INTERNATIONAL ENERGY AGENCY

Energy Policies of IEA Countries

BELGIUM

2005 Review

OECD

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The International Energy Agency (IEA) is an autonomous body which was established in November 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an international energy programme.

It carries out a comprehensive programme of energy co-operation among twenty-six of the OECD's thirty member countries. The basic aims of the IEA are:

- to maintain and improve systems for coping with oil supply disruptions;
- to promote rational energy policies in a global context through co-operative relations with non-member countries, industry and international organisations;
- to operate a permanent information system on the international oil market;
- to improve the world's energy supply and demand structure by developing alternative energy sources and increasing the efficiency of energy use;
- to assist in the integration of environmental and energy policies.

The IEA member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, the Republic of Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States. The European Commission takes part in the work of the IEA.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of thirty democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission takes part in the work of the OECD.

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REVIEW TEAM

The IEA 2005 in-depth review of the energy policies in Belgium was undertaken by a team of energy policy specialists drawn from IEA member countries. The IEA review team visited Belgium from 11 to 15 April 2005 for discussions with federal and regional energy administration officials, energy industry groups and non-governmental organisations. The team greatly appreciates the candour and co-operation shown by everyone it met.

The members of the team were:

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Jolanka Fisher managed the review and drafted the report, with the exception of the chapter on natural gas, which was written by Daniel Simmons from the IEA's Energy Diversification Division, and the chapter on nuclear power, which was written by Robert Rush Price of the Nuclear Energy Agency. Monica Petit prepared the figures and Bertrand Sadin prepared the maps. Marilyn Ferris and Viviane Consoli provided editorial assistance.

ORGANISATIONS VISITED

The team held discussions with the following groups:

- Agoria, an organisation representing industrial customers
- BBL, an organisation representing Flemish environmental groups
- BFE, a retail electricity supplier
- BFP, the federal planning bureau
- BRAFCO, an organisation representing independent oil retailers
- CREG, the federal regulator for natural gas and electricity
- CWaPE, the Walloon energy regulatory commission
- Distrigas, a natural gas retail supplier
- Electrabel, a generator and retail electricity supplier
- Elia, the transmission system operator
- Essent, a retail electricity supplier
- Figaz, a natural gas industry association
- Fluxys, the natural gas pipeline network operator
- Luminus, a retail electricity supplier
- IBGE/BIM, the Brussels-Capital government administration for energy and the environment, which is also the regulator for natural gas and electricity
- Inter-Environnement, an organisation representing Walloon environmental groups
- Inter-régies, an organisation of public companies in the energy sector
- Federal Ministry of Public Health and the Environment
- Federal Public Service (Ministry) for Economy, SMEs, Self-employed and Energy
- Fédération Pétrolière Belge, an organisation representing major oil companies
- Ministry of the Flemish Community, Division of Natural Resources and Energy

- Ministry of the Walloon Region
- Nuon, a retail electricity supplier
- SPE, a generator and retail electricity supplier
- Union Pétrolière Belge, an organisation representing independent oil companies
- VREG, the Flemish regulator for natural gas and electricity
- Wattplus, a retail electricity supplier

REVIEW CRITERIA

The IEA *Shared Goals*, which were adopted by the IEA ministers at their 4 June 1993 meeting in Paris, provide the evaluation criteria for the in-depth reviews conducted by the IEA. The *Shared Goals* are set out in Annex B.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Since the last in-depth review in 2001, there have been a number of positive developments in Belgium's energy policy. Electricity and natural gas market reforms have further progressed in such areas as independent functioning of the electricity transmission system operator, allocation of cross-border electricity transmission capacity at the northern border using market-based mechanisms, the entry of new market players and the development of an electricity exchange, Belpex. Belgium is also working with its neighbours France and the Netherlands to further integrate their electricity markets and improve and increase cross-border exchange of electricity capacity. The regions and the federal level are taking measures to tackle climate change and achieve their part of the Kyoto commitment through such measures as rigorous building performance measures and green certificate trading schemes. A notable recent positive development is the decision to create a centralised oil stockholding agency. Despite this progress, Belgium still faces many challenges.

Under a complex division of responsibilities between the federal and regional governments, it is challenging to achieve national energy policy goals. This can reduce the efficiency and the effectiveness of the energy systems of Belgium as a whole. Furthermore, better integration between the regions of Belgium will facilitate integration with its neighbouring countries and with the larger European market. Belgium should continue to harmonise its regional energy markets' rules and regulations – a process that does not require all regions to adopt the same energy policies and goals – while it also works to integrate a cohesive Belgium with its neighbouring countries and Europe.

