company. This approach ensures not only the technical-economic quality of the ideas put forward, but also a high level of acceptance of these ideas by the company, two conditions which are necessary for the real efficiency of RUE* measures.

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[2] Study carried out between the end of 1997 and the end of 2000 by Econotec, at the request of the DGTRE *[Department for Technology, Research and Energy].*

After an initial pilot project in three companies, the study related to seven other companies in various sectors (iron and steel, chemicals, agri-food and pharmaceuticals), of different sizes (between 140 and 800 employees) and with annual energy bills of between 0.5 and 5 million €/ annum.

Very convincing results in terms of energy savings, of the order of 10 to 20%, viable in the very short term, were obtained. The majority of the improvements consisted mainly of changes and investments (75%), but good management measures also had their place (22%).

The order of 19/12/84 (granting subsidies to companies or professional federations for operations aiming for better control of energy consumption) allowed subsidies to be given to energy audits on condition that the investments studied actually took place. This order was no longer suitable for the current situation, however. It only authorised payment of the subsidy for an audit after the investment had taken place and thus did not truly represent support for decision making in matters of energy management. Furthermore, no regulatory mechanism gave a subsidy for setting up energy accounting, a tool which is nevertheless essential for the rational use of energy* in companies.

A new order for improving the energy efficiency* of the private sector (AGW of 30 May 2002 – MB of 07 July 2002) came into force on 1 September 2002 to alleviate these shortcomings. It proposed:

1. for all companies, a subsidy of up to 50% of the external costs of the energy audit[3] prior to investment for energy-saving or resorting to renewable energy or quality cogeneration;

2. for companies signatory to a declaration of intent prior to an industry-wide agreement, a subsidy of up to 75% of the external and internal costs of the energy audit; [3]

3. for federations of companies, a subsidy of up to 100% of their services within the framework of operations aiming to improve energy efficiency* in their sector taken overall;

4. a subsidy of up to 50% of the costs of implementing a quality system of analytical energy accounting;

5. a subsidy of 50% of the costs necessary (technical tests, setting up files) to allow the technical authorisation of products contributing to a better control of energy.

With a view to making the use of energy audits and accounting more widespread, there is good reason to provide for regular communications in this regard. The activity of the

[3] The audits must be carried out by an auditor approved by the Region to give the right to subsidies. Furthermore, the auditor must be independent of the claimant company and of the companies contracted to carry out the work or investments and be neither an energy supplier, nor a supplier of the equipment on which the study is based.

provider of energy audits must also be developed, in terms of quality and quantity. That is why the auditors must be authorised by the Region.

Financial incentives

Investment subsidy

The laws on economic expansion (for companies) and economic reorientation for (SMEs) grant an incentive with the aim of promoting and encouraging investment in products or processes which develop renewable energy. The aid given is currently 15% of the amount of the investment programme.

A review of these laws is in progress, within the competence of the Ministry of the Economy. A draft decree relating to incentives which encourage environmental protection and the sustainable use of energy was adopted at the first reading. It states that a maximum of 40% of the eligible costs may benefit from investment aid, both for RUE investments within the framework of the production process and for investment by small enterprises in the production of energy from renewable energy sources or quality cogeneration installations. The eligible costs are limited to the additional costs required to achieve the environmental protection objectives.

Tax deductions for UDE/SEU [utilisation durable d'energie - sustainable energy use] investments

A tax deduction in relation to ISOC *[Corporation Tax]* is possible for investments which allow energy savings.
A reduction of 13.5% is currently applicable for a certain number of investments. [4] A review both of the amount, which is too low, and the list of investments, which is out of date, is currently being undertaken at federal level. The Regions are consulted through CONCERE-fiscal.

Raising the awareness of and mobilising small and medium-sized industrial consumers

The large energy consumers are "naturally" aware of the energy problem, particularly as seen in their bills. Furthermore, they have sufficient internal resources to undertake energy management. This is not the case for companies in which "energy" is less important. For these companies, first of all they have to be made aware of the situation, be informed of the possible opportunities for improvement and train personnel in charge of energy management.

With this aim in mind, the design and distribution of the periodical "Le REactif" which has existed for 6 years has been reviewed. The content of this quarterly periodical, which is free of charge and initially intended for Energy Managers, has been adapted to interest a much wider audience and present various news items. It is now addressed to decision

[4] Listed in Annex II of the Income Tax Code

makers as well as to technical managers and its distribution has been extended to the private sector.

Within the framework of the structural funds, a project to promote energy savings and renewable energy for managers of very small enterprises and SMEs from Hainaut is in progress. This project, which is being carried out by the Hainaut Union Syndicale des Classes Moyennes *[equivalent to the UK's Federation of Small Businesses]* aims to inform them of the challenges involved, the possible solutions and the existing public assistance by means of articles, information sessions, a website, an office, the publication of a guide to good practice, etc.

Raising awareness of the RUE will also be encouraged indirectly in SMEs by the preferential rate given under the laws of economic expansion for energy-saving investments. These investments will enable the competitiveness of these companies to be increased and will contribute to developing the local industrial fabric.

In addition, the Region is financing an "industry facilitator". This post is a support service for companies, providing advice for energy managers in their search for solutions and improvement, but without replacing a consultant or equipment supplier: existence of particular technology, identification of existing equipment on the market, questions relating to instruments of information and aid which exist in the Walloon Region, search for consultancy firms, suppliers, etc. It also consists of organising regular information/training seminars on different technical solutions (thematic training, presentation of actual cases). Its role is to provide assistance for any energy problem that may be encountered. It may also act as a link between the claimant company and an approved consultancy firm.

Finally, in 1997 the Walloon Region took part in the foundation of COGENSUD asbl, whose purpose is to encourage the development of cogeneration in Wallonia. The actions taken by COGENSUD to achieve this objective are diverse and many:

- awareness and training (seminars, guides, calculation tools, website, Success Stories, technical-economic articles, exhibition, etc.)
- consultation and recommendations to lobby the Public Authorities on the need to introduce legislation in favour of cogeneration
- consultancy mission through the Cogeneration Facilitator of the Walloon Region (strategic meeting with project sponsors, checking of projects, search for innovative solutions, aid in obtaining assistance or finance schemes, etc.)

These actions concern the technology of cogeneration in general and therefore affect all sectors, including industry.

Actions for industry and impacts at a glance

The actions envisaged in the short and medium term for industry, as well as the prospects in the longer term, are summarised in table 7.

	Short and medium term [5]: 2003-2004 Concrete and rapid results	**Long term: 2005 and beyond..** Lasting results
Industry-wide agreements	Defining ABC classifications with industry federations representing 90% of final industrial consumption put into concrete form	Implementation of industry-wide agreements
Audits and energy accounting	Adaptation of legislation to encourage audits and energy accounting – make results known	Make audits and energy accounting more widespread
Financial incentives	Review of incentives and tax allowances for SEU investments to generate investment	Direct financial support to increase investments
Awareness and training	"REactif" periodical – industry facilitator – thematic training – case studies	Intensify the "company-citizen" approach

Table 2: Short- and medium-term actions for the industrial sector and long-term prospects

According to the "BAU*" scenarios drawn up by Econotec, the final consumption * of industry between 2000 and 2010 will be between the following two extremes:
- scenario 1: increase by more than 8% (increased activity and maintaining of Liege hot iron and steel industry);
- scenario 2: decrease by around 10% (closure of Liege hot iron and steel industry – no conversion considered).

With economic activity similar to that stated in the reference scenarios, implementation of the energy policy would give the following results between 2000 and 2010:

	Scenario 1		***Scenario 2***	
	BAU	**SEU**	**BAU**	**SEU**
Electricity	+ 27%	+ 15%	+22%	+10%
Fuels	+ 5%	- 6%	- 15%	- 26%
TOTAL	+ 8%	- 3%	- 10%	- 21%

Table 3: Comparison of changes in final consumption projected by the BAU and SEU scenarios in the industrial sector

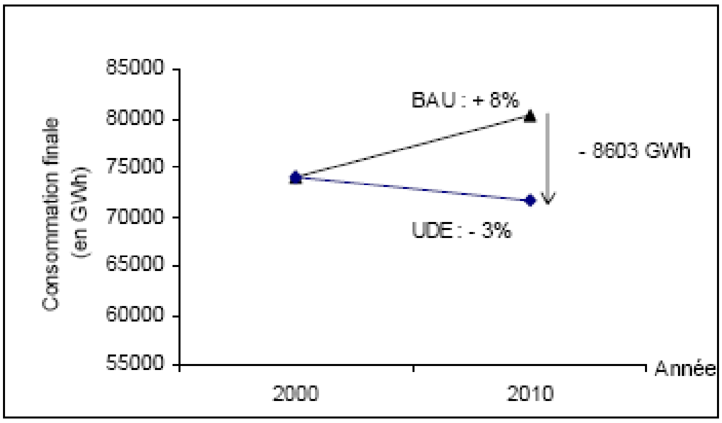
It is important to note that the potential for action in industry (of the order of 8500 GWh) is not dependent on the occurrence of either of these scenarios (figures 26 and 27).

The natural development of the industrial structure results in an increase in the share of electricity. A limited increase can be foreseen, despite better management and the use of more efficient technologies (pumps, motors, variable speed, lighting, etc.).

As regards the consumption of fuels, a significant economic potential for reduction exists: good management measures, heat recovery, cogeneration, etc.

[5] Planned to be implemented during this legislative period

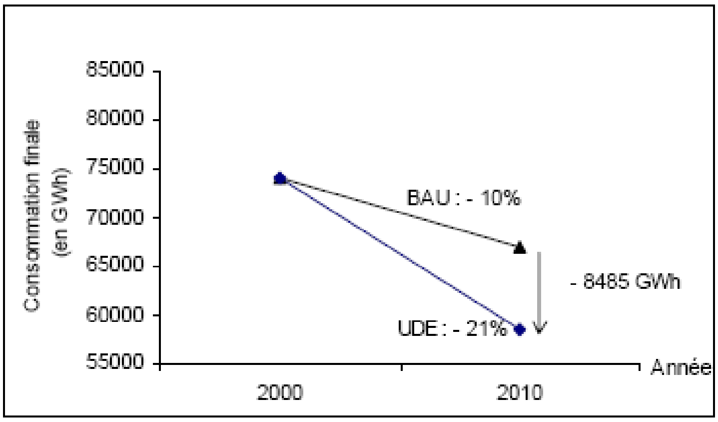
The investments required by the industries are estimated at around 240 million euros [6] spread over the next ten years, or 24 M €/annum which represents about 1% of the annual volume of investments.[7]



Key:

Consommation finale (en GWh)	Final consumption (in GWh)
Année	Year

Figure 5: Projected change (scenario 1) in



Key:

Consommation finale (en GWh)	Final consumption (in GWh)
Année	Year

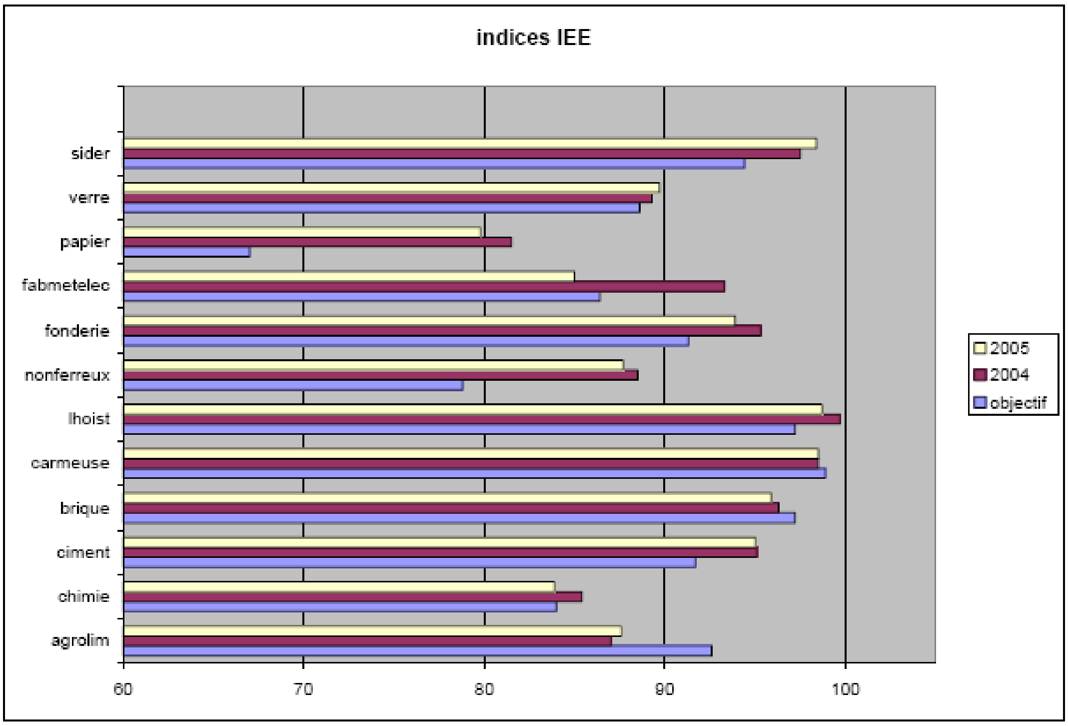
Figure 6: Projected change (scenario 2) in

[6] Estimate from investments calculated by ECONOTEC
[7] In 2000, industry investments rose to more than 2.1 billion euros in Wallonia (source: Report on the economic and social situation of Wallonia 2001 – CESRW).

The final consumption of industry

Overall result

	agrolim	chimie	ciment	brique	carmeuse	lhoist	nonferreux	fonderie	fabmetelec	papier	verre	sider	
objectif	92,6	84	91,7	97,2	98,9	97,2	78,8	91,3	86,4	67	88,6	94,4	
2004	87	85,4	95,1	96,3	98,5	99,7	88,5	95,3	93,3	81,5	89,3	97,5	
2005	87,6	83,9	95	95,9	98,5	98,7	87,7	93,9	85	79,8	89,7	98,4	



Key - table:

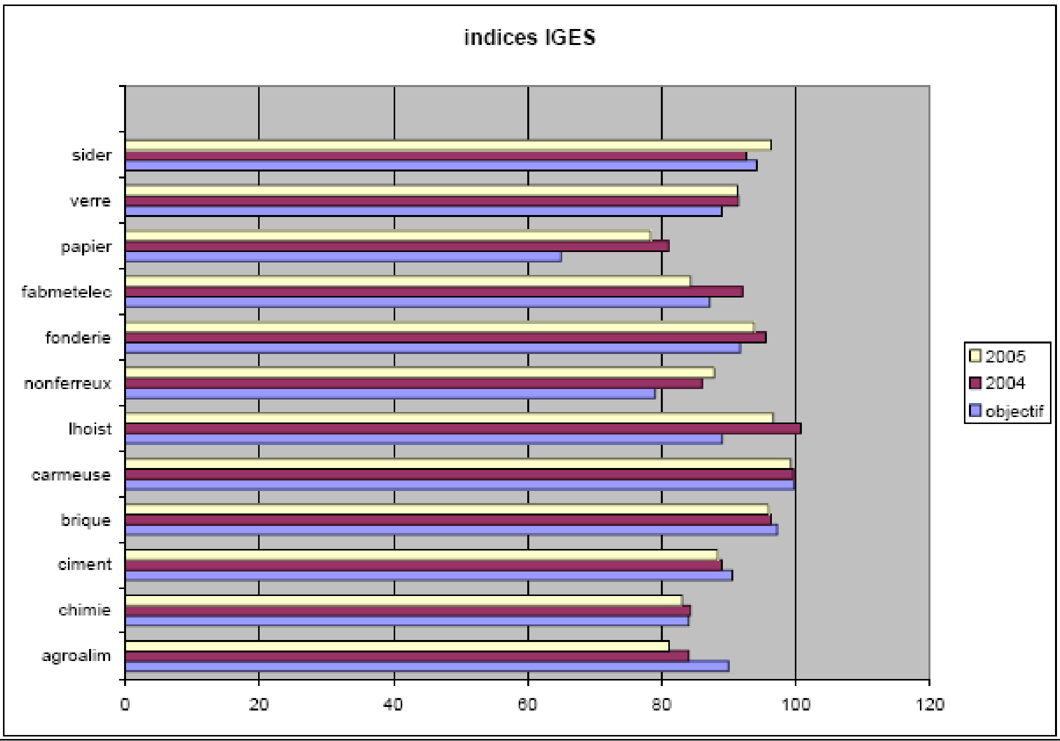
Objectif	Target
Agrolim	Agri-food
Chimie	Chemicals
Ciment	Cement
Brique	Brick
Carmeuse	Carmeuse
Lhoist	Lhoist
Nonferreux	Non-ferrous
Fonderie	Foundry
Fabmetelec	Fabmetelec
Papier	Paper
Verre	Glass
Sider	Iron and steel

Key – diagram:

Indices IEE	IEE indices
Sider	Iron and steel
Verre	Glass
Papier	Paper
Fabmetelec	Fabmetelec
Fonderie	Foundry

Nonferreux	Non-ferrous
Lhoist	Lhoist
Carmeuse	Carmeuse
Brique	Brick
Ciment	Cement
Chimie	Chemicals
Agrolim	Agri-food
2005	2005
2004	2004
Objectif	Target

	agroali	chimie	ciment	brique	carmeus	lhoist	nonferreu	fonderie	fabmetel	papier	verre	sider		
objectif	89,9	84	90,5	97,2	99,8	89	79	91,7	87,2	65	88,9	94,2		
2004	84	84,3	88,9	96,3	99,6	101	86	95,5	92	81	91,4	92,6		
2005	81,1	83	88,3	95,9	99,2	96,6	87,8	93,8	84,3	78,3	91,3	96,3		



Key - table:

Objectif	Target
Agroalim	Agri-food
Chimie	Chemicals
Ciment	Cement
Brique	Brick
Carmeuse	Carmeuse
Lhoist	Lhoist
Nonferreux	Non-ferrous
Fonderie	Foundry
Fabmetelec	Fabmetelec
Papier	Paper
Verre	Glass
Sider	Iron and steel

Key – diagram:

Indices IGES	IGES indices
Sider	Iron and steel
Verre	Glass
Papier	Paper
Fabmetelec	Fabmetelec
Fonderie	Foundry
Nonferreux	Non-ferrous
Lhoist	Lhoist
Carmeuse	Carmeuse
Brique	Brick
Ciment	Cement
Chimie	Chemicals
Agroalim	Agri-food
2005	2005
2004	2004
Objectif	Target

Taking into account the changes which took place between 2004 and 2005 and the results of the different federations, the "Walloon" IEE index improved very slightly from 91.7% to 91.5% and the "Walloon" IGES index fell from 91.2% to 90.2%.