In 2003, Belgium passed legislation requiring the phase-out of nuclear power between 2015 and 2025. Nuclear energy currently supplies about 55% of the country's electricity generation. This huge supply gap will need to be covered by a combination of energy savings, electricity imports or additional electricity generating capacity. The effects of this phase-out will vary considerably depending on how nuclear power is replaced and how much energy is saved through energy efficiency gains. Various scenarios and their implications on energy mix, natural gas and electricity imports and carbon dioxide (CO_2) emissions suggest that the nuclear phase-out will increase CO_2 emissions substantially in 2030. Others, when assuming that nuclear power is replaced with efficient, environment-friendly technologies and that Belgium's substantial energy efficiency potential is realised, show that it is possible for Belgium to meet its long-term electricity demand without

increasing CO_2 emissions. Given the various scenarios, the federal government should conduct more comprehensive long-term studies on the effects of the phase-out of nuclear power and the available options to replace nuclear on energy security, environmental protection and economic growth. Such studies should be made public.

A law recently passed transfers some powers of the federal regulator to the federal government. The government should ensure that this movement does not weaken the power and effectiveness of the regulator. In moving towards competitive markets, stability and regulatory certainty are essential to remove market barriers and increase market efficiency.

The existence of the federal regulator and the regional regulators derives from the federal structure. However, the federal structure does not necessarily preclude the possibility of having more co-ordinated and national regulation, as in the case of Australia, which has created a new single national regulator replacing numerous regional regulators. The federal and regional governments should review the current multi-layer and multi-regulator structure. At the very least, the co-ordination and co-operation among the regulators should be further strengthened to avoid segmentation of the market and complex regulatory procedures.

Belgium has had a vertically integrated monopoly energy supplier of gas and electricity, which has since been legally unbundled. However, there is still cross-ownership and the supply companies, Distrigas and Electrabel, which both have Suez as their controlling shareholder, still have a dominant share of the Belgian gas and electricity markets. This structure could prevent the development of a well-functioning Belgian energy market. Appropriate measures should be taken to reduce the dominance of these incumbents. Furthermore, sufficient resources to prevent anti-competitive behaviour and intervene, when necessary, should be given to relevant regulators and authorities.

Belgium's 2003 greenhouse gas (GHG) emissions slightly exceed 1990 emissions, meaning that it has to reduce its total emissions by 8.4% from 2003 levels to meet its Kyoto commitment. By purchasing a portion of its reductions on the international market, Belgium must in fact reduce its emissions by around 7% below 2003 levels, and possibly less if the regions also purchase some emissions on the international market. Regardless of the exact amount of international purchases, it will still be a very challenging mission to meet. Not only does Belgium's emissions path since 1990 show that it is currently not on target to meet its Kyoto commitment, but modelling results also show that energy-related CO_2 emissions will surpass 1990 emissions by 8.3% in 2012 under one scenario. Nevertheless, studies suggest that Belgium can meet its Kyoto target, but this will necessitate significant actions to dramatically improve energy efficiency and fully implement the

European Union Emissions Trading Scheme (EU-ETS). The nuclear phase-out beginning in 2015 will make it more difficult to achieve further CO_2 emissions reductions beyond the first Kyoto commitment period. In developing its National Climate Change Plan, careful calculations of emissions reduction potentials and of the costs of policies and measures are essential to ensure cost-effectiveness and sustainability of climate change mitigation efforts.

Belgium has the opportunity for substantial energy efficiency improvements. However, it is clear that this would require a significant strengthening in the implementation of policies and measures to improve energy efficiency. Critical to this effort is improved monitoring of the results and cost-effectiveness of various policies and measures. All of the regions and the federal government are targeting energy savings in buildings. Much of this new legislation is being developed within the framework of the EU Directive on the Energy Performance of Buildings. Given the importance of the residential sector in Belgium's energy consumption, standards on the energy performance of buildings should be stringent enough to improve the sector's efficiency and bring it in line with EU standards. It is just as critical that the standards are effectively implemented. It is positive to see that emphasis will be placed on monitoring and enforcement.

Belgium's green and combined heat and power (CHP) certificate schemes, which promote renewable and CHP electricity development, can be improved in order to maximise their efficiency and benefits. For example, currently, most certificates issued in different regions cannot be traded between regions except between Wallonia and Brussels-Capital. In general, the lack of transferability of certificates harms the overall effectiveness of the programmes and prevents the development of more efficient renewable and CHP energy installations. To increase the efficiency of the schemes, and lower the overall costs, all regions and the federal government should strengthen existing efforts to ensure that all certificates are transferable. Models for this process are Sweden and Norway, which are discussing an integrated green certificate trading scheme. In addition, what installations are eligible for the certificates and the method of their calculation need to be harmonised. In designing the certificate system, minimum and differentiated certificate prices should be used with caution. While minimum prices provide certainty to potential investors, they could reduce the cost-effectiveness of green certificate schemes, and make them function like feed-in tariff schemes. In addition, differentiated minimum prices could hinder competition among various technologies and lead to inefficient and more costly renewable energy. Furthermore, minimum price levels could block reductions in certificate prices, increasing the costs of the certificate scheme.

Belgium has unique petroleum price caps in order to protect customers in the event of short-term price spikes. While oil prices in Belgium are well below the maximum ceiling, the price ceiling could reduce demand response to a price

spike and exacerbate any spot shortages of fuel due to rapid buying. The existence of price caps could also easily lead to political pressures for market intervention during price spikes. Belgium should consider removing these caps.

Belgium's recent legislation creating a centralised oil stockholding agency is a very positive development. The country should monitor the progress of the establishment of the agency to ensure as soon as possible long-term compliance with Belgium's IEA stockholding obligation.

Belgium's domestic gas demand is expected to rise by 2.9% annually over the next 10 years. A key issue is that all entry points to the country are contractually congested – the Suez Group continues to control nearly all entry capacity to the country on long-term contracts. Storage capacity is allocated each year according to priority rights that favour the Suez Group. All transit capacity that provides access to the hub in Zeebrugge is controlled by Suez under existing long-term contracts. In addition, the company has ownership interests in Fluxys (the transportation system operator), a majority of the distribution system operators, the services company and the Belgian electronic customer database. This concentration makes it difficult for other players to have access to the market and gives Suez the ability to leverage its market power.

To make greater progress towards a competitive energy market within Belgium, the energy market structure should be modified so that asset owners are given incentives to offer effective third-party access (TPA). This means that the interests of the inter-municipal distribution companies and the supply companies should be de-coupled through effective unbundling, Fluxys should be completely independent of gas suppliers and consumers, a secondary capacity market should be implemented and regulators should be given more power to enforce compliance within the market. If legal separation does not provide effective competition, then stronger measures – including ownership unbundling – should be considered. For a competitive market to develop, regulators must monitor the market and ensure that no conflicts of interest are allowed to remain between suppliers and other actors, including municipalities, either through ownership interests, preferred customer status or shared assets. The regulator should be free to collect information on these interests without having to justify why it is required so that proper investigations into market practices can be undertaken.

Belgium's gas consumption growth and its role as a pivotal European natural gas transit country places strategic importance on the degree of available border capacity linking Belgium to its neighbours, as well as maintaining and improving the quality of the gas network within the country. Currently, there is a lack of competition in the supply market, owing in large part to the lack of transportation capacity access. Belgium should consider ways to enhance security of supply by facilitating investment in and access to new border capacity via the use of transparent market-based mechanisms.

The cost of balancing services is a concern in Belgium, where balancing penalties are amongst the highest in the EU. It is the responsibility of the network users to balance their gas flows. However, imbalances are unavoidable, particularly for smaller suppliers without a significant portfolio, since volumes are determined the day before delivery, and consumption can deviate from expectations. Making more gas available to third parties and, as a result, increasing volumes on the traded market is essential to increasing the liquidity at the Zeebrugge hub, which would generate gas pricing that reflects fundamentals within Belgium. Liquidity would also be increased by providing more information to market players, and by collapsing the four regional gas markets (three high-calorie balancing zones and one low-calorie zone) into one high-calorie gas balancing zone that includes the Zeebrugge hub trading point and one low-calorie zone. The government should also consider providing TPA to blending facilities, which would allow competing high-calorie gas suppliers to service low-calorie gas consumers to enhance competition.

The elimination of the distinction between transit of international gas and transport of national gas would be beneficial for better integration with other European networks.

Belgium has made significant changes to its electricity market. At present, more than 90% of consumption is supplied through a liberalised retail market. The transmission grid is now managed by Elia, providing transparent and non-discriminatory access to the grid. These efforts have resulted in significant entry of new suppliers to the retail market. Despite these efforts, Belgium needs to continue to develop a competitive electricity market. In order to achieve a more comprehensive and integrated market, the regional and federal governments and regulators should open electricity markets in all regions without unnecessary delays. In addition, the regional and federal authorities should work together to ensure that market rules and regulations are harmonised, given the relatively small size of the Belgian market and even smaller size of the regional markets. In particular, differences in green and CHP markets, differences in public service obligation requirements and the need to obtain different supplier licenses in different regions create higher business costs for market participants.

Despite Belgium's progress towards opening its electricity market, the market power of the incumbent hampers true competition, discourages new entry and prevents the market penetration of other competitors. Furthermore, owing to nuclear facilities that have been largely depreciated, new entrants may find it more difficult to compete on price with the dominant incumbent. The government uses virtual power plant (VPP) auctions to reduce Electrabel's market share. VPP auctions should be conducted in an open, transparent and fair manner. If these efforts do not effectively reduce the incumbent's market dominance, stronger unbundling should be considered. In addition, despite legal unbundling of electricity distribution, Electrabel still manages some

operations and customer databases, which makes it difficult for retail suppliers to obtain customer data from the distribution network operators. Unbundling customer databases from Electrabel control should be completed as soon as possible.