- <u>The Brussels-Capital Region</u>

As the Brussels-Capital Region is a city, there is very little industrial activity. The majority of economic activity in Brussels is based on the production of services.

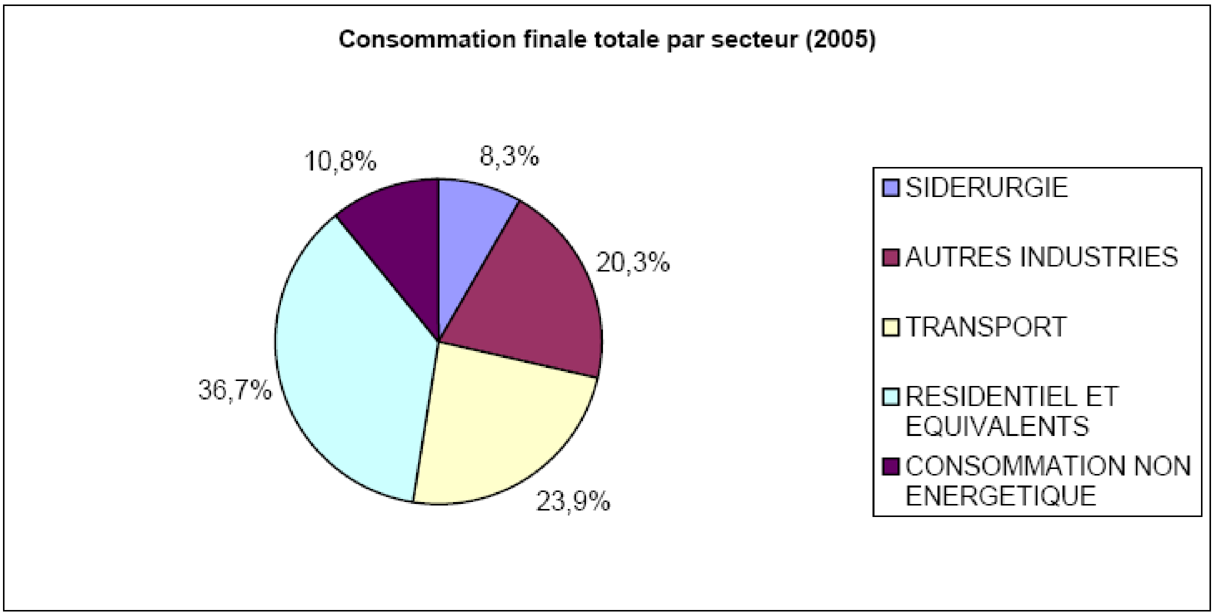
See annex entitled *"RBC – Annexe 3 – Baromètre conjoncturel 2006.pdf"* *("BCR – Annex 3 – Cyclical barometer 2006.pdf")*.

Demand/Supply structure

I. Consumption of primary fuel by sector

The final consumption of energy which represents the apparent gross consumption of primary energy after deduction of transformation activities and losses of energy amounted to 41 140 Ktep in 2005, recording a fall of the order of 2.2% compared with 2004.

The figure below shows how this total final consumption is distributed between the different sectors of activity:

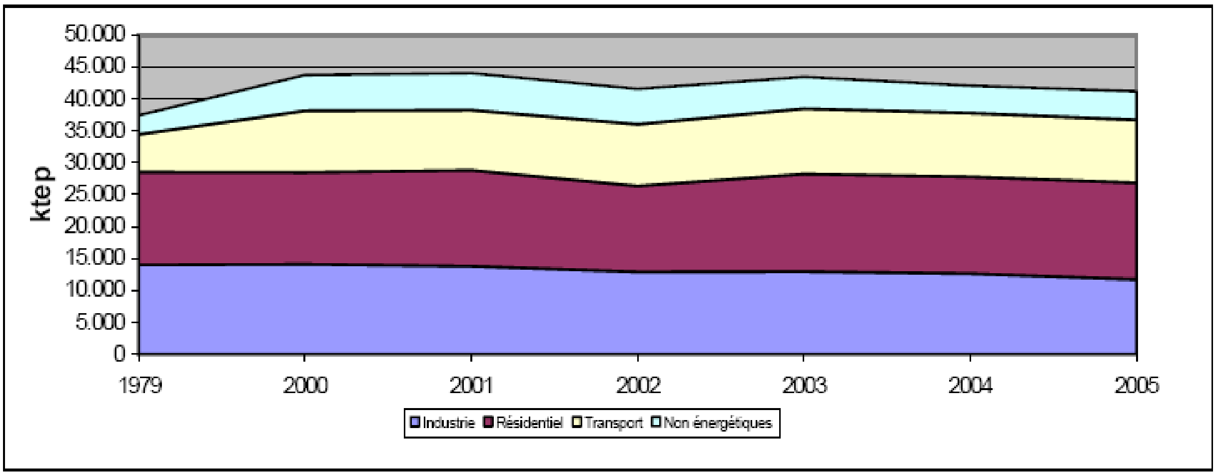


Key:

Sidérurgie	Iron and steel
Autres industries	Other industries
Transport	Transport
Résidentiel et équivalents	Residential and equivalent
Consommation non énergétique	Non-energy consumption

Source: SPF Economie

Total final consumption by sector (2005)



Key:

Ktep	Ktep
Industrie	Industry
Résidentiel	Residential
Transport	Transport
Non énergétiques	Non-energy

Source: SPF Economie

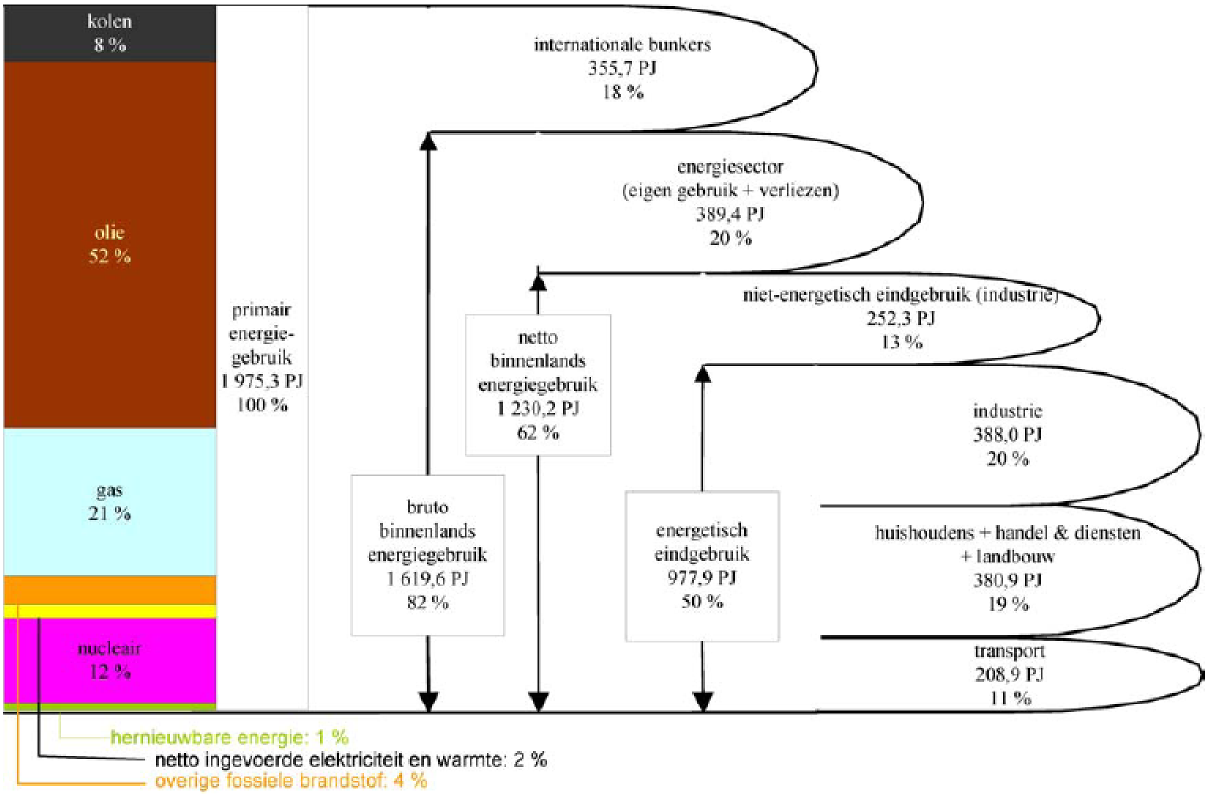
If we look at the change in total final consumption, the following points can be seen:

- overall, a rise in total final consumption;
- a decrease in the total final consumption of the industrial sector (-13.1%);
- an increase in the total final consumption of residential and tertiary (+4.4%);
- transport is the area of activity which has increased its total final consumption most spectacularly;
- non-energy uses which constitute the activity indicator of the petrochemicals industry (naphtha, natural gas) show an overall rise of 49% over the period 1979 -2005.

The table below shows the final consumption of energy by sector

Final consumption of energy in tep (PCI)							
2005	**Electricity**	**Gas**	**Solid fuels**	**Oil**	**Renewable fuels**	**Heat**	**Total**
Iron and steel	515,672	1,218,579	1,619,713	32,700	0	14,861	3,401,525
Other industries	2,874,118	3,279,430	328,280	1,165,478	346,221	356,668	8,350,195
Transport	145,735	0	0	9,688,604	0	0	9,834,339
Residential and equivalents	3,360,618	5,530,100	147,628	5,803,857	203,453	55,516	15,101,172
Non-energy uses	0	887,992	0	3,566,234	0	0	4,454,226
Not specified	0	0	0	0	0	0	0
Final consumption	**6,896,144**	**10,916,101**	**2,095,622**	**20,256,873**	**549,674**	**427,045**	**41,141,458**

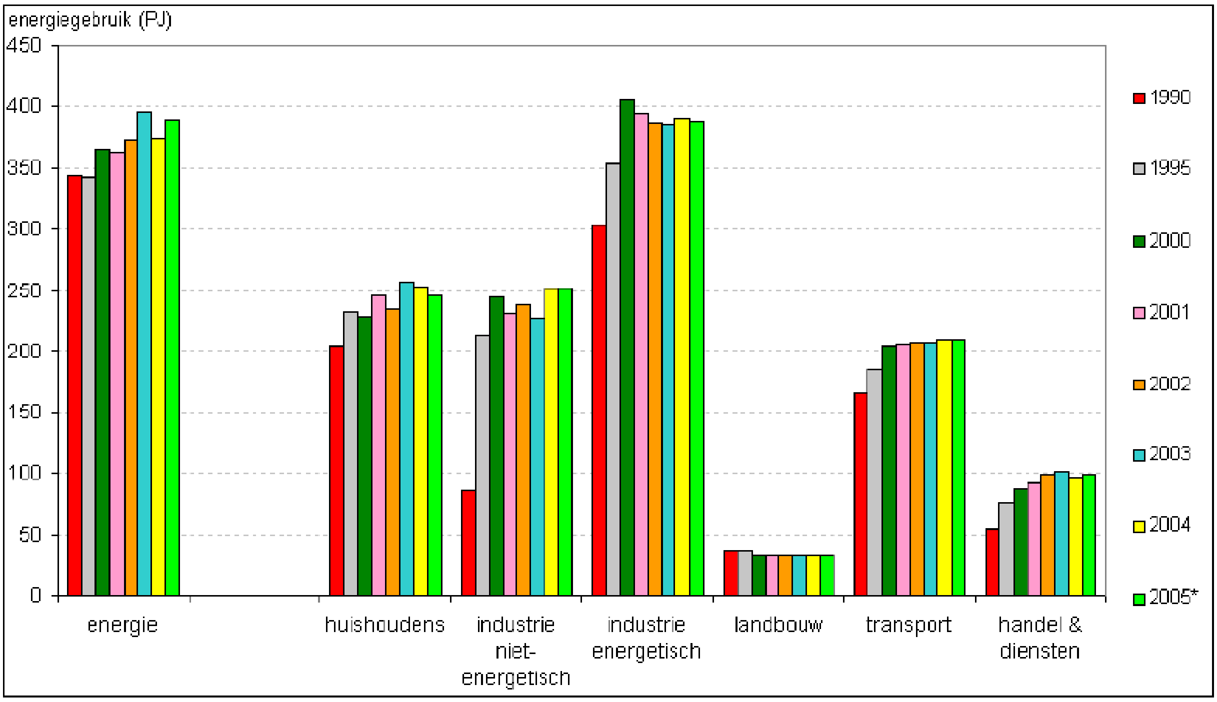
The Flemish Region



Key:

Coal 8%				International bunkers 355.7 PJ 18%			
Oil 52%	Primary energy utilisation 1,975.3 PJ 100%				Energy sector (own use + losses) 389.4 PJ 20%		
			Net domestic energy utilisation 1,230.2 PJ.			Final non-energy use (industry) 252.3 PJ 13%	
							Industry 388.0 PJ 20%
Gas 21%		Gross domestic energy utilisation 1,619.6 PJ			Final energy use 977.9 PJ 50%		Households + trade and services + agriculture 380.0 PJ 19%

		82%					
Nuclear 12%							Transport 208.9 PJ 11%
Renewable energy 1%							
Net external heat and electricity supplies: 2%							
Other fossil fuels: 4%							



Key:

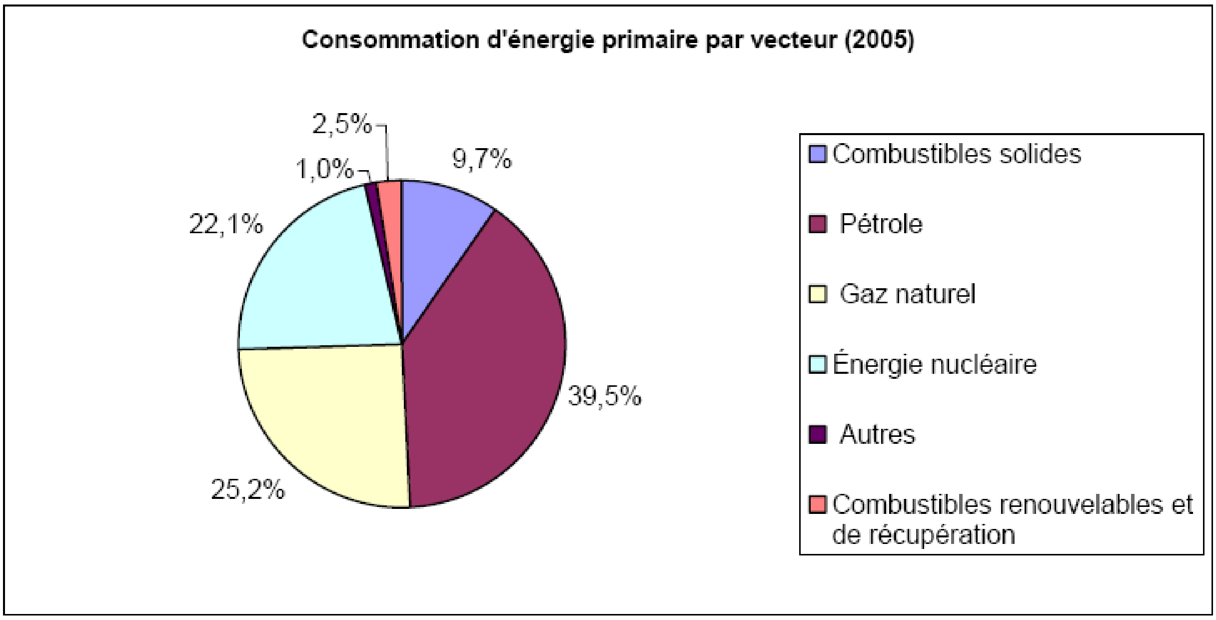
energiebruik (PJ)	energy utilisation
energie	energy
huishouders	households
industrie niet-energetisch	industry non-energy
industrie energetisch	industry energy
landbouw	agriculture
transport	transport
handel & diensten	trade & services

II. Survey of the energy sector

1) Belgium

Primary energy consumption amounted to 56 205 Ktep in 2005. It showed a clear decrease of the order of 2 .6% compared with 2004.

The distribution of this primary energy consumption by energy vector is as follows:



Key:

Combustibles solides	Solid fuels
Pétrole	Oil
Gaz naturel	Natural gas
Energie nucléaire	Nuclear energy
Autres	Others
Conbustibles renouvelables et de récupération	Renewable and recovered fuels

Source: SPF Economie

Primary energy consumption by vector (2005)

The above graph illustrates the dominance of oil in the country's primary energy supply, and to a lesser extent natural gas and n uclear fuels.

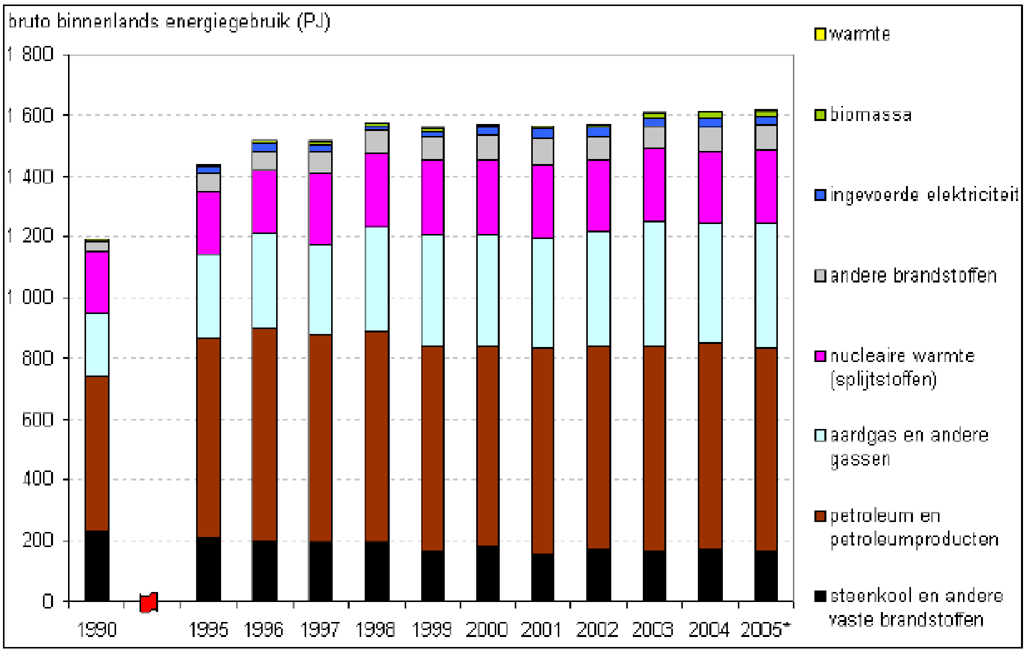
Primary energy consumption in Ktep (PCI)							
	1973	1980	2000	2002	2003	2004	2005
Solid fuels	11,777	11,339	8,382	6,539	6,210	6,427	5,454
Oil	27,268	23,019	23,690	22,338	24,153	22,448	22,227
Natural gas	7,162	8,935	13,405	13,414	14,441	14,610	14,152
Nuclear	20	3,270	12,548	12,340	12,345	12,328	12,401
Others (primary electricity)	-50	-203	413	688	580	707	586
Renewable and recovered	-	-	969	963	1,210	1,201	1,385

fuels							
Total	**46,177**	**46,360**	**59,408**	**56,283**	**58,940**	**57,721**	**56,205**

Source: SPF Economie

From an examination of the above table which shows the change in the country's primary energy supply, the following should be noted:
- the increase in primary energy consumption;
- the strong downward trend in solid fuels (- 2.4%/annum on average) over the period under consideration (1973-2005);
- the regular growth in natural gas (+2.2%/annum);
- a substantial increase in nuclear over the period under consideration, which stabilises around 12,350 Ktep during the period from 2000 to 2005.

The Flemish Region



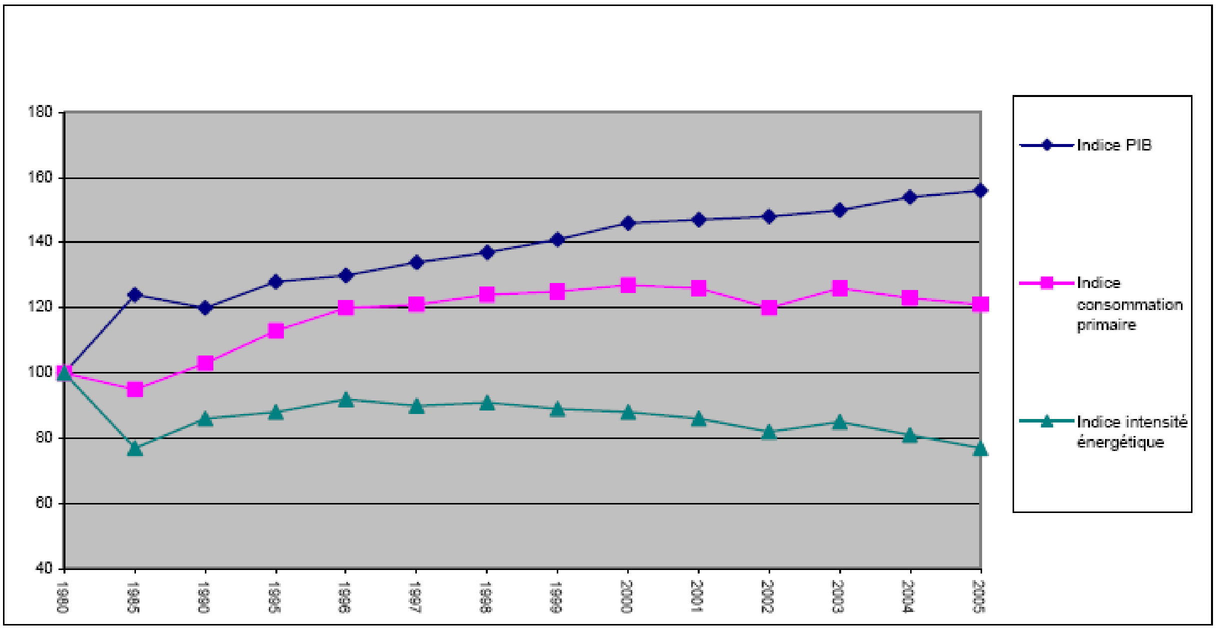
Key:

bruto binnenlands energiegebruik (PJ)	gross domestic energy utilisation
warmte	heat
biomassa	biomass
ingevoerde elektriciteit	imported electricity
andere brandstoffen	other fuels
nucleaire warmte (splijtstoffen)	nuclear energy (fissile material)
aardgas en andere gassen	natural gas and other gasses
petroleum en petroleumproduction	petroleum and petroleum products
steenkool en andere vaste brandstoffen	coal and other solid fuels

III. Primary energy intensity

1) Belgium

Primary energy intensity, calculated as being the ratio between primary energy consumption and the GDP expressed in volume (1990 prices), shows a break in the trend which has been seen since 1996.



Key:

Indice PIB	GDP index
Indice consommation primaire	Primary consumption index
Indice intensité énergétique	Energy intensity index

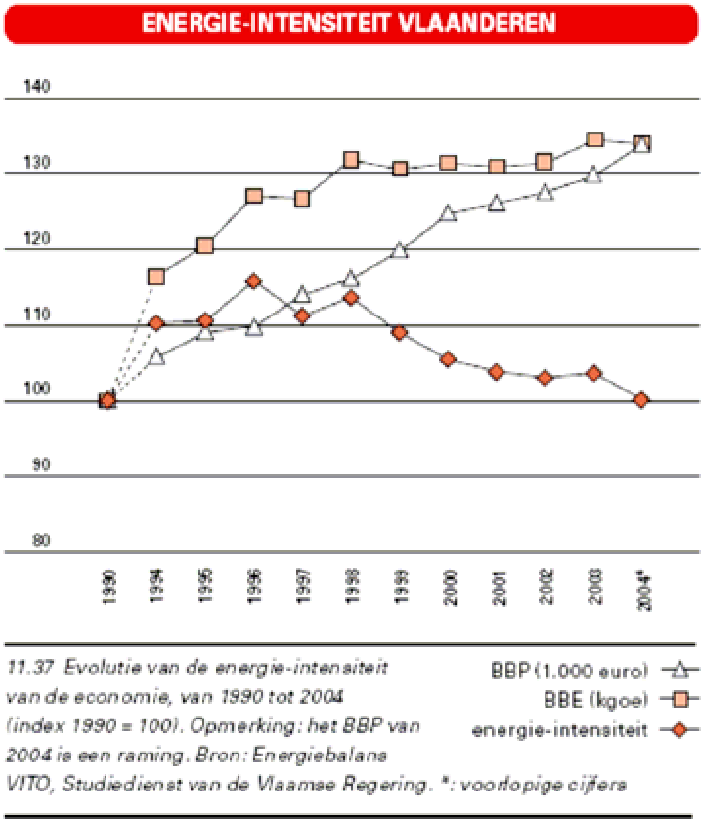
Source: SPF Economie

After falling sharply between 1980 and 1985, energy intensity continued to increase until 1996 and then fell regularly until 1992, increasing slightly in 2003 and decr easing again in 2004 and 2005. In 2005, energy intensity was at an identical level to that observed in 1985.

We can see over the period under consideration (1980 -2005) a gradual loosening of the link between economic growth and primary energy consumption .

2) Regional features

- <u>The Flemish region</u>



<u>Key</u>:

ENERGIE-INTENSITEIT VLAANDEREN	ENERGY INTENSITY - FLANDERS

11.37 Energy intensity trend of the economy from 1990 to 2004 (index 1990 = 100).
Note: the 2004 GDP is an estimate. Source: Flemish Ins titute for Technology Research Energy Audit, Flemish Government Research Department. *: provisional figures
GDP (1 000 EUR) •
GNP (kgoe) •
Energy intensity •

- <u>The Walloon region</u>

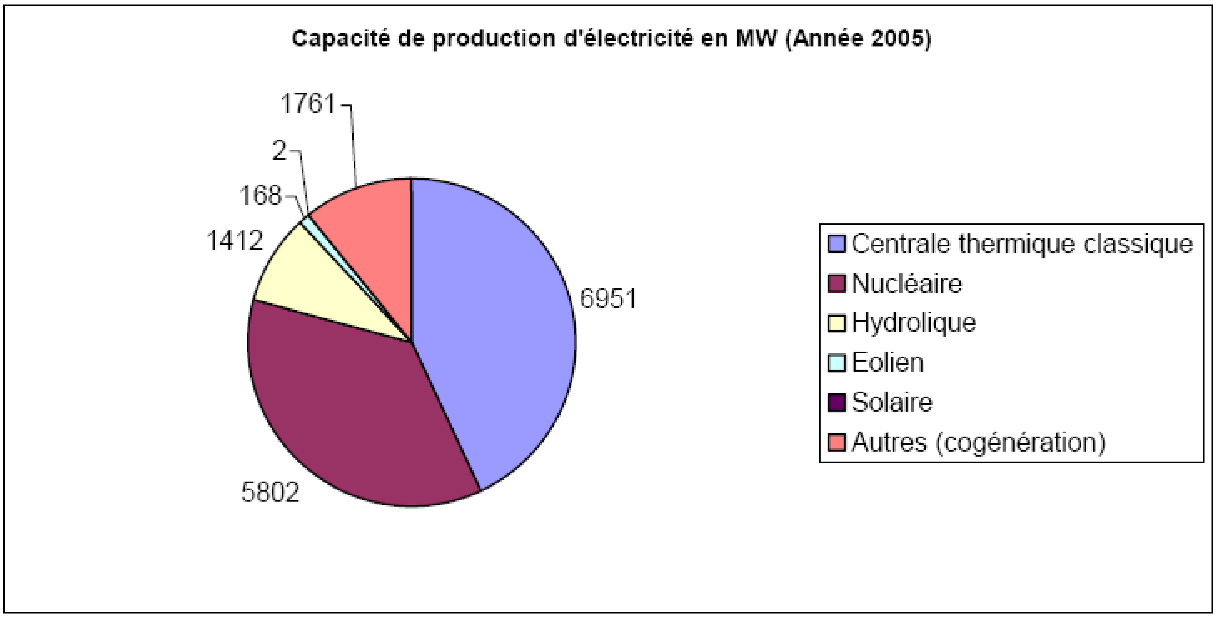
- <u>The Brussels-Capital region</u>

See annexes *"RBC – Annexe 5 –Bilan énérgetique 2004.pdf" ("BCR – Annex 5 – Energy Audit 2004") and "RBC – Annexe 6 –Bilan énérgetique 2005.pdf" ("BCR – Annex 6 – Energy Audit 2005")*

IV. Model of electricity production

1) Belgium

The country's electricity generation system corresponds to an installed capacity of 16,096 MW. It is distributed as follows:



Key:

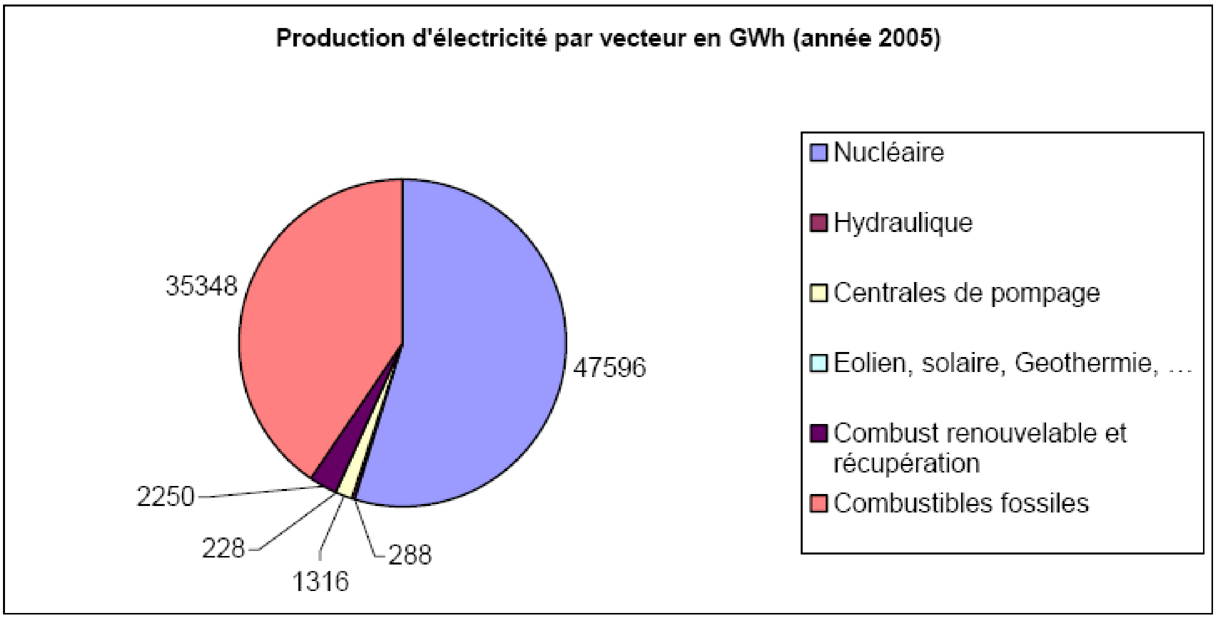
Centrale thermique classique	Conventional thermal power station
Nucléaire	Nuclear
Hydrolique	Hydraulic
Eolien	Wind farm
Solaire	Solar
Autres (cogénération)	Others (cogeneration)

Source: Eurostat

Electricity production capacity in MW (2005)

In 2005, the electricity consumption of the country amounted to 93 330 GWh, with electricity production amounting to 87 026 GWh and a net import balance of 6 304 GWh.

The contribution of the different energy vectors to the domestic production of electricity is given in the figure below.