Integration of Belgium's electricity market with the markets of other countries can diminish the market power of dominant players by enlarging the effective size of the market. An essential step is co-operation with neighbouring countries. Elia, the transmission system operator, has planned grid investments that would increase the present cross-border capacity. This is a positive development and should be accelerated. It is equally critical that the Belgium regulator and Elia continue to work closely with the transmission system operators of neighbouring countries to co-ordinate market operations. In this context, it is promising that in July 2005 the regulators of Belgium, France and the Netherlands issued a joint consultation document to facilitate regional market integration between the wholesale electricity markets of the three countries.

The appointment of Elia as the transmission system operator has greatly improved non-discriminatory access to the grid. In addition, cross-border transmission along the northern border with the Netherlands is allocated using market-based mechanisms. However, interconnection capacity along the southern border with France is allocated according to historical priority lists and is not market-based. This allocation method is counter to the market-based approach Belgium committed itself to through the EU directive, and hampers new actors from entering the Belgiam electricity market, delaying development of an integrated regional European electricity market. The joint consultation document and plans to introduce market-based mechanisms for transmission capacity allocation at its southern border are commendable developments. Elia should continue efforts to evolve towards more market-based and cost-reflective balancing mechanisms. New legislation introducing multi-year methodology on approving transmission and distribution tariffs should be promptly implemented.

Belgium's 2003 energy R&D budget has increased significantly since 1999. This is a commendable development. At the regional level, growing emphasis on energy efficiency and, to a lesser extent, on renewable R&D, well reflects the priorities of regional energy policies. Belgium's collaboration with the private sector and universities, as well as its participation in ten IEA cross-country implementing agreements will help maximise the benefits of its energy R&D budget. It is important that Belgium further develop methods to review energy R&D policies and spending, to ensure that they are in line with overall energy policies, and that projects are cost-effective. Evaluating the performance of ongoing and completed programmes can result in more efficient use of limited financial resources. While federal and regional governments seem to be conducting some evaluation, they are encouraged to share their experience and expertise for *ex ante* and *ex post* evaluation.

Despite the decision to phase out nuclear, it is sensible to sustain nuclear-related R&D with a view to ensuring reliable and safe operation of, and expertise on, nuclear power and waste disposal through sufficient funding and staffing of SCK•CEN, the country's nuclear research centre.

RECOMMENDATIONS

The government of Belgium should:

General energy policy

- *Strengthen the collaborative process of the federal and regional governments – through CONCERE/ENOVER and any other forums – paying close attention to reducing any disjoints between energy policies that would significantly reduce efficiency.*
- *Harmonise energy policies and measures both between federal and regional levels and across regional levels.*
- *Deepen collaboration with neighbouring countries in order to increase the effectiveness of energy policy. This includes continuing the efforts to create a real single energy market with neighbouring countries, and eventually an integrated European market.*
- *Continue to develop scenarios as an evolving reference for considering the combined impacts of all federal and regional policies and measures.*
- *Conduct long-term quantitative studies assessing the effects of the phase-out of nuclear power and the available options to replace nuclear on energy security, environmental protection, energy prices and economic growth, and make the results publicly available and understood.*
- *Ensure that the gas and electricity grids are able to adapt to long-term changes in the generation and fuel mix.*
- *Streamline the process of planning, siting and building energy infrastructure.*
- *Take measures to reduce the dominance of the incumbent actor in the gas and electricity markets to improve competition.*
- *Give relevant regulators and authorities the necessary means to prevent anti-competitive behaviour and intervene when necessary.*
- *Review the need for four independent regulators in the electricity and gas sectors. If multiple regulators are needed, further strengthen co-ordination among them.*

- *Ensure that the transfer of responsibilities from the independent regulator to the federal government does not diminish the regulator's effectiveness.*
- *Phase out energy subsidies to consumers, including the provision of "free" electricity and other subsidies or rebates that shield consumers from accurate price signals, and instead use social policy instruments to provide economic subsidies.*

Energy and the environment

- *Give priority to the development and implementation of a National Climate Plan, which includes the calculation of emissions reduction potentials and cost-effectiveness of all policies and measures.*
- *Strive to harmonise, where possible, the policies and measures at federal and regional levels with a view to maximising their effects at national level.*
- *Ensure effective implementation and monitoring of policies and measures not covered by the EU-ETS.*
- *Ensure a balanced and cost-effective approach between developing domestic policies and measures apart from the emissions trading scheme, the government purchase of emission allowances on the international market and the allocation of emission allowances in the EU-ETS in order to meet the Kyoto target.*
- *Clarify how changes to Belgium's energy supply and demand profile due to the phase-out of nuclear power beginning in 2015 will affect CO_2 emissions, paying particular attention to how realising Belgium's significant energy efficiency potential may reduce these emissions.*