Key:

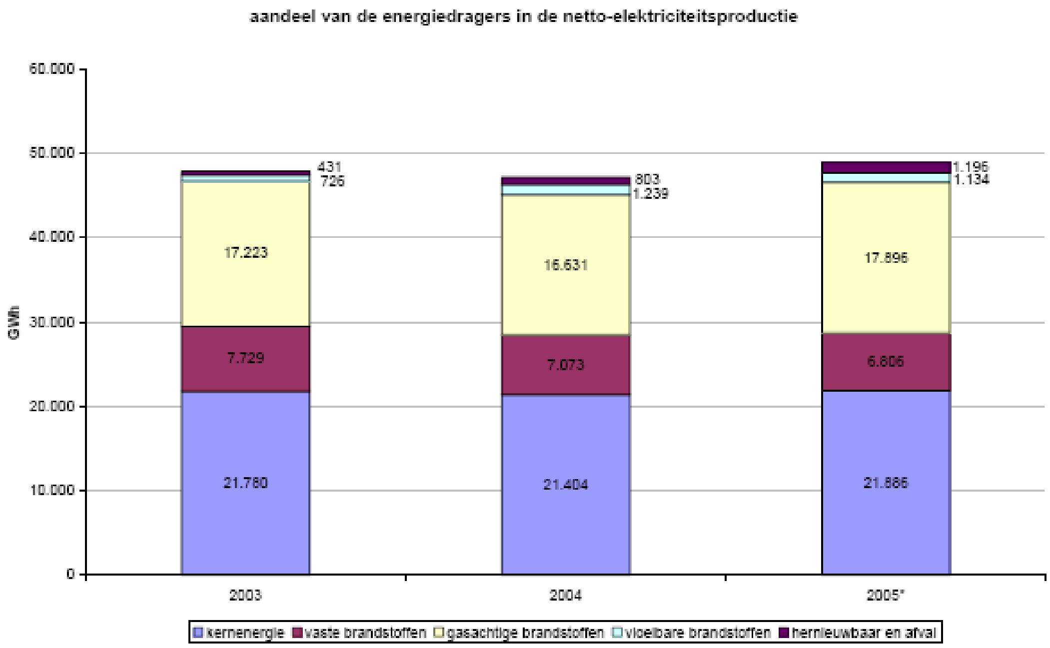
Nucléaire	Nuclear
Hydraulique	Hydraulic
Centrales de pompage	Pumped storage station
Eolien, solaire, geothermie…	Wind farm, solar, geothermal, etc.
Combust. renouvelable et récupération	Renewable and recovered fuels
Combustibles fossiles	Fossil fuels

Source: SPF Economie

Production of electricity by vector in GWh (2005)

2) Regional features

- <u>The Flemish region</u>



Key:

Aandeel van de energiedragers in de netto-elektriciteitsproductie	Proportion of energy suppliers in net electricity production
kernenergie	nuclear energy
Vaste brandstoffen	solid fuels
Gasachtige brandstoffen	Gaseous fuels
Vloebare brandstoffen	Liquid fuels
Hernieuwbaar en afval	Renewable and waste

Tabel 5: Ontwikkeling van de elektriciteitsvraag in België volgens het BAU scenario

[TJ]	2000	2002	2004	2006	2008	2010	2012	2015	2020
Vlaanderen	*181 459*	*186 179*	*191 241*	*196 369*	*198 449*	*203 193*	*206 661*	*211 454*	*217 431*
Residentieel	36 118	38 335	41 694	42 510	43 242	43 717	43 776	45 941	47 633
Tertiair	32 753	40921	39 652	40 947	41 508	41 858	42 194	43 104	44 477
Landbouw	3 684	3 843	3 359	3 844	3 844	3 844	3 844	3 844	3 844
Transport	2 819	2 703	2 741	3 064	3 292	3 518	3 545	3 585	3 652
Industrie	106 085	100 376	103 795	106 003	106 563	110 257	113 302	114 981	117 825
Wallonië	*84 580*	*86 441*	*88 343*	*89 970*	*91 305*	*92 660*	*95 296*	*99 464*	*106 950*
Brussel	*18 795*	*19 909*	*20 830*	*21 793*	*22 800*	*23 854*	*24 957*	*26 735*	*29 901*
Totaal België	**284 834**	**292 529**	**300 414**	**308 131**	**312 554**	**319 707**	**326 913**	**337 653**	**354 283**

%	'00-'02	'02-'04	'04-'06	'06-'08	'08-'10	'10-'12	'12-'15	'15-'20
Gemiddelde jaarlijkse groei Vlaanderen	1,29%	1,35%	1,33%	0,53%	1,19%	0,85%	0,77%	0,56%

Key:

Tabel 5: Ontwikkeling van de elektriciteitsvraag in België volgens het BAU scenario	Table 5: growth in electricity demand in Belgium according to the BAU scenario
Vlaanderen	Flanders
Residentieel	residential
Tertiair	Tertiary
Landbouw	Agriculture
Transport	Transport
Industrie	Industry
Wallonië	Wallonia
Brussel	Brussels
Total België	Total Belgium
Gemiddelde jaarlijke groei Vlanderen	Average annual growth - Flanders

- Walloon region

- Brussels-Capital region

See annexes *"RBC – Annexe 5 –Bilan énérgetique 2004.pdf" ("BCR – Annex 5 – Energy Audit 2004"), "RBC – Annexe 6 –Bilan énérgetique 2005.pdf" ("BCR – Annex 6 – Energy Audit 2005") and "RBC – Annexe 7 –Autoproduction 2005.pdf" ("BCR – Annex 7 – Autoproduction 2005")*

Types of fuels usable for cogeneration and their availability

One advantage of "cogeneration" technology is the ability to use practically all types of fuel, both fossil fuels (natural gas, fuel oil, domestic oil, coal, etc.) and renewable fuels (wood, biogas, vegetable oils. animal fats, organic waste, etc.). We should point out that renewable fuels must undergo one or more preparation treatments before use in any of the cogeneration technologies. For example, wood must be crushed and even dried before being put into a steam boiler coupled to a steam turbine.

With regard to the availability of renewable fuels, clearly it is not only local resources that should be used. As for fossil fuels, supplies would have to come from world markets: Electrabel buys wooden pellets from South Africa, Canada and Poland, to supply its 100% biomass electricity power plant in Awirs. It must be ensured that the biomass used is sustainable, that is, that the equivalent of the biomass taken has been replanted under environmentally-friendly conditions. The Walloon Region is at the forefront in Europe in terms of the traceability and verification of the sustainable nature of the operations involved in importing biomass for energy purposes. It intends to continue and emphasise this method so as to avoid any use of biomass exploited in a non-sustainable manner.

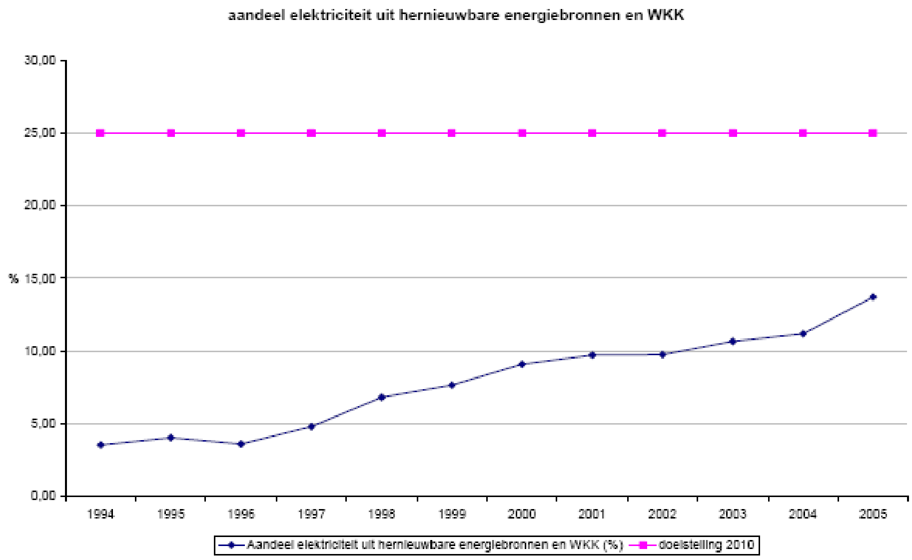
However, there are local deposits, which may be used as a priority provided that a fair balance is found between the cost of the raw material and the cost of imported energy sources to meet the target of energy independence. It should be noted that renewable fuels have the advantage of being distributed more fairly throughout the world. It is possible to buy wood from practically all the regions of the world, which is not the case for natural gas or oil. Opting for renewable energy, even if it is imported, thus allows Belgium's energy dependency on some foreign countries to be reduced.

Finally, access to the natural gas network is not possible for everyone in Belgium. The distribution network is less extensive in the southern part of Belgium than in the North. This constraint limits the potential for developing natural gas cogeneration.

High-efficiency cogeneration potential

I. The Flemish Region

Historiek:



Key:

Historiek	Historical trend
aandeel elektriciteit uit hernieuwbare energiebronnen en WKK	proportion of electricity from renewable energy sources in chp
Aandeel elektriciteit uit hernieubare energiebronnen en WKK (%)	proportion of electricity from renewable energy sources in chp (%)
doelstelling 2010	2010 objective

Inventory 2005:
Since 1990, the CHP power capacity inventory in Flanders has been carried out by Vito. In an earlier report "WKK-inventaris Vlaanderen: Stand van zaken 2005" (CHP inventory Flanders: status 2005) this inventory was updated for 2005 on instruction from VEA (Flemish Energy Agency). In 2006, significant changes were undertaken as regards the quality definitions and the Flemish and European reference efficiency values for the calculation of the energy performance of CHP plants.

The figures from the report "WKK-inventaris Vlaanderen: Stand van zaken 2005" are recalculated in the report "WKK-inventaris Vlaanderen: Stand van zaken 2005 (2)" presented here, taking into account the changes mentioned.

Therefore the figures in the later report can no longer be compared with those in previous inventories due to the modified method of calculation.

The table below is a summary of the figures for power capacity and energy of the CHP plants set up in Flanders in 2005:

• In addition to the details for the total installed electric power and total electricity production, the corresponding figures were calculated pursuant to Annex II of Directive 2004/8/EC of the European Parliament and of the Council [1] or pursuant to Annex II of the Flemish Government Decree of 7 July 2006 [2]. In accordance with this, heat or electricity from the same plant but not originating from CHP is excluded. The figures for CHP plants which qualify for certification are also presented. These are the plants which qualify as from 01/01/2002 in accordance with Annex III of the Flemish Government Decree of 7 July 2006 [2], taking into account the European reference efficiency values [3].

• In order to classify whether CHP facilities are qualitative or not, para. a and c of Annex III of Directive 2004/8/EC of the European Parliament and of the Council[1] were taken into account or Annex III of the Flemish Government Decree of 7 July 2006 [2]. Here small-scale CHP plants are considered to be qualitative when RPEB > 0 and large -scale CHP plants are considered to be qualitative when RPEB > 10%. The Ministerial Decision of the Flemish Government published in the Belgian Official Gazette on 1/12/2006 [3], and which incorporates the European reference efficiency values were also taken into account for the reference efficiency values. This latter decision (correction factors for network loss) is not taken into account in Annex IV as there were insufficient details available to apply these. For plants greater than 25 MWe Art. 12 para. 2 of Directive 2004/8/EC of the European Parliament and of the Council [1] were taken into account to determine whether or not a plant is classified as qualitative.

• The primary energy savings were calculated three times: once on the basis of the European reference efficiency values (pursuant to the Ministerial Decision of the Flemish Government published in the Belgian Official Gazette on 1/12/2006 [3]), a second time on the basis of the Flemish reference efficiency values as defined in Art. 10 of the Decision of the Flemish Government of 7 July 2006 [2] and once, for plants operating with renewable energy, taking the nominal steam output as defined in the annex to the VREG decision 2004-62 into account [4].

	Motoren	Gasturbines	STEG	Stoomturbines netgekoppeld	Stoomturbines directe aandrijving	Totaal
Totaal opgesteld elektrisch WKK vermogen [MW]	161	326	731	126	113	1457
Totaal opgesteld thermisch WKK vermogen [MW]	300	420	436	743	860	2769
Opgesteld elektrisch WKK vermogen volgens Annex II [MW]	152	289	371	126	113	1051
Opgesteld elektrisch kwalitatief WKK vermogen volgens definitie richtlijn 2004/8/EG [MW]	143	203	282	90	53	771
Opgesteld elektrisch certificaatgerechtigd WKK vermogen [MW]	40	0	395	5	0	440
Productie van elektriciteit en warmte van WKK-installaties						
Totale netto elektriciteitsproductie [GWh/jaar]	418	2337	3644	612	907	7918
Totale warmteproductie [GWh/jaar]	558	3054	2812	3206	6631	16261
Netto elektriciteitsproductie volgens Annex II	399	2100	2133	519	899	6040
Netto elektriciteitsproductie kwalitatieve WKK volgens definitie richtlijn 2004/8/EG [GWh/jaar]	397	1445	2014	465	396	4717
Netto certificaatgerechtigde elektriciteitsproductie [GWh/jaar]	102	0	1233	40	0	1376
Gemiddelde vollastdraaitijd [h/jaar]	3933	7165	4986	4841	8036	5433
Primaire energiebesparing van WKK-installaties						
Primaire energiebesparing op basis van Vlaamse referentierendementen [GWh/jaar]	289	1146	1587	274	229	3526
Primaire energiebesparing op basis van Vlaamse referentierendementen met fictief stoomopwekkingsrendement [GWh/jaar]	289	1146	1587	79	-960	2142
Primaire energiebesparing van kwalitatieve WKK op basis van Vlaamse referentierendementen	316	1118	1461	532	748	4176
Primaire energiebesparing van kwalitatieve WKK op basis van Vlaamse referentierendementen met fictief stoomopwekkingsrendement [GWh/jaar]	316	1118	1461	337	335	3567
Primaire energiebesparing op basis van Europese referentierendementen [GWh/jaar]	315	1413	1985	863	1818	6414
Primaire energiebesparing van kwalitatieve WKK op basis van Europese referentierendementen	342	1257	1701	1112	1448	5860
Relatieve primaire energiebesparing van WKK-installaties						
RPEB op basis van Vlaamse referentierendementen	19	15	16	5	2	10
RPEB op basis van Vlaamse referentierendementen met fictief stoomopwekkingsrendement [%]	19	15	16	2	-10	6
RPEB van kwalitatieve WKK op basis van Vlaamse referentierendementen [%]	22	23	21	13	13	18
RPEB van kwalitatieve WKK op basis van Vlaamse referentierendementen met fictief stoomopwekkingsrendement [%]	22	23	21	6	3	16
RPEB op basis van Europese referentierendementen	21	17	19	16	16	17
RPEB van kwalitatieve WKK op basis van Europese referentierendementen [%]	24	25	24	23	23	24

Key:

Motoren	Engines
Gasturbines	Gas turbines
STEG	Combined cycle unit
Stoomturbines netgekoppeld	Steam turbines, network-connected
Stoomturbines directe aandrijving	Steam turbines, direct-driven
Totaal	total
Totaal opgesteld elektrisch WKK vermogen [MW]	Total installed electrical CHP power capacity [MW]
Total opgesteld thermisch WKK vermogen [MW]	Total installed thermal CHP power capacity [MW]
Opgesteld elektrisch WKK vermogen volgens Annex II [MW]	Installed electrical CHP power capacity in accordance with Annex II [MW]
Opgesteld elektrisch kwalitatief WKK vermogen volgens definitie richt lijn 2004/8/EG [MW]	Installed electrical qualitative CHP power capacity in accordance with definitions in Directive 2004/8/EC [MW]
Opgesteld elektrisch certificaatgerechtigd WKK vermogen [MW]	Approved installed electrical CHP power capacity [MW]
Productie van elektriciteit en warmte van	Production of heat and electricity by CHP

WKK-installaties	installations
Totale netto elektriciteitsproductie [GWh/jaar]	Total net electricity production [GWh/year]
Totale warmteproductie [GWh/jaar]	Total heat production [GWh/year]
Netto elektriciteitsproductie volgens Annex II	Net electricity production in accordance with Annex II
Netto elektriciteitsproductie kwalitatieve WKK volgens definitie richtlijn 2004/8/EG [GWh/jaar]	Net electrical qualitative CHP production in accordance with definitions in Directive 2004/8/EC [GWh/year]
Netto certificaatgerechtigde elektriciteitsproductie [GWh/jaar]	Net approved electricity production [GWh/year]
Gemiddelde vollastdraaitijd [h/jaar]	Average full load running time [hrs/year]
Primaire energiebesparing van WKK - installaties	Primary energy saving of CHP installations
Primaire energiebesparing op basis van Vlaamse referentierendementen [GWh/jaar]	Primary energy saving on the basis of Flemish reference efficiency values [GWh/year]
Primaire energiebesparing op basis van Vlaamse referentierendementen met fictief stoomopwekkingsrendement [GWh/jaar]	Primary energy saving on the basis of Flemish reference efficiency values with nominal steam output [GWh/year]
Primaire energiebesparing van kwalitatieve WKK op basis van Vlaamse referentierendementen	Primary energy saving of qualitative CHP on the basis of Flemish reference efficiency values
Primaire energiebesparing van kwalitatieve WKK op basis van Vlaamse referentierendementen met fictief stoomopwekkingsrendement [GWh/jaar]	Primary energy saving of qualitative CHP on the basis of Flemish reference efficiency values with nominal steam output [GWh/year]
Primaire energiebesparing op basis van Europese referentierendementen [GWh/jaar]	Primary energy saving on the basis of European reference efficiency values [GWh/year]
Primaire energiebesparing van kwalitatieve WKK op basis van Europese referentierendementen	Primary energy saving of qualitative CHP on the basis of European reference efficiency values
Relative primaire energiebesparing van WKK-installaties	Relative primary energy saving of CHP installations
RPEB op basis van Vlaamse referentierendementen	RPEB on the basis of Flemish reference efficiency values
RPEB op basis van Vlaamse referentierendementen met fictief stoomopwekkingsrendement [%]	RPEB on the basis of Flemish reference efficiency values with nominal steam output [%]
RPEB van kwalitatieve WKK op basis van Vlaamse referentierendementen [%]	RPEB of qualitative CHP on the basis of Flemish reference efficiency values [%]
RPEB van kwalitatieve WKK op basis van Vlaamse referentierendementen met fictief stoomopwekkingsrendement [%]	RPEB of qualitative CHP on the basis of Flemish reference efficiency values with nominal steam output [%]

RPEB op basis van Europese referentierendementen	RPEB on the basis of European reference efficiency values
RPEB van kwalitatieve WKK op basis van Europese referentierendementen [%]	RPEB of qualitative CHP on the basis of European reference efficiency values [%]

The total electrical output inventory in 2005 for CHP plants in Flanders is 1,457 MWe, which means that 378 MWe in CHPs were added in 2005. These plants have a total net electricity production of 7,918 GWh/year. CHP production accor ding to Annex II to the Flemish Government Decree of 7 July 2006 [2] is 76% of this. 53% of installed power capacity relates to qualitative CHP plants pursuant to Art. 12 para. 2 of European Directive 2004/8/EC [1]. 30% of installed power capacity and 17% of electricity production is approved. Total installed thermal power capacity is 2,762 MW with a total heat production of 16,261 GWh per annum.