Energy efficiency

- *Continue to work to implement energy efficiency policies and measures, including those outlined in the Fraunhofer study.*
- *Strengthen monitoring of sectoral energy efficiency improvements.*
- *Ensure that standards on the energy performance of buildings are not only sufficiently stringent but also effectively implemented and enforced.*
- *Evaluate the effectiveness of the two different measures on the rational-use-of-energy public service obligations in Wallonia and Flanders and harmonise them before full energy market opening.*
- *Monitor and evaluate the cost-effectiveness of all energy efficiency measures, including voluntary agreements with industrial companies, and ensure that*

these findings are used as criteria when selecting policies and measures in the future.

- *Ensure that voluntary agreements with industry provide incentives for companies operating at energy efficiency rates that are both below and above world-class levels, as the policies intend.*
- *Ensure that CHP certificates are tradable in all regions.*
- *Further co-ordinate transport efficiency efforts across regions and the federal government.*
- *Remove fiscal policies that provide incentives for companies to purchase inefficient cars.*
- *Take necessary steps to improve private-sector investment in energy efficiency (e.g. through third-party financing by banks) by making these investments fiscally attractive.*

Renewable energy

- *Further strengthen the efforts to harmonise the federal and regional quota systems on green certificates with a goal of establishing a national green certificate market.*
- *Ensure that the differentiated minimum certificate prices do not reduce the cost-effectiveness of the certificate system.*
- *Ensure compliance of the quota obligation is not undermined by fines that are too low.*
- *Evaluate whether various support schemes can be more streamlined to maximise their cost-effectiveness.*
- *Consider the costs and benefits of promoting technologies not necessarily suited for the climate conditions in Belgium, such as solar photovoltaics.*
- *Create a comprehensive strategy and develop policies and measures – including fiscal incentives – to increase the use of biofuels in transportation.*

Oil

- *Consider removing the oil price ceiling and any other oil price regulations that may inhibit demand response to oil price spikes.*
- *Put the fund for the clean-up of soil polluted by heating oil storage tanks into operation as quickly as possible.*

Natural gas

- *Decrease as much as possible the existing structural barriers to entry to encourage new actors to enter the gas market, by promoting effective TPA to the gas network.*
- *Introduce mechanisms to reduce market concentration by, among other things, ensuring that Fluxys is completely separated from any upstream or downstream operator.*
- *Give relevant regulators and authorities the necessary means to prevent anti-competitive behaviour and intervene when necessary.*
- *Ensure stable regulations, including regulated tariffs, for transport operation and development.*
- *Consider ways to enhance security of supply by increasing market-based access to planned and existing capacity in order to encourage competition.*
- *Consider measures to decrease the strain on the domestic gas transportation system by supporting an actively traded market, through increasing volumes of domestic gas traded at the Zeebrugge hub.*
- *Eliminate the technical distinction between gas "transit" and "transportation" so that other participants can gain access to Belgium's considerable transit capacity. Belgium will thereby maintain its position as an attractive transit country.*
- *Monitor the ongoing integration of the transit system with the domestic supply system.*

Electricity

- *Harmonise regulations and obligations for retail suppliers in different regions.*
- *Continue to work with the neighbouring countries of France and the Netherlands to increase interconnection capacity and better integrate all electricity markets, with the goal of creating a more integrated European electricity market.*
- *Decrease the existing structural barriers to entry to encourage new actors to enter the electricity market.*
- *Monitor the liquidity and functioning of the forthcoming Belgian electricity exchange, Belpex, and ensure that any preconditions for a common market with neighbouring countries are met.*
- *Replace the current first-come first-served allocation of interconnection capacity with market-based mechanisms at the southern border.*

- *Ensure that mechanisms to reduce market concentration, such as VPP auctions, are regulated and conducted in a transparent and fair manner, and open to all interested parties. If VPP auctions continue to be used, consider modifying them so that their outcomes are consistent with an efficient, competitive market.*

- *Ensure multi-year and stable regulations, including regulated tariffs, for network operation and development.*

- *Ensure effective unbundling in distribution – including information technology systems – and that distribution network operators remain completely neutral toward all market participants.*

Nuclear power

- *Make preparations to preserve the ability to operate nuclear power plants after 2015 in the event of a* force majeure*, consistent with the law on the nuclear phase-out.*

- *Continue the education and other measures that ensure the availability of qualified personnel to staff the nuclear sector – including decommissioning and nuclear waste management activities – and relevant regulatory bodies.*

Technology, research and development

- *Enhance* ex ante *and* ex post *cost-benefit analysis of R&D activities.*

- *Enhance regional non-nuclear public-private partnership in energy R&D programmes.*

- *Enhance information exchange, co-operation, and co-ordination among regional governments in the areas of common interests, such as energy efficiency and renewables-related R&D.*

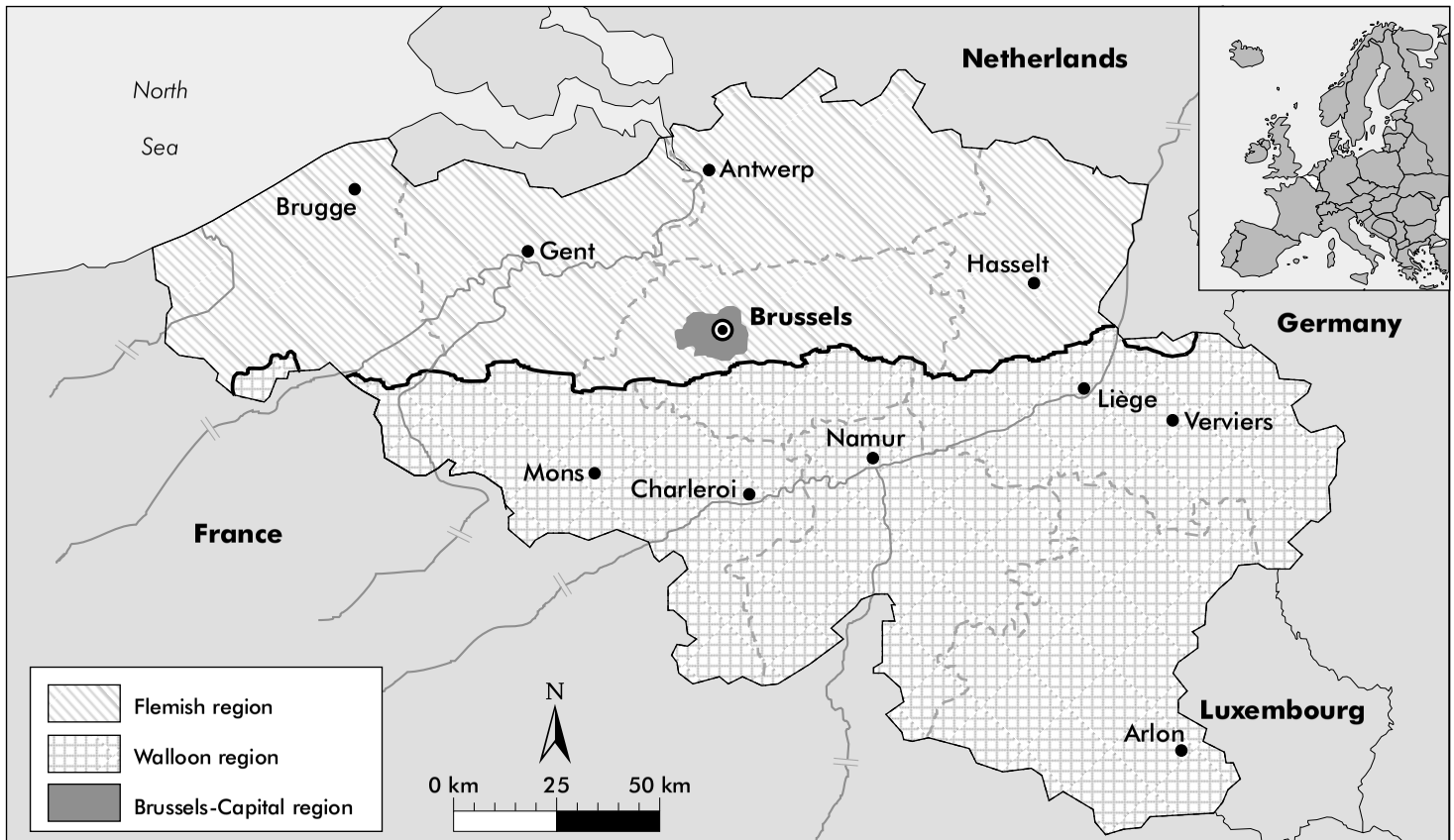
- *Develop improved processes for the collection of data on energy R&D funding and the allocation of that funding.*

- *Enhance co-ordination between the offices responsible for energy policy and science/technology policy to ensure the consistency between energy policy and energy R&D programmes.*

- *Maintain a minimum nuclear R&D capability; carefully evaluate programme requirements and funding of the SCK•CEN centre, as well as any decision to close the country's nuclear research reactor.*

Figure 1

Map of Belgium



Source: Belgian Ministry for Economic Affairs, Energy Administration.