The industry is the most important sector with a total installed electric power of 925 MWe or 63.5% of the tota l installed power capacity.

As regards fuels, natural gas appears to be by far the most important fuel, with a total installed electric power of 1 176 MWe or almost 81% of the total installed power capacity.

The total primary energy savings calculated using the Flemish reference efficiency values is 3 526 GWh per year or 12.7 PY. If only the qualitative plants are taken into account, this amounts to 4 175 GWh per year or 15 PY. Total primary energy savings calculated using the European reference efficiency values amounts to 6 414 GWh per year or 23.1 PY, almost twice as much as when calculated using the Flemish reference efficiency values.

There is 1 STEG unit where, despite RPEB of more than 10%, the CHP efficiency is less than 70%, which means that this cannot be considered as qualitative for Europe. This unit is, however, eligible for certification if the additional requirement of Art. 12 para. 2 for plants with a power output in excess of 25 MWe is not adopted in the Flemish definition of quality .

The total primary energy savings that count towards CHP certification in 2005 is 281 GWh or 1 PY.

Potential 2020								
Heat demand for heating and process heat to 2020 (TJ/year)								
	2006	2008	2010	2012	2014	2016	2018	2020
Residential	242800	248252	247636	246100	244563	243027	241490	239953
Tertiary industry	73449	73315	72825	72349	71873	71396	70920	70444
Greenhouse horticulture and livestock farming	99702	100512	101322	102132	102942	103752	104562	105372
Total	415951	422079	421783	420580	419377	418175	416972	415769
Source: VITO, 3E: Forecasts for renewable energy and CHP to 2020								

Tabel 8: Opgesteld vermogen (MWe), elektriciteitsproductie (GWh) en primaire energiebesparing in het PRO scenario[3] in 2020 en opgesteld vermogen (MWe) en elektriciteitsproductie (GWh) in het BAU scenario[4] in 2020 (Vlaanderen)

	PRO scenario 2020			BAU scenario 2020	
	Opgesteld vermogen (MWe)	Elektriciteits-productie (GWh)	Primaire energiesparing (GWh)	Opgesteld vermogen (MWe)	Elektriciteits-productie (GWh)
Groene WKK motoren	184	819	540	149	714
Groene WKK turbines	285	1756	1076	160	941
Stoomturbines, netgekoppeld	82	658	337	82*	658
Stoomturbines, directe aandrijving	27	851 (in equivalenten)	291	27**	851 (in equivalenten)
WKK motoren	500	2113	1268	381	1732
WKK gasturbines	1397	10738	5711	1000	7999
STEG BASF	385	2955	310	385	2955
Totaal	**2860**	**19889**	**9532**	**2184**	**15850**

Bron: VITO, 3E: Prognoses voor hernieuwbare energie en warmtekrachtkoppeling tot 2020

Table 8: Installed power capacity (MWe), electricity production (GWh) in primary energy savings in the PRO scenario in 2020 and installed power capacity (MWe) and ele ctricity production (GWh) in the BAU scenario in 2020 (Flanders)

	PRO scenario 2020			**BAU scenario 2020**	
	Installed power capacity (MWe)	**Electricity production (GWh)**	**Primary energy savings (GWh)**	**Installed power capacity (MWe)**	**Electricity production (GWh)**
Green CHP engines					
Green CHP turbines					
steam turbines, network-connected					
steam					(In

turbines direct-driven		(In equivalents)			equivalents)
CHP engines					
CHP gas turbines					
BASF combined cycle unit					
Total					

Source: Flemish Institute for Technology Research, 3 ^{E}: forecasts for renewable energy and cogeneration to 2020

II. The Walloon region

An initial potential was calculated in June 2005 at the request of the regulator, CWaPE. This potential was looked at again in July 2007 by the Cogeneration Facilitator for the Walloon Region, the ICEDD (Institut de Conseil et d'Etudes en Développement Durable – Institute for Advice and Research on Sustainable Development), taking into account the increase in the price of equipment in recent years and in energy prices, in particular natural gas in 2006. Determining the economic potential is not easy as it depends on many factors. An important factor is the support for production set in place by the Walloon Region, called green certificates. Unlike support of the "feeding tariff" type, the value of the green certificates depends on the market, which expresses the balance between supply (producers of green electricity) and demand (the suppliers subject to quota). This balance can therefore vary between the minimum price guaranteed by the Walloon Region, (65€ per green certificate) and the maximum price corresponding to the amount of the penalty for suppliers (100 € per missing green certificate). The market price is currently around 90 €.
Two economic potentials are therefore proposed:
- a proactive potential which is based on a price of 90 € per green certificate;
- a pragmatic potential [8] which is based on a price of 65 € per green certificate.

	Electric power (kWe)	Electricity production (GWh/year)	Number of green certificates (GC/year)
Energy potential	526,594	3,188	830,601
Proactive economic potential	290,598	1,817	562,875
Pragmatic potential	**253,000**	**1,626**	**439,600**

Surprisingly, while the price of natural gas has increased more than the price of electricity, **the economic potential has only reduced by 9 MW_e (or 3%)** compared with 2005. Looking at the

[8] Many entrepreneurs base their business plan on a value of 65 €

results more closely, some projects become less efficient than before and others are more efficient. It all depends on the class of consumption of electricity and natural gas, given t hat the percentage change in price depends on the class of consumption.

III. The Brussels-Capital Region

Methodology of the study

The estimate of the cogeneration potential is based on a double approach known as bottom -up and top-down. The bottom-up approach starts from the individual situation of a series (1600) of tertiary, industrial and collective housing establishments, known through the energy surveys carried out annually by the ICEDD on behalf of the Brussels -Capital Region and broken down by sector of activity. The top -down approach analyses the industrial, tertiary and housing sectors as a whole. The emphasis was on the bottom -up approach, which is more specific and reliable, and which was then compared with the top -down approach.

The first stage consisted of listing the establishments whose individual consumption of fuel and electricity are known: more than 1300 establishments in the Brussels tertiary sector (public and private), more than 200 industrial establishments and around 70 collecti ve housing buildings.

The second stage was to carry out an initial dimensioning of a cogeneration unit, based on the energy data from each establishment. A net annual heat requirement (BNeC) was estimated per establishment taking into account the thermal efficiency of the installation (estimated at 80%), the amount of heat which can actually be cogenerated (not cooking, for example) and a rational use of energy factor (or DSM – Demand Side Management – estimated at 5% for industry and 10% for the tertiary sector). This net annual heat requirement was then distributed over time according to a choice of 13 standard thermal profiles, depending on the presumed method of operation of the establishment studied (5 days out of 7; 6 days out of 7; 8 h out of 24 h per day, etc.). The dimensioning rule of the cogeneration installation is that which maximises the production of thermal energy. We should point out that this method of dimensioning is quite conservative. We presume functioning at full load, while in pr actice, cogeneration units can function up to a partial load of 80% without significant loss of efficiency, and therefore increase their life. In addition, the possibility of functioning in tandem with several small cogeneration units and the distribution of heat to neighbouring buildings have not been taken into account. Finally, economic optimisation was done by trying to maximise the number of hours of operation and thus minimising the cogeneration capacities to be installed, so that the investment is m ore productive.

The third stage consisted of calculating the cost effectiveness of the cogeneration project. A record of gains was drawn up (gain on the electricity bill; gain on heat; gain on green certificates; etc.) and of costs (cost of servicing and maintaining the cogeneration unit; purchase of fuels for cogeneration; additional cost of extra electricity, etc.). The difference gives the net annual gain of the project. By dividing the net investment, less any subsidies, by this net annual gain, we obtain the simple payback period (SPP) of the cogeneration project. The calculation of the Net Present Value (NPV) and the Internal Rate of Return (IRR) take account of the change in this net annual gain over the years.

The fourth stage consisted of extrapolating the energy potential and the economic potential throughout the Region. The energy potential represents the sum of all the cogeneration units it is possible to install in terms of energy. The economic potential includes only projects whose simple payback period is less than 3 years in industry and less than 5 years for the tertiary sector and housing. The top-down approach, based on the total consumptions of the sectors, allows us to extrapolate the results obtained according to the bottom-up approach to the other establishments whose energy consumption is not known.

We should state that only cogeneration using a natural gas motor has been envisaged on the Brussels territory. This fuel emits less CO2 than fuel oil and has the advantage of being easily available. Renewable fuels, which often require a substantial area for storage, were not considered voluntarily. In Brussels, the space available is accounted for.

Regional support mechanisms

Green certificates: an aid to production

To encourage producers to turn towards the production of green electricity and quality cogeneration, the Brussels authorities set in place a mechanism of green certificates by the decree of 19 July 2001. The details of this mechanism can be found in an order dated 6 May 2004.

The idea is simple: installations which have been certified and which allow a minimum saving of 5% of CO2 compared with installations with separate production of heat and electricity benefit from “green certificates” every quarter. In concrete terms, based on this mechanism, one green certificate is granted to the certified installation for each quantity of 217 kg of CO2 which it avoids emitting.

The price of the green certificates is currently 69 € but the value of 90€ was used in the model, in anticipation of the rise in the fine from 75 € to 100 € in 2007. The greater the CO2 saving, the greater the gain achieved from the sale of green certificates. Cogeneration units which use a renewable fuel, generally more expensive, can therefore be economically advantageous for the project sponsor. *(To find out more see: www.ibgebim.be > Entreprises > Energie > libéralisation des marchés de l’énergie> certificats verts).*

Level of investment subsidies

Cogeneration systems installed in the Brussels -Capital Region can benefit from investment aid of 20% through the Energy Incentives 2006 "Tertiary – Industrial" or "Collective housing". Furthermore, there is a tax allowance of 13.5% on company profit for the investment in cogeneration. The net advantage therefore depends on the company's tax rate.

(To find out more see: www.ibgegim.be > Entreprises > subsides et fiscalité)

Principal results

From the thermal point of view, the Net Heat Requirements (BNeC) based on conservative hypotheses, amount to 2,105 GWh, or 55% of the consumption of fuel in the sectors studied. The cogeneration units which could technically be installed in the Brussels region have the capacity to produce 879 GWh of heat or 23% of the initial requirements. Taking into account the constraint of the payback period, the economic potential indicates a thermal pro duction of 781 GWh, or 20% of the heat requirements.

The consumption of electricity in the Region in 2003 was of the order of 5 500 GWh. The cogeneration units which could technically be installed in the Brussels region have the capacity to produce 540 GWh of electricity, or 10% of the Region's consumption. The economic potentials vary between 492 GWh for the potential calculated on the Simple Payback Period to 518 GWh based on the NPV. The rise in energy prices means that efficient cogeneration install ations will be more profitable.

"Gas motor" scenario Option: without storage	Electric power (MWe)	Electricity production (GWh)	Number of green certificates
Energy potential	**123.2**	**540.4**	**316,549**
Economic potential	**112.1**	**492.0**	**291,156**

Table 4: Principal results in terms of power, electricity production and number of green certificates

The tertiary sector represents 77% of the economic potential of electricity production. The main sub-sectors are shown below, with a net dominance of the public and priva te offices sector (33%).

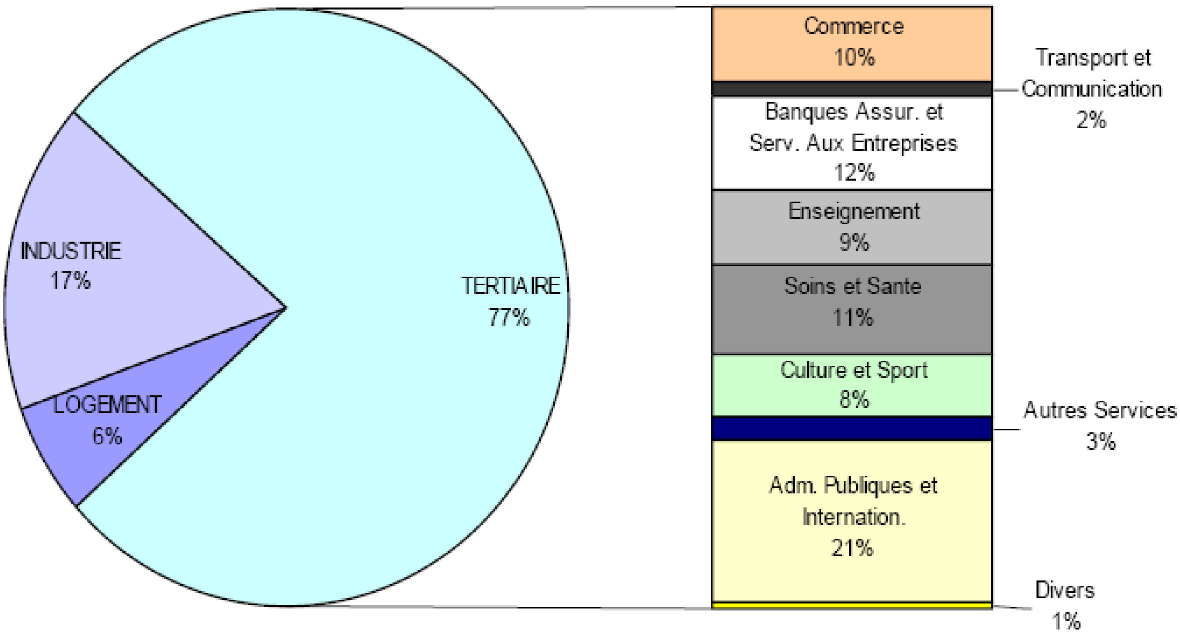


Figure 7 : Répartition du potentiel de production électrique par secteurs et sous-secteurs.

Key:

Industrie	Industry
Logement	Housing
Tertiaire	Tertiary
Commerce	Commerce
Transport et Communication	Transport and Communication
Banques Assur. et Serv. aux Entreprises	Banks, Insurance and Services to Companies
Enseignement	Teaching
Soins et Santé	Health care
Culture et Sport	Culture and Sport
Autres services	Other Services
Adm. Publiques et Internation.	Public and International Administration
Divers	Miscellaneous

Figure 7: Distribution of electricity produc tion potential by sectors and sub -sectors

If all of these establishments have room to install a heat storage tank, enabling the annual duration of operation of cogeneration to be increased, and therefore its efficiency, the energy potential climbs to 666 GWh of electricity production with 389 000 GC and the economic potential is 623 GWh with 366 000 GC.

The figure below shows different results according to the scenarios envisaged. These percentages of electricity consumption in Brussels which could be co vered by “efficient” cogeneration are

8.9%, or even 11.6% if the option of heat storage and 20% subsidies is considered. The decision makers need to be convinced to achieve this economic potential…

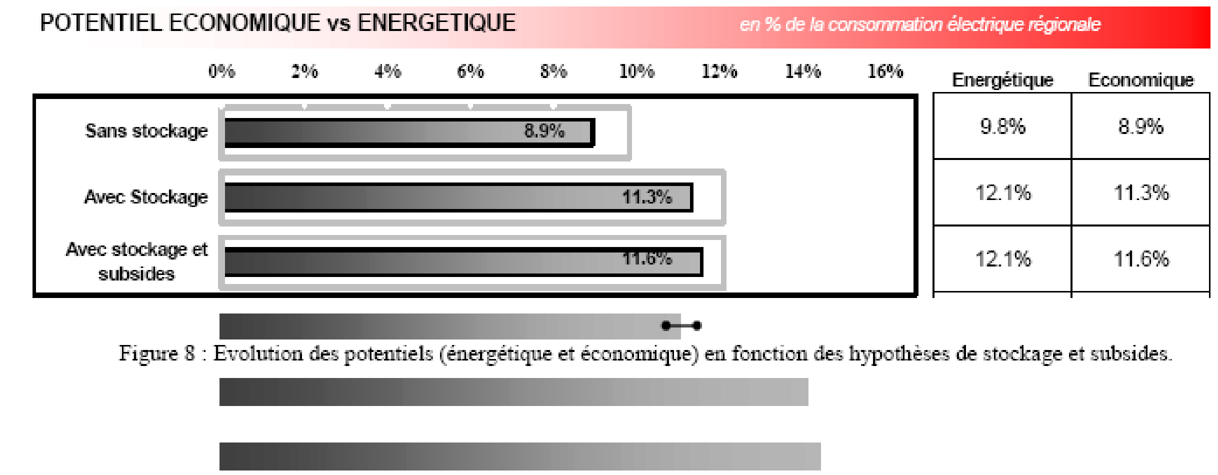


Figure 8 : Evolution des potentiels (énergétique et économique) en fonction des hypothèses de stockage et subsides.