COUNTRY OVERVIEW

POLITICAL STRUCTURE AND CURRENT POLITICAL MAKE-UP

Belgium is a constitutional monarchy that, as a result of four successive revisions of the Constitution (in 1970, 1980, 1988–89 and 1993), has become a federalist State composed of three communities (the Flemish Community, the Wallonia-Brussels Community and the German-speaking Community) and three regions (the Flemish region, the Walloon region and the Brussels-Capital region). The communities correspond to population groupings based on language (Dutch, French and German, all three of which are official languages). The regions are defined on a territorial basis (see Figure 1).

The government is a federal parliamentary democracy under a constitutional monarch. As a result of the constitutional revisions, there are now three levels of government (federal, regional and linguistic community) with a complex division of responsibilities. Currently, there is a federal government coalition formed by members of the Flemish Liberal Democrats (VLD), the Francophone Reformist Movement (MR), the Francophone Socialist Party (PS) and the Flemish Socialist Party Alternative (SP.A-Spirit). At the regional level, Brussels-Capital has a so-called olive tree coalition of Christian Democrats, Socialists and the Green Party. The Flanders government consists of a coalition of Christian Democrats and Socialists. The Walloon government consists of a coalition of Christian Democrats and Socialists.

Table 1

Belgium and its Regions in 2004

		Belgium	*Flanders*	*Wallonia*	*Brussels-Capital*
Land area	km^2	30 528	13 522	16 844	162
Population	Million	10.396	6.016	3.380	1.000
Population density	Inhabitants/km^2	341	445	201	6 172
GDP	Billion EUR	283.8			

Sources: Belgium's Federal Public Service for Economy, SMEs, Self-employed and Energy, Statistics Division, and Main Economic Indicators, OECD Paris, July 2005.

With a population of over ten million people and a land area of less than 31 000 square kilometres, Belgium is the third most densely populated country in the OECD (see Table 1). The economy has capitalised on its central

geographical location, highly developed transport network and diversified industrial and commercial base. Industry is concentrated mainly in the populous Flemish area in the north. Given its limited natural resources, Belgium imports high levels of raw materials and exports a large volume of finished goods, making its economy very dependent on the state of world markets. Economic growth, which was 1.1% in 2003, dropped sharply in 2001–2003 because of the global economic slow-down. It is expected to recover somewhat in 2005.

ENERGY POLICY OBJECTIVES

Since the early 1970s, Belgium's overall policy objectives have concentrated on security of supply based on diversification of geographical sources and fuels, energy efficiency, transparent and competitive energy pricing and environmental protection.

The three regions, which are responsible for a large share of energy policy, have also outlined their energy policy goals. Flanders is focused on the permanent promotion of the efficient use of energy, including both reducing energy use in the residential sector and increasing energy efficiency in industry and the service sector. The region also aims to increase environmentally-friendly energy production through the use of renewables and combined heat and power (CHP). Another objective of the Flemish energy policy is to provide the best possible energy services at correct and socially acceptable prices for all social groups, through regulation of electricity and gas markets.

Wallonia's energy policy objectives are outlined in its Plan for Sustainable Mastery of Energy, which is currently being reviewed but has not yet been adopted by the government. These goals are to modify behaviour through increased public awareness of energy issues; promote the efficient use of energy in buildings, industry, the public sector and the tertiary sector; to develop the renewable energy sector; regulate electricity and gas markets and discuss and evaluate policies, actions and measures.

The Brussels-Capital policy goals are to improve public awareness of the efficient use of energy, to improve awareness of and develop decision-making tools for building developers on the energy performance of buildings, to provide finance training and other support to the tertiary sector (including public authorities) and to set up a support system for renewable and alternative energy projects.