Key:

POTENTIEL ECONOMIQUE VS ENERGETIQUE	ECONOMIC VS ENERGY POTENTIAL
Sans stockage	Without storage
Avec stockage	With storage
Avec stockage et subsides	With storage and subsidies
Energetique	Energy
Economique	Economic

Figure 8: Change in potentials (energy and economic) according to storage and subsidy hypotheses

We should state that in 2004, the cogeneration units in existence in the Brussels-Capital Region produced about 41 GWh of electricity, or the equivalent of a small percentage of Brussels' consumption of electricity. 1% should therefore be added to the potential figures mentioned above, to obtain the total percentage of electricity consumption which could be produced by cogeneration in the Brussels-Capital Region.
After determining, from amongst the first 1474 Brussels establishments studied, those which had an economic potential based on the simple payback period chosen for the tertiary sector (5 years) and industry (3 years), or 535 establishments (36%), we wrote to them asking them to apply for a free relevance study.

At the end of November 2005, we received 73 applications (14% of the economic potential), and they received the supplementary questionnaire to enable the study to be refined. Completed questionnaires were sent back by 24 establishments.

Even without financial support through the green certificates, there was already an economic potential of the order of half the energy potential: 129 tertiary establishments, 9 industrial establishments and 4 housing properties, generally the largest consumers. If this potential has not yet been realised, it must be assumed that a fair payback period of less than 5 years (for the tertiary sector) or 3 years (for industry) is not sufficient to raise the barriers preventing cogeneration from developing.

Thanks to the green certificates (at 90 €), the payback period for these establishments and industries has decreased and makes cogeneration efficient for 552 tertiary establishments, 35 industries and 23 housing properties in our sample. On average, the green certificates enable a reduction of 50€ to be granted for each MWhe produced by cogeneration with natural gas!

Heating network

The dimensioning of cogeneration is still done on the basis of the heating requirements. For large consumers of electricity, it would be beneficial to increase the size of the installation to cover the electrical needs more effectively. As a corollary, excess heat will be produced which will have to be resold in the vicinity. If we compare the two options for one building, for the net present value of gains over 10 years and for the associated internal rate of return, the heating network option is more advantageous than the cogeneration option alone. We have presumed for buildings connected to the heating network a purchase price for heating reduced by 20% compared with the price currently paid to produce it itself.

We can draw the **following conclusions on the heating networks:**

- Depreciated over 15 years, a heating network, even at the high price of 1 000 €/m of line and 20 000 € for one sub-station per establishment, is a solution which is more advantageous both from the energy and environmental point of view (increase in production by cogeneration, its efficiency and therefore green certificates granted) and from the economic point of view (better efficiency);
- If a heating network is installed, it is better to connect the maximum number of potential consumers to it. The best configuration is to provide for a heating network for both sides of the same street;
- The consumption profiles for heating establishments which can be connected to the heating network should be as diverse as possible, which would allow cogeneration of a greater size (as the profile of heating requirements is “translated” upwards) and allow it to operate for longer.

For large consumers of electricity, it is always an advantage to check the heating demand in the neighbouring buildings in order to optimise production.

Conclusions

The study of the technical-economic potential of cogeneration shows that, for the part of total consumption studied, gas motors can be installed in the Brussels-Capital Region with a total capacity of 123 MWe which would produce 540 GWH of electricity, giving a circulation of 316 000 green certificates for a reduction of around 69 000 tonnes of CO_2 compared with separate production. The hypotheses considered are quite conservative and it is not unreasonable to think that, consequently, this potential could be improved.

Basing our arguments on a payback period of 3 years in industry (490 GWh in fuel) and 5 years in the tertiary sector (2,657 GWh in fuel) and housing (666 GWh in fuel), the economic potential thus deduced allows the installation of gas motors with a total electric power of 12 MWe producing 492 GWh of electricity, or **16% of their electricity consumption** (3,169 GWh) and a total thermal power of 177 MWth producing 781 GWh of heat, or **28% of net heating requirements** (2,746 GWh). We note that the economic potential represents 91% of the energy potential. The number of green certificates granted for this effic ient cogeneration would be 291 000 for an annual saving of 63 000 tonnes of CO_2. We should state that if these cogeneration units were supplied by a renewable fuel, the CO_2 saving and therefore the number of green certificates would be multiplied by 5. I n relation to the total consumption of electricity (5,500 GWh), cogeneration could therefore produce 9% of the final consumption of electricity in the Region.

If we consider that the heating storage installation is in all cases efficient and possible as i t allows the curves of production and heating requirements to be staggered, so that demand is met more effectively, the energy (and economic) potential will be increased by electricity production of 125 GWh, or in total 11.3% of the final consumption of el ectricity in the Region.

In the tertiary sector, representing the largest potential in the Region, the most promising sub - sectors, individually, are hospitals and swimming pools with an energy potential for all the establishments studied and an economic p otential equal to 75% and 64%, respectively, of the energy potential of these sectors.

The sub-sectors which also have advantageous energy and economic potential are old people's homes, education and public administration.

Finally, the study of the heat ing networks showed the importance of finding heat consumers close to large electricity consumers. The reasoning that was followed for the heating networks was to increase the size of the cogeneration initially based on the thermal requirements of large consumers of electricity, in order to increase the electricity production which could be self - consumed, and to then redistribute the excess heat from cogeneration to "neighbours".

Impact of the potential of cogeneration on the socio -economic and environmental aspects

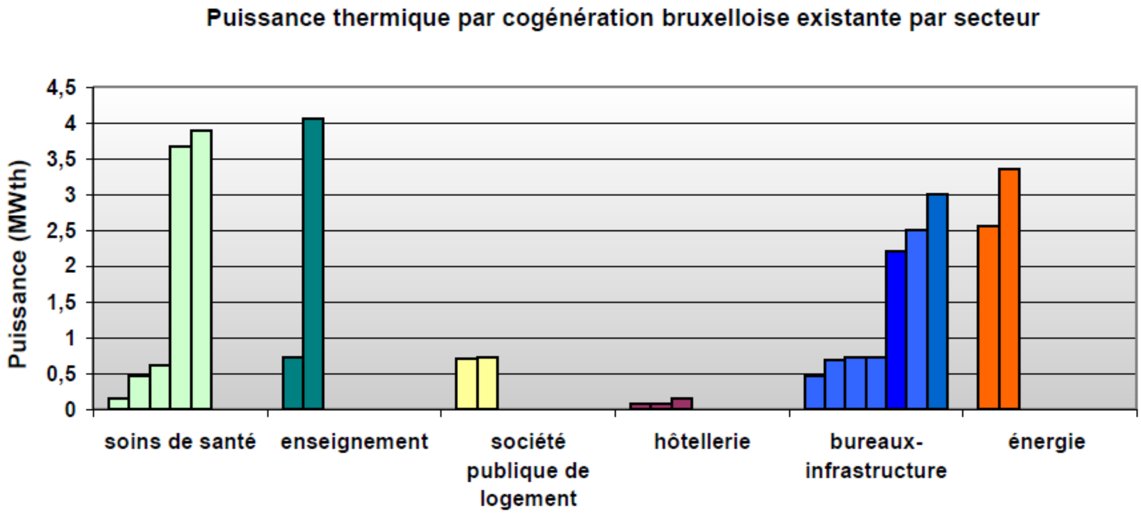
I. Brussels-Capital Region

Overview of the current market

- What are the existing installations?

At the end of 2005, the Brussels -Capital Region had about twenty cogeneration installations. Their total production capacity was in the region of 15.5 MW electrical [9] and slightly less than 20 MW thermal.[10] Taking into account the installation or replacement projects planned in the short and medium term, the regional capacity should reach 40 MW_e/52 MW_{th} within the next three or four years.

It is interesting to note that the range of power of the cogeneration installations in Brussels is distinctly lower than the possibilities in the Walloon or Flemish Regions, mainly because of the lack of major industrial sites. The graph below shows that the principal sectors where cogeneration technology has made a breakthrough are the tertiary sector of offices -infrastructure and health care.



Key:

Puissance (MWth)	Power (MWth)
Soins de santé	Health care
Enseignement	Education
Société publique de logement	Public housing company
Hôtellerie	Hotel industry
Bureaux-infrastructure	Offices-infrastructure

[9] Excluding electricity production from the gas recovery turbine of the Sibelga installation
[10] By way of comparison, the electricity production capacity of the Brussels -Capital Region was 105.3 MW in 2003.

Thermal power by existing cogeneration in Brussels according to sector

- What are the characteristics of the Brussels market?

First of all, as the tertiary and residential sectors are the principal final users of cogeneration in Brussels, mainly to cover their heating requirements in buildings and domestic hot water, the functioning and production of these cogeneration systems are thus heavily dependent on the climate (that is the number of degrees-days) and often limited to the heating period (October to March).

Furthermore, the current cogeneration installations practically all operate using gas motors equipped with a turbo and connected to the regional natural gas distribution network.[11] Other potential fuels are only used to a small extent. For example, in the very short term, two "bio-fuel" cogeneration systems should see the light of day: one operating on rapeseed oil and the other on biogas.

Secondly, the Brussels green certificates system is particularly favourable to cogeneration systems. The number of certificates granted depends on the actual production of heat and electricity while in the two other regions only the production of "green" electricity is taken into account. As a cogeneration system operating on "sustainable bio-fuel" is much more advantageous from the point of view of the number of certificates granted, the mechanism should support the deployment of this type of project more significantly.

Finally, the great majority (75%) of Brussels cogeneration systems are owned by "third-party investors", with a strong presence of the inter-communal operator Sibelga in this role. Within a short time, the public federal bodies will be able to call on FEDESCO (Federal Energy Service Company) as an institutional third-party investor for investments in the rational use of energy.[12]

- Who are the actors in the cogeneration market?

A cogeneration installation can be owned by a private individual or the "final user" company (the company which consumes the heat produced and even the electricity from cogeneration as a priority) which then acts as "autoproducer". In another possible system, the ownership of the installation falls to an external body called the "third-party investor".

The latter case is particularly attractive in the context of the cogeneration market as:

1. cogeneration technology is not generally controlled correctly by the final users (cf. the motors and turbines require a much more qualified and specialised labour force than "traditional"

[11] As a reminder, the Brussels-Capital Region alone is served by the Slochferen gas network, which is known to be L (low) gas.
[12] http://www.cidd.fgov.be/fedesco/fedesco/htm

boilers). The third-party investor system allows the complete management of the project, the installation and the operation to be outsourced.

2. the investment cost of a cogeneration installation is higher than that of a boiler, but the third-party investor is responsible for this.

3. the final user is tied to the third-party investor by a long-term supply contract which generally guarantees a reduction in the energy bill of the final user compared with the investment in a new boiler.

Benefiting from an external partner who takes on both the technological risk (dimensioning of the installation, feasibility study, choice of motors and purchase direct from the equipment supplier or the importer, repairs and maintenance, etc.) and the financial risk (initial investment, change in costs and operating gains, etc.) are the major advantages for the final client: on the one hand, he need not be concerned about the installation or its operation and, on the other hand, he buys back the heat and electricity he requires at a price fixed contractually over the long term (approximately 10 years).

From another point of view, apart from a supply agreement lasting several years, the third-party investor benefits from the possibility of having his quality installation certified [13] by the **IBGE** *[Brussels Institute for Environmental Management]* and obtaining green certificates based on the actual production of his installation.

In terms of the actors on the market, the public authorities have another important role particularly as regards the regulations linked to the cogeneration installation (e.g. operating licence/environmental licence/authorised emission limits, etc.).

With regard to the more technical aspects, the maintenance of and repairs to cogeneration installations, whether they are owned by a third-party investor or an autoproducer, are often sub-contracted to an organisation specialising in this area (the operator) such as Axima Services, Treco-Eneria, Van Wingen NV, etc.

- Green certificates

Since the last quarter of 2004, cogeneration installations in Brussels certified by the IBGE have received green certificates based on their actual production of heat and electricity.

During the first half of 2005, around 3,500 certificates were granted to cogeneration systems while the regional quota to be achieved in 2005 [14] by suppliers of electricity exceeded 76,000 certificates.

[13] A quality cogeneration installation must at least record a gain in CO_2 emissions of 5% compared with the references of the separate production of electricity and heating.

[14] In 2005, the quota amounted to 2.25% of the sales of electricity on the Brussels territory excluding the captive market (or around 76 500 green certificates to be purchased) for a discharge fine of 75 €. The quota was fixed at 2.5% in 2006 (or +/- 85 500 green certificates) and the fine at 75 €. For the following years and up to 2012, an order has yet to be issued stating the quotas and fines.

In 2006, the quota should correspond to +/ - 85 500 certificates. The regional supply is therefore much less than demand and in 2007, the total liberalisation of the gas and electricity markets in the Brussels-Capital Region could increase this gap further.

The government of the Brussels -Capital Region, in its decree of 3 May 2005 (MB: 17/05/2005) acknowledged, from that moment and temporarily, Walloon green certificates granted to installations which comply with the Brussels legislation and gave them an economic value equivalent to the Brussels certificates.

Environmental assessment

Compared with the situation in 2004 (average national electricity consumption installations and average regional heating installations), that year cogeneration installations enabled the direct emission (that is linked to the process of combustion) of some 2,300 tonnes of greenhouse gases (GHG) to be avoided.

If we consider the reference technologies, a gas turbine power plant with an electricity yield of 55% and a high-efficiency gas boiler (90%), cogeneration systems will also have enabled direct and indirect emissions of 100 to 1,000 tonnes of GHG to be reduced (i.e. linked to the transformation and routing of the fuel), depending on the hypotheses considered.

With an economic cogeneration potential of 112 MW electrical, and around 177 MW thermal, and the experience gained to improve the operation and yield of future installations (e.g. the use of a hot-water storage tank to smooth the cogeneration operation), GHG emissions could be reduced by +/- 69,000 tonnes compared with the current situation and by 41,000 to 89,000 tonnes compared with the reference situation (a gas turbine power plant 55% coupled with a high - efficiency boiler).

In spite of all of the above, it must be noted that the “gas motor” cogeneration systems emit considerably more NO_x and CO per kWh of heat provided than a boiler.

Nevertheless, a large number of manufacturers offer installations equipped with a catalyst guaranteeing compliance with the German TA Luft standard in terms of emissions of NO_x and CO.

In addition, the inclusion of rational use of energy projects, such as cogeneration, after the completion of an energy audit and the most advantageous investments in terms of reduction of consumption, ensures a correct dimensioning of the installation in the long term as well as a maximum reduction in emissions, of whatever type.

Socio-economic aspects

- Specialisms and skills

The cogeneration market is a relatively complex market comprising products (the cogeneration installation as such) and services (third-party investor, maintenance, operation, etc.), which requires a broad range of skills.

It is therefore made up of several specialisms dealing with certain specific stages in the cogeneration installation project.

The installer and those who are in charge of the maintenance and operation of the cogeneration system must master several purely technical disciplines, such as thermodynamics, ventilation, mechanics, electrical connections, plumbing connections, etc. One does not suddenly become an installer or operator, or the environmental and economic advantages of cogeneration will be reduced to nothing.

There are, however, other specialisms in the cogeneration market, which are relatively more accessible, but where it is noted that training may be lacking. Consultancy firms and energy advisers should, in fact, be able to identify the possibility of installing a cogeneration system for clients for whom they carry out an energy audit and suggest investments to reduce consumption and/or rational use of energy. Often this type of investment is not even considered due to the lack of knowledge or information on this subject, on the part of both the auditors and their clients. It is therefore important to emphasise that training and software are available from IBGE and other specialist bodies, in order to improve the knowledge of cogeneration technologies, assist consultancy firms and energy advisers in making their “diagnoses” and integrate the cogeneration option in their suggestions for investment in the best way possible.

Also, we must be aware that the energy audit offered by third-party investors in the cogeneration project is focused mainly on the quantification and distribution over time of the final client’s consumptions of electricity and heat. It therefore does not generally take account of any potentials for reducing consumption, which may be harmful to the overall approach put forward by the new European directive on the energy performance of buildings and the more drastic reduction of greenhouse gas emissions.

From the financial point of view, the third-party investor generally carries out studies on the dimensioning and economic feasibility of projects himself but if the final client wishes to become an autoproducer and invest his own resources, he will generally call upon a consultancy firm or a specialist adviser. There again, many tools are available to those who wish to be trained in this area.

Another valuable external aid for those wishing to become autoproducers can also be seen in the specialism of intermediary between holders and potential buyers on the green certificates market.

- Employment

Cogeneration installation projects call on local labour on several occasions, qualified or not depending on the circumstances.

From the start of the project, the site often requires adaptation to be able to receive the cogeneration installation and therefore certain work needs to be done by construction companies.

In the same way, the third-party investor or internal project manager must also be able to go to the site quite quickly in order to make the necessary decisions in time and thus manage the economic return of the project. From the employment point of view, the pre-project phase alone (prior to the completion of the investment) requires from 5 to 20 working days depending on the size of the installation, or a budget of around 3,500 up to more than 20,000 € per installation. Added to this are follow-up, certification of the installation by the IBGE to obtain green certificates (+/- 2-3 working days per installation) and the quarterly index statement. The economic potential identified for the Brussels region is thus some 1,170 installations.

Maintenance and repair services must be close to the sites as speed of intervention on site in the event of any problems may have a considerable impact on the profitability of the installation. If we account for an average budget for the maintenance of an installation of 1.52 € per hour of operation, the market should become even more attractive with 1,170 installations operating on average 2,000 h per year.

Finally, the use of renewable fuels from local production sources (e.g.: rapeseed oil, biogas, etc.) would allow the attraction of cogeneration to be increased further compared with its impact on employment "in the vicinity", mainly in agriculture and for transformers of biomass into biofuels.

Conclusion

In view of the economic potential for developing cogeneration in the Brussels-Capital Region and the current market situation, both in terms of the number of installations and the number of green certificates necessary to cover the regional quota, there is certainly still room for actors, particularly locally, who wish to invest or extend their activities in the capital.

Furthermore, the recent implementation of the green certificates system in Brussels and the forthcoming application of the new European directive on the energy performance of buildings will ensure that the area is more than favourable to this development.

Nevertheless, it is essential to note that, in order to take full advantage of cogeneration from the environmental point of view and in terms of energy performance, the most relevant approach consists of:

1. carrying out an energy audit;
2. minimising the consumption of heat and electricity where possible;
3. investing in the rational use of energy systems, such as a quality cogeneration installation if the feasibility study is conclusive.

In order to help new applicants on the cogeneration market, the Brussels-Capital Region has many sources of information available and organises seminars. All information on this subject can be obtained from the "cogeneration" facilitator.

Identification of obstacles

I. Obstacles at federal level

Due to the federal competences in energy matters, it is possible to describe a number of obstacles of a federal type, or Belgian in general, to the development of the "cogeneration" sector.

1) The Elia transport network development plan includes a list of sites where the installation of power stations (including cogen) is either desired, or strongly discouraged (e.g. Limbourg). Interesting projects have therefore been abandoned for that reason;
2) a number of locations suitable for the installation of an electricity production unit of more than 25 MW are still currently owned by historical operators, which prevents certain entrants from developing projects, notably of the "cogeneration" type; for this reason, the Federal Government decided (at the end of 2006) that unused sites intended for the production of electricity would be taxed or should be offered for sale to new operators coming into the electricity market, so that new production capacities could be established there;
3) currently, there is no real large-scale market for heat (steam, hot water) in Belgium (for example, large-scale urban heating) from industrial cogeneration. This opportunity is not yet a national habit, although it has been seen to be advantageous in other European countries.
4) the culture and decision-making processes of the major companies working intensively in energy are not currently ready for this type of investment (with a few exceptions);
5) there are a number of space constraints. The Belgian territory is particularly restricted. Furthermore, the gas and electricity transport networks are not by definition present everywhere, which limits both the opportunities for fuel supply and the reinjection of surplus electricity.
6) the liberalisation of the markets adds to the uncertainty, which reduces the time frame for decisions to be made. Every investment in production capacity therefore becomes more risky, which limits effective investments.

II. Obstacles at regional level

The Walloon Region

Technical obstacles

There are several kinds of technical obstacles:

- obstacles intrinsic to cogeneration: need for maintenance, in-depth study, etc.
- obstacles linked to the region: industrial fabric, natural gas network, etc.
- obstacles linked to the emergence of the market: competence and number of actors, etc.

<u>Sensitive technology</u>

A cogeneration system is, first and foremost, a much more sensitive installation than the boiler that it generally replaces. It consists of a motor or turbine with many moving parts which require regular and rigorous maintenance.

This should certainly be mentioned as one of the main obstacles, and it is inherent to cogeneration.

Cogeneration is never obligatory

A corollary to this obstacle is that cogeneration is never obligatory. One can always produce heat with a boiler and connect to the electricity network. Investing in a complex tool without being rigorously obliged to do so requires a strong will.

Actors on the market

The nature of the current cogeneration market is an obstacle. In fact, the market in its current form (expansion of quality cogeneration) is still in its early stages. We highlight below the 3 main weaknesses of the market in its current state.

- small number of separate actors
- variable competence of those actors
- no uniform approach to dimensioning

Number of actors

There are still only a few actors active in the Walloon Region in the different types of cogeneration according to size or fuel. For example, there is only one actor for micro-cogeneration based on rapeseed oil. It is therefore impossible to have any competition as this situation seems oligopolistic.

In the same way, industrialists who wish to install cogeneration often prefer to be associated with an existing producer of electricity. Here too the number of actors in place is to say the least limited, even if the trend is towards an increase.

Competence

The competence of certain consultancy firms is also important. Thus there are sometimes feasibility studies which are surprising, at the very least. Ignorance of the heat consumption profile, lack of knowledge of electrical constraints in the case of paralleling a transformer and other examples have been related to us during this study.

Dimensioning

A cogeneration system is a considerable investment. Therefore many applicants obtain their information from several consultancy firms. They thus frequently end up with estimates of power which are radically different (of the order of 150%).

However, the firm's competence is not necessarily in question. Technical choices such as the number of hours of operation can greatly influence the size of the cogeneration system to be installed. A smaller system will often be able to operate for longer than a larger installation. Other firms will favour a standard-size cogeneration system for reasons of maintenance.

This potential multiplicity of dimensioning occasionally discourages applicants for cogeneration and may thus constitute an obstacle.

Pre-feasibility study

A pre-feasibility study is the essential prerequisite for any measure with the aim of installing a cogeneration system. Before going any further, it must be established that a cogeneration system will be useful and profitable for that particular case.

This measure, which makes the decision-making process cumbersome, sometimes slows things down considerably, particularly in semi-public administrations and bodies. That is why the Region finances a cogeneration facilitator who carries out this type of study free of charge.

Reliability of installation

Natural gas network

Not all the sites which may potentially be suitable for cogeneration are automatically connected to the natural gas network at the moment. That is the case for industrial installations (particularly for part of the paper sector and agri-food industries which are often located far from major roads) but also for smaller cogeneration systems.

Walloon industrial fabric

The potential for developing very large cogeneration systems (greater than 20 MW) is limited by the nature of the Walloon industrial fabric. The industries likely to take on these installations are mainly in the heavy chemicals sector (cf. Solvay) and paper (cf. Burgo). Unlike Flanders, Wallonia does not have a large number of companies which are likely to take on large-capacity cogeneration systems.

Electricity network

The very nature of cogeneration requires its connection to the electricity network. It does not consist of a standby generator providing a minimum supply in the event of a power cut, but is more like a production unit operating over long periods.

Recent incidents in the European electricity network have thus shown a weakness in this type of installation (like other types of decentralised installations producing electricity, such as photovoltaic or wind farms). In the case of a black out, the cogeneration generators cannot switch on and off automatically. They can only be switched back on once the network has been re-established. This should therefore be taken into account particularly if the production of heat has to be provided continuously.

Maintenance

As we have already stated, a cogeneration system requires regular and qualified maintenance, which is therefore costly.

Heat consumption

Heat consumption is an obvious prerequisite for the construction of a cogeneration installation. This heat consumption is not always easily seen, however. The heat requirements of an industrial site, housing or even a hospital are different both by the very nature of the heat necessary (temperature, nature of coolant fluid, etc.) but also in the time profile of the consumption. However, cogeneration, whatever the technology used (motor or turbine, fossil or biomass) only lends itself to a limited number of start-up and shutdown cycles.

We give details below of the obstacles linked to heat consumption:

- Difficulties linked to transportation
- Failure to recognise the consumption profile

Transportation

Heat transportation is certainly a technology which is well controlled and operated by many companies in Belgium, but it is no less problematic.

A pipe transporting a coolant fluid (water, steam, etc.) is in fact a source of losses and is therefore harmful to the overall efficiency of the installation. Ideally, heat must be consumed as close as possible to its place of production. The internal constraints within the site often prevent this ideal situation and mean that transportation is necessary.

Modern techniques enable this disadvantage to be reduced greatly. However, apart from losses due to operation, heat transportation (in a single pipe or in a network) requires an initial investment and maintenance costs which are not inconsiderable.

Failure to recognise the consumption profile

Many applicants for the installation of a cogeneration system are not sufficiently aware of their heat consumption profile. This is the case more particularly in the tertiary and non-market sector where this production of energy is still often seen as inevitable.

Awareness

Finally, cogeneration is, as we have said, an emerging technology. Despite the considerable work done by the regional administration and the promotion companies, a considerable technical potential exists. Many companies, institutions, etc., still do not know that cogeneration would be an advantage for them or are not yet aware of it. The decision makers must be made aware of this opportunity even before verifying whether the technical potential is also an economic potential.

Financial obstacles

The technical obstacles that we have just mentioned are certainly important but they alone cannot explain the relative nervousness with which cogeneration is received. Even though the technical manager or the engineer in charge of a company or site is convinced, the financial manager still has to be persuaded.

Cogeneration must therefore be profitable. The mechanism of Green Certificates and aid from the public authorities

Price volatility

The volatility of energy prices to be taken into account (fuel and electricity) is certainly the principal disincentive when it comes to investment. Recent price trends certainly make any investment likely to reduce the energy bill interesting but they raise doubts about the long-term profitability (5 to 10 years) of the installation.

All those we interviewed during this study mentioned this lack of visibility as their most difficult problem. We shall therefore describe in detail the different price components to be taken into account.

Cogeneration burns a fuel to produce heat and electricity. We shall therefore begin by looking at the changes in the price of possible fuels and also the replaced fuels. A cogeneration system most frequently replaces a boiler using fuel oil, heavy fuel or natural gas.

We shall then look at the changes in the price of electricity which cogeneration produces. This electricity is most often consumed at source but must occasionally be sent on to the network at a pre-established price.

Fuel

In order to benefit from the aid mechanisms for the production of green electricity, cogeneration installations must show a real saving of CO2 compared with a referenc e installation. The consequence of this obligation is to eliminate the most polluting cogeneration systems in terms of CO2 emissions such as cogeneration using heavy fuel and for smaller facilities, using fuel oil.

Cogeneration systems can therefore be c lassified into two categories:

- fossil cogeneration systems, most frequently using natural gas. There is a cogeneration installation in the Walloon Region operating with fuel oil and benefiting from green certificates but this example is an isolated case. Fossil cogeneration consists of 19 installations recognised by CWaPE (5 pending) and represents 75% of the installed power.
- biomass cogeneration systems, further aided by the mechanism of green certificates. 16 installations are recognised by C WaPE (9 pending) and represent 25% of the installed power.

Gas

The price of natural gas has been under pressure during recent months. Historically linked to the price of oil products (although this correlation is contested particularly by the International Energy Agency (IEA), it has recently undergone substantial rises.

The installation of a natural gas cogeneration system therefore presumes risk management linked to changes in the price of gas. The most important consumers may compensate for a part of this risk by means of derived products but this remains inaccessible for most installations.

Biomass

Changes in the price of biomass are linked to several factors, particularly the price of fuel but also the meteorological change depending on the type of biomass u sed.

However, a distinction should be made between two types of biomass:

- Biomass produced voluntarily: pellets, palm oil, etc. which, like natural gas, require risk management linked to the price of fuel.
- Biomass as the co-product of an installation: saw dust, grease, etc. which comes from a production installation; in this case the risk is of course better controlled and price volatility is less of a burden on the installation’s budget.

Electricity

The repurchase price of electricity produced and discha rged on to the network is often a source of surprise for cogeneration applicants who think they can benefit from the same price they pay for their electricity.

Like all of the energy market, these prices are also subject to volatility and speculation.

Repurchase price

The repurchase price of electricity is not generally attractive. It is often more useful to be one's own consumer rather than aspiring to being in competition – difficult competition – with major power stations installed on the network.

Influence of the Day Ahead Market

The price of electricity has certainly changed depending on the different fuels but it is also subject to speculation.

The Belgian Day Ahead Market BELPEX is linked to the Dutch market (APX) and the French market (Powernext). These markets may experience considerable fluctuations. We can mention two examples:

- Peak at more than 1000 EUR/MWh for one hour due to several technical problems in the Electrabel power stations.
- Lower limit at 0 EUR/MWh, at the end of December 2007. Demand was certainly weaker but we can also mention the fact that, for meteorological reasons, there was surplus production of electricity by wind farms in Germany. Also the Dutch network is closely linked to the German market. Demand was clearly surplu s, prices fell.

These examples show that the price of electricity on the market can fluctuate considerably. Such variations can be a problem for the owner of a cogeneration system.

Initial investment

The initial investment for a cogeneration system re presents a considerable disincentive. This is all the more so as the possibilities for third -party investors are currently limited (cf. below) and above all the Walloon industrial decision makers are hesitating, even refusing, to resort to this type of financing.

The main investment items are

- consultancy costs
- costs linked to administrative obligations
- purchase of actual equipment
- purchase of possible filtering equipment

Consultancy

For relevance, the consultant's report is financed free of charge by t he Region through the facilitator. After that, although subsidised, the reports necessary for the dimensioning of the cogeneration system represent a considerable cost item. It should be noted that most of the main contractor applicants often ask for sev eral reports from different firms due to the size of the investment.

Other consultancy costs can also affect small cogeneration installations more particularly. These are orientation and detailed studies required by the GRD/DNO [gestionnaire de reseau du distribution = DNO – distribution network operators] for which the price is fixed. The fixed price is relatively low for a major project but it can become considerable for an installation of some tens of kW.

Administrative obligations

The costs linked to the administrative obligations relate mainly to preparing the necessary files to obtain green certificates. Other costs can also increase the total bill. We can mention by way of example the operating licences in the case of installation which burn was te.

Equipment

It goes without saying that the prices of the installation represent the most important item in the cogeneration project. We will not give further details on this item which depends enormously on the technology used. However, the initial investment is most often clearly greater than that of a conventional boiler. It is therefore a major investment which is rarely part of the core business of potential investors.

Filtering

The costs linked to the installation of filtering devices (partic ularly on some installations using biomass or including natural gas motors) should also be taken into account. These filters represent a major investment: they cost 100 000 EUR at the Aigremont cogeneration system (755 kW), for example.

Problems linked to the third-party investor

The third-party investor is a quite simple principle which has proved to be successful, particularly in the field of energy saving. A company, the third -party investor, pays for a new installation, renovation, etc., and is reimbu rsed on the savings achieved under the terms of a contract negotiated at the outset. At the end of the contract, the third -party investor hands over the ownership of the installation.

This principle cannot currently be applied easily to cogeneration. In fact, it presumes that electricity is produced. If the owner of the cogeneration system is not also the principal electricity consumer, he becomes de facto a producer of electricity and is thus subject, among other things, to the Green Certificate quota s ystem. This greatly discourages actors in the third -party investment market who might otherwise be interested and explains why the cogeneration systems invested in by third parties to the company or institution are invested in by electricity producers.

Several solutions are currently being studied or tested in order to reduce the impact of this obstacle. Part of the response was given by the Region. Since the decree of the Walloon Government of 13 July 2006 came into force, amending the decree of 21 Mar ch 2002 on the licence to supply electricity, the Government has allowed green electricity producers to supply clients through a limited licence. Two types of limited licence were introduced by the decree of 13 July:

- supply licence for limited power (10 MW max.);
- supply licence for particular clients (based on a list of a maximum of 10 named clients).

We should mention the limited production licence being tested currently by Renogen, allowing it to supply the companies in a zoning area with electricity.

Personnel linked to the installation

When a company or an institution plans to enter into a cogeneration project as autoproducer, that is, without the support of an electricity supplier, it must also ensure that it has the competent technical staff necessary to operate the system.
One or more qualified technicians will be required (depending on the size of the installation) supervised by an engineer.
Apart from their cost for the companies, these technical profiles are rare throughout the Walloon economy, and cogeneration is no exception.

Advantage for electricity producers

Electricity producers who agree to invest in a cogeneration project naturally do so if they see a financial advantage expressed particularly in terms of the time it takes to achieve a return on investment.

The liberalisation of the electricity market and the major consolidations observed on the European scene are pushing producers to review these minimum investment rates upwards. This means that several projects which would be economically and technologically viable will not be taken on by the producers.

Supplementary electricity tariff

When a cogeneration system is installed, it generally provides all or part of the basic consumption of electricity of the site where it is operated . The owner must, for the majority of the time, resort to an electricity supplier to meet peak demand.

The tariff to enable this peak demand to be paid for is, for obvious reasons of network balance, much higher than the MWh price proposed before the cogeneration was set up.

Therefore, the electricity savings are not always as high as expected and the risk of accidents frightens off decision makers when choosing whether or not to invest.

Investment outside core business

A particular disincentive to investment in a cogeneration installation, at least in the case of private companies, is that it is an investment outside the company's core business. A chemical, agri-food or other type of company, for example, will balk at investing in a device producing heat and electricity.

This obstacle, part financial and part psychological, is, however, put into perspective by some companies for which the energy bill represents a considerable share of the cost price. The industry-wide agreements signed between the Region and certain companies also require them to make this type of investment provided that they are profitable. Such an investment then well and truly helps towards making the core business profitable.

Administrative obstacles
The administrative obstacles are often mentioned as an impediment to the development of cogeneration. These are in particular lack of clarity of the legislation (due to the novelty of this field), retail sales taxation and, more generally, the role of the public authorities in general.

Role of the public authorities

Many of the parties involved have stated concerns as regards the role of the public authorities in general.

By "public authorities" we mean a definition in the broad sense, not restricted to services directly influencing cogeneration (such as energy policy, bodies in charge of the regulation of the market, etc.) but the public authorities as a whole.

We shall look at the role of the public authorities thus defined, as expected by the different parties involved, and also at more detailed aspects of the way in which specifications are drawn up for invitations to tender for cogeneration installations.

Role of precursor

As stated above (Technical Obstacles) the cogeneration market is not yet mature; too few actors, too few installations, etc.

Frequently in the past, the public authorities contributed to the financing of pilot installations or occasionally accommodated them where possible.

However, this type of installation is still quite rare in the Walloon Region. The public authorities are all the more able to help launch a technology as they are not subject to the same time constraints as a private company in terms of return on investment and benefit from substantial aid from the energy budget of the Walloon Region, as well as the green certificates for undertaking the investments.

Specifications

The legislation on public markets uses a strict and precise nomenclature defining classes of activities.

The very nature of cogeneration places it at the crossroads of thes e classes: it includes a part for combustion, a thermal part producing heat and a part for the production of electricity.

The use of the system of classes of activities is therefore tricky and presents problems: requiring an “electrical class” does not al low the skills necessary for cogeneration to be judged in advance in any way. Furthermore, most of the actors (including some with recognised expertise) do not have the classes of activities which are occasionally required.

We note that some awarding bodi es go beyond this system in order to be able to achieve a more extensive invitation to tender.

Green Certificates mechanism

Remark to be deleted: CWaPE MUST show itself to be vigilant and demanding and MUST ensure that the biomass is renewable, failing w hich the mechanism would be discredited by particular cases.

20 MW Barrier

Green Certificates are only granted for the first 20 MW produced by cogeneration. This barrier currently penalises two installations in the Walloon Region: Burgo Ardennes (29.8 MW) (to be checked as Burgo is a biomass COGEN!) and Solvay (94.4 MW). Given the nature of the Walloon industrial fabric (c.f. above), few installations of this size are likely to see the light of day but they represent a great deal in terms of power.

We should note that this obstacle is reinforced by the Elia tariff approved by the CREG *[Commission for Electricity and Gas Regulation]* in 2006.

Problem of electricity supply

As mentioned above, a considerable disincentive to the development of cogeneration is the status of electricity producer (and the obligations arising therefrom) given to the owner of a cogeneration system when it is not an autoproduction system.
To illustrate this obstacle, we give three examples:

- Housing properties under co -ownership
- The problem of the third -party investor (mentioned as a reminder, as already described above)
- Reduced supply licence

Co-ownership

In the case of a housing property under co -ownership, the problem of the electricity supply arises with the installation of a cogeneration system which would supply the inhabitants of the property with heat and electricity. It is therefore an administrative problem which makes the implementation of part of the technical potential of the cogeneration market difficult.

Third-party investor

Mentioned here as a reminder. As this administrative obstacle has important financial consequences, we have given more details above.

Operating licence

Biomass cogeneration has many advantages and the aid policy operated by the Walloon region makes it attractive.

However, for the agri-food industries in particular, the biomass available is occasionally considered to be waste in the legal sense of the term. Using it in a cogeneration system therefore means that the system is classified as an incinerator with the considerable administrative burdens involved. While this is fully justified in certain cases, in others the requirements are excessive. It depends on the nature of the biomass used.

Emission standards
Currently there are no legally fixed emission standards for the Walloon Region. Most of the requirements recommend compliance with the German TA Luft standards, which regulate the emissions of NOx in particular, and these are considerable for motors operating with natural gas.

The Flemish Region (thus following the Netherlands and Germany) has adopted the standards known as "demi TA-luft" which are in fact twice as stringent as the TA Luft standards. New standards have been announced for the Walloon Region but the current uncertainty on the choice of these standards does not create a good climate for some types of cogeneration.

Therefore cogeneration systems using natural gas would be greatly affected by the application of the "demi TA-luft" standards. For such technology (mainly useful for small units), using a particularly costly filtering system would be compulsory. The profitability of these installations would therefore be compromised. A similar situation is to be feared for certain types of biomass cogeneration.

The lack of a precise emission standard is therefore a considerable obstacle due to the climate of uncertainty it produces.

Protection required

To be completed after meeting the DNO

Heating network

Currently there is no legislation covering the operation of a heating network. This is no doubt due to the lack of major urban heating networks, unlike the situation in several neighbouring countries. Several projects are currently being studied but this legislative uncertainty does not encourage investment in a heating network other than inside the company which owns the cogeneration installation.

The Brussels-Capital Region

See Annex "RBC- Annexe 1 – Analyse obstacles à la cogénération 2007.doc" ["BCR – Annex 1 – Analysis of obstacles to cogeneration 2007"]

The Flemish Region

The obstacles encountered in the Flemish region are similar to those encountered in the two other regions of the country.

III. Regional features

The Walloon Region

Walloon industrial fabric

The potential for developing very large-scale cogeneration (more than 20 MW) is limited by the nature of the Walloon industrial fabric. The industries likely to use these installations are mainly in the heavy chemicals sector (cf. Solvay) and paper (cf. Burgo). Unlike Flanders, Wallonia does not have a large number of companies likely to take on high-power cogeneration systems.

Green Certificates mechanism

Remark to be deleted: CWaPE MUST show itself to be vigilant and demanding and MUST ensure that the biomass is renewable, failing which the mechanism would be discredited by particular cases.

20MW Barrier

Green Certificates are only granted for the first 20 MW produced by cogeneration. This barrier currently penalises two installations in the Walloon Region: Burgo Ardennes (29.8 MW) (to be checked as Burgo is a biomass COGEN!) and Solvay (94.4 MW). Given the nature of the Walloon industrial fabric (cf. above) few installations of this size are likely to see the light of day but they represent a great deal in terms of power.

We should note that this obstacle is reinforced by the Elia tariff approved by the CREG in 2006.

Operating licence

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However, for the agri-food industries in particular, the biomass available is occasionally considered to be waste in the legal sense of the term. Using it in a cogeneration system therefore means that the system is classified as an incinerator with the considerable administrative burdens involved. While this is fully justified in certain cases, in others the requirements are excessive. It depends on the nature of the biomass used.

It is therefore a considerable obstacle for a particular category of cogeneration.
(Note to be deleted: COBELPA and FEBELBOIS and others would cry out if they read that!).

Emission standards
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The lack of a precise emission standard is therefore a considerable obstacle due to the climate of uncertainty it produces.

Formulation of strategies for cogeneration

I. The Federal Authority

Because the Federal State is not competent in these matters, there is no federal strategy on cogeneration in the strict sense. However, there are global strategies in which cogeneration can be included favourably:

In 2005, the CREG drew up an indicative programme for electricity generation for 2005 -2014 which was approved by the Minister for ENERGY. This indicative programme recommends a policy of investment in centralised production units by 2014, taking into consideration the future availability of decentralised production (1729 MW of renewable and 1749 MW quality cogeneration) and imports intended to cover demand: 8 units with a combined gas -steam cycle (gas turbine power plant) of 400 MW and 4 open -cycle gas turbines of 80 MW.

The royal decree of 11 October 2000 relating to the granting of individual authorisations covering the establishment of electricity generation plants provides that prior individual authorisation is necessary for any new plant with a net available capacity of more than 25 MW or for an increase of more than 25 MW or 10% of the net available capacity of an existing plant not yet covered by an authorisation. The criteria for granting the authorisation allow the CREG and SPF Economie to make a statement on the general appropriateness of the project, taking into account the guidelines defined in the feasibility study, in particular on the real need encountered, its inclusion in the electrical network, the use or not of the best technology available in terms of energy yield and atmospheric emissions and finally the nature and origin of the fuels selected. It is therefore a considerable power of discretion and direction.

Furthermore, article 5 of the law of 29 April 1999 supplements the authorisation mechanism with the possibility of resorting to a public European invitation to tender in the event of a lack of private investment shown by the feasibility study. Paragraph 5 of this article provides that the minister applies the same selection criteria as for the authorisation procedure referred to in article 4, in particular the use of the best technology available, which also gives it considerable power of discretion and direction, particularly for the promotion of cogeneration.

II. The Flemish Region

The Flemish Government Agreement postulates that by 2010 25% of the electricity supplied will be environmentally friendly, generated from renewable energy sources (6%) or cogeneration (19%).

CHP certificates are the most important instrument in achieving this target: electricity suppliers have to submit CHP certificates every year for a specified percentage of their supplies. This percentage will increase to 5.23% of their supplies in 2012. CHP certificates are awarded for primary energy savings achieved as the result of cogeneration. Any electricity suppliers submitting insufficient CHP certificates will have to pay a pecuniary penalty. In this way demand will be created for CHP certificates and cogeneration operators can sell the certificates, which they themselves are given free of charge, on the certificate market. The target fixed via the number of certificates by 2012 corresponds with the estimated primary energy savings realised by approximately 2200 MW of electricity of high -efficiency cogeneration. This also corresponds with the economic potential of high -efficiency cogeneration by 2012.

The market value of CHP certificates is currently approximately 40 euro per certificate (= per MWh primary energy savings). The maximum value is equal to the pen alty for each missing cogeneration certificate, amounting to 45 euro per certificate. The statutory guaranteed minimum value per certificate is 27 euro.

The certificate system has been in operation since 1 January 2005 and was set out in the Flemish Government Decree of 7 July 2007 to promote electricity generation from qualitative cogeneration.

This decree also regulates the granting of guarantees of origin in compliance with Directive 2004/8/EC. Here the definition of high -efficiency cogeneration is a dopted from the directive, the Flemish Region having opted for the application of Art. 12 (2). In a ministerial decree in fulfilment of the abovementioned decree, the reference efficiency values are also set out as defined pursuant to Directive 2004/8/EC b y the Commission Decision of 21.12.2006.
The decision by the Flemish Government and the ministerial decision which regulate implementation of Directive 2004/8/EC are published in the Belgian Official Gazette on 1 December 2007. The legal basis for impleme ntation of the Directive (introduction of guarantees of origin for electricity from cogeneration) is included in Article 23 II of the Electricity Decree of 17 July 2000. In practice, guarantees of origin are already currently being issued pursuant to Directive 2004/8/EC and the Commission Decision of 21.12.2006 by the Vlaamse Reguleringsinstantie voor de Elektriciteits - en Gasmarkt (VREG: Flemish Electricity and Gas Regulatory Body). VREG is also a member of the European Association of Issuing Bodies.

Ecology investment support is also applicable to cogeneration plants installed by companies.

Both the regulation of certificates and ecology investment support have been announced by the Commission and approved in accordance with the European regulations on matters of government assistance.

In addition to the certificate system, ecology investment support and the introduction of guarantees of origin, other measures have been taken to remove the thresholds for cogeneration projects, the most important being:
- Realistic emission standards for gas engines, biogas engines and engines running on vegetable oils;
- Cheaper standard rates for connecting up CHP installations to the natural gas and electricity grid, where the grid operator bears the cost of the firs t 1000m of these grids on public land (on 26 January 2007 the Flemish Government approved a draft bill containing various provisions as regards the environment, energy, and public works).
- Clear rules for setting up fermentation plants (and the associat ed cogeneration projects) in rural areas (on 19 May 2006 the Flemish Government amended the Circular concerning the setting up of manure-processing and other fermentation plants in rural areas).

III. The Walloon Region

Reminder of the **"Sustainable Energy Control Plan – by 2010 in Wallonia".**

The aim of this plan is to meet the challenges of the future by allowing Wallonia to face up to its responsibilities in terms of controlling its energy needs, its impacts on the environment and in particular with regard to the greenhouse effect and the necessary economic and social dimension of the energy question in Wallonia.

> The objective as regards cogeneration is, from fossil fuels, to produce **15% of the consumption of electricity in 2010** from cogeneration (3.4% in 2000; 7.2% in 2005). The envisaged change in the production of electricity from cogeneration is shown in figure 38 (extract from the Sustainable Energy Control Plan).

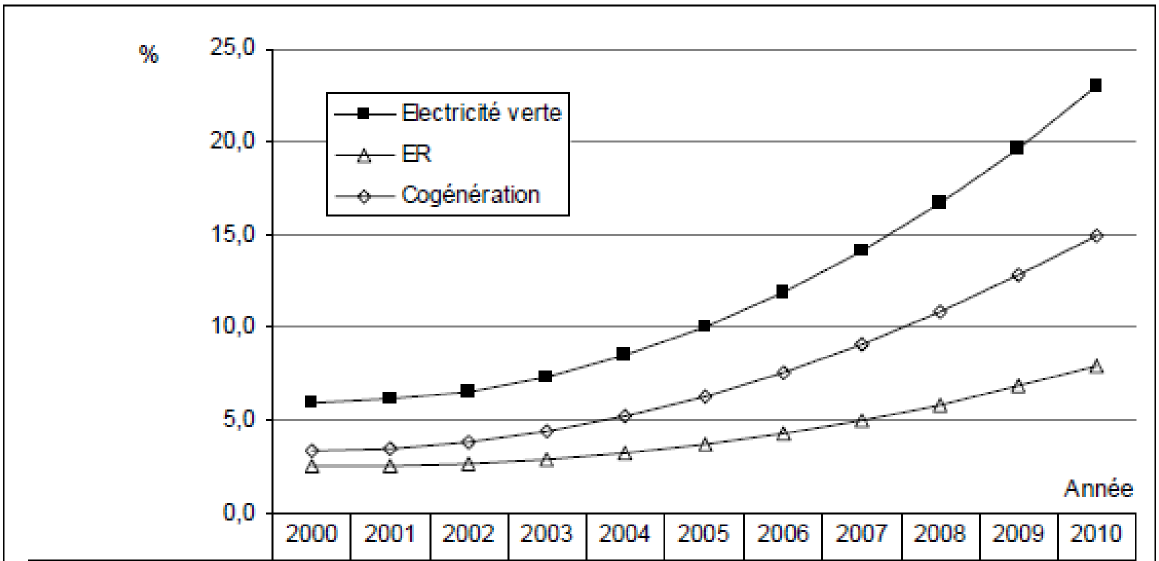
By way of indication, this objective corresponded in 2003 to

- about 170 additional units in the industrial sector and
- 1200 units in the tertiary sector.

> For the industrial and tertiary sectors, this objective is based on studies evaluating the potential still in existence in Wallonia, on a company-by-company basis.[15]
>
> Today, we have 44 sites for 479 Mwe.
>
> For the residential sector, the objective relies particularly on the development of micro-cogeneration and fuel cells after 2005 (table 12).

From renewable energy sources, the objective is to achieve electricity production * of **8% by 2010,** starting from 2.6% in 2000 (4% in 2005) and increasing this proportion gradually (figure 38). This objective was fixed on the basis of a study estimating the potential of electricity from renewable sources in Wallonia[16] and is shown in detail in table 12.

[15] Demand for heat which can technically be cogenerated for the Walloon Region and the Brussels-Capital Region, study carried out by the Walloon Institute for Electrabel, December 1996.
[16] Organisation of the renewable electricity market in Wallonia; summary report APERe, GEB *[Groupe Energie Biomasse]*, April 2000.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Electricité verte	6,0	6,2	6,5	7,3	8,5	10,0	11,9	14,1	16,7	19,7	23,0
ER	2,6	2,6	2,7	2,9	3,2	3,7	4,3	5,0	5,9	6,9	8,0
Cogénération	3,4	3,5	3,9	4,4	5,3	6,3	7,6	9,1	10,8	12,8	15,0

Key:

Electricité verte	Green electricity
ER	Renewable energy
Cogénération	Cogeneration
Année	Year

Figure 9: Envisaged change in the proportion of green electricity in the consumption of electricity in Wallonia

Table 5: Green electricity by 2010 in the Walloon Region (table updated in line with new data available)

In order to maintain the momentum and stimulate the target market, the Walloon Region must continue to inform, raise awareness and assist those involved in controlling their en ergy consumption, all the more so as the regulatory context is changing considerably, particularly due to the liberalisation of the gas and electricity markets.

IV. The Brussels-Capital Region

Since 2001, suppliers have known their obligations as regards green electricity in the Brussels-Capital Region. In 2006, green electricity generation in the Brussels Region enabled 15,000 green certificates to be produced per year, or the equivalent of 17% of the quota the Region had set for itself. This quota was 2.5% of the final consumption of electricity.

From 2001 to 2006, green electricity generation increased by 11 MW, essentially due to cogeneration using natural gas. This increase in production facilities is not sufficient to meet the Brussels quota. However, we know that the potential for cogeneration in Brussels is substantial and that the economic profitability of these projects is ensured in real terms by the green certificates mechanism. Other technologies, particularly those operating with biomass, also have favourable conditions for developing in Brussels. Although green electricity generation in Brussels does not allow the Region's quota to be met at present, it is probably only a question of time, and of starting up new projects.

Annexes

Walloon Region

- WALLOON ENERGY AUDIT 2005 RENEWABLE ENERGY 2005
- 2005 Annual Report on green certificates

Flemish Region

- CHP inventory 2005 pursuant to EU directive
- 061222 BAU+ annex 4

Brussels-Capital Region

- BCR – Annex 1 – Analysis of obstacles to cogeneration 2007
- BCR – Annex 2 – Cogeneration Potential 2005
- BCR – Annex 3 – Cyclical barometer 2006
- BCR – Annex 4 – Allocation Plan 2008 – 2012
- BCR – Annex 5 – Energy audit 2004
- BCR – Annex 6 – Energy audit 2005
- BCR – Annex 7 – Autoproduction 2005
- BCR – Annex 8 – 2005 Annual report on the recognition of Walloon green certificates
- BCR – Annex 9 – Notice SR-20061122-50 relating to the Quota of green certificates for 2007 and the following years to promote green electricity and quality cogeneration in the Brussels - Capital Region, 22 November 2006.