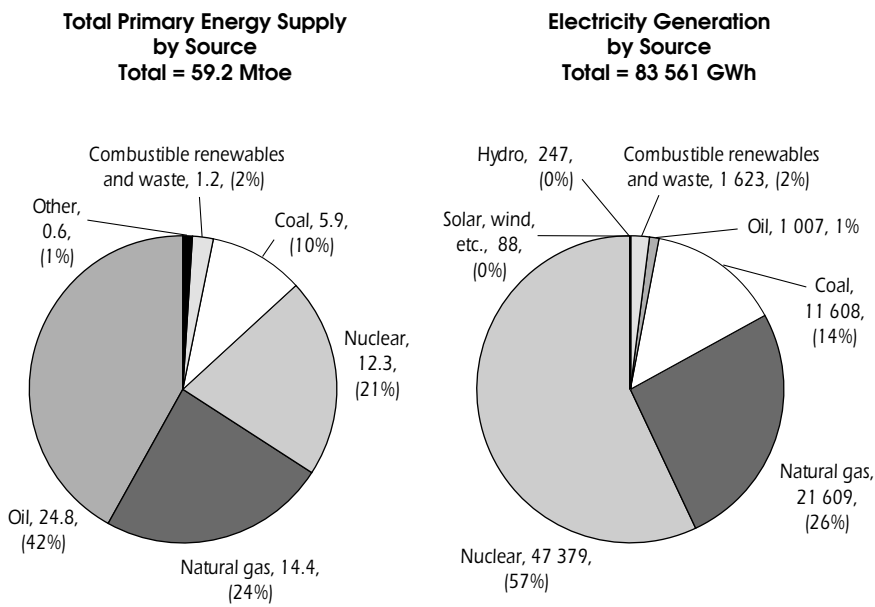
NUCLEAR PHASE-OUT

In 2003, the federal parliament passed a law regarding the phase-out of nuclear energy between 2015 and 2025 (*la loi du 31 janvier 2003 sur la sortie progressive de l'énergie nucléaire à des fins de production industrielle d'électricité*). The law requires that nuclear power plants be decommissioned

40 years after they start operation, and that no new power plants are built. As nuclear energy currently supplies over half of the country's electricity generation and over one-fifth of its primary energy supply (see Figure 2), a number of measures are to be taken to ensure future security of supply. First, the federal regulator must produce every three years a rolling ten-year indicative programme on electricity production. From 2015, the programme must be conducted each year. The regulator must evaluate security of supply and formulate recommendations should it be jeopardised. Should supply security be threatened, the King can take necessary measures – after deliberation in the Council of Ministers and on advice of the federal regulator. These measures must respect the phase-out decision, except in the case where a *force majeure* is declared.

Figure 2

Nuclear Power as a Share of TPES and Electricity Generation, 2003



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005.

Because Belgium's current planning horizon extends to only ten years, available 2004 planning studies generally do not address the energy supply and demand situation – as well as economic and environmental impacts – of the nuclear phase-out due to start in 2015.

The federal government recently established a special commission with the task of conducting in-depth analysis of Belgian energy policy for the coming 25 years. This "Commission 2030" is composed of national and international

energy experts with a high-level of expertise in different energy domains. The "Commission 2030" began its activities at the end of May 2005.

The results of their analyses should lead to identification of Belgium's strategic long-term energy options. The first findings are expected to be made public in 2006; the second phase will include public discussions and debate of the findings and options.

INSTITUTIONAL STRUCTURE

DIVISION OF RESPONSIBILITIES

Energy policy responsibilities are split between the federal and regional governments (see Table 2). The regional governments of Flanders, Wallonia and Brussels-Capital are principally responsible for designing and implementing policies for energy efficiency, renewables, non-nuclear energy R&D and market regulation for the distribution and supply of electricity and gas through distribution networks. The federal government is responsible for issues such as electricity and gas tariffs; market regulation for large infrastructure for storage, transport and distribution of energy; the nuclear fuel cycle and R&D in both nuclear fusion and fission.

Table 2

Division of Energy Policy Responsibilities

Federal government	*Regional governments*
• Security of supply	• Regulation of gas and electricity markets
• National indicative investment plans for gas and electricity (in collaboration with the CREG, the federal regulator)	• Distribution and transmission of electricity (electricity grid <70 kV)
	• Public distribution of natural gas
• Nuclear fuel cycles and related R&D programmes	• District heating equipment and networks
	• New and renewable sources of energy (except nuclear)
• Large stockholding installations	
• Production and transmission/transport of energy (including electricity grid >70 kV), including large storage infrastructure	• Recovery of waste energy from industry or other uses
	• Promotion of the efficient use of energy
• Tariffs and prices	• Energy statistics and balances
• Statistics (energy balances)	
• Product norms	

Source: Country submission.

In addition, the municipalities have a legal monopoly on electricity distribution. Nearly all municipalities have transferred the distribution of electricity to inter-municipal companies called *intercommunales*, which partially finance the local municipal governments. The annual contribution of energy-related revenues to municipal budgets can reach 10%.

FEDERAL LEVEL

At the federal level, energy matters are handled by the Directorate-General for Energy, part of the Federal Public Service (a ministry) for Economy, SMEs, Self-employed and Energy. Of the 78 employees working on energy issues, 67 are full time. The Ministry of Public Health and the Environment is responsible for environmental issues. The Ministry of Mobility and Transport is responsible for transportation matters. At the regional levels, various authorities have been designated by the regional governments to deal with decentralised energy policies. The National Climate Commission, which was established in 2003, and the federal Interdepartmental Commission for Sustainable Development are also important co-operative policy-making forums.

The federal Gas and Electricity Regulatory Commission (CREG – *Commission de Régulation de l'Electricité et du Gaz/Commissie voor de Regulering van de Elektriciteit en het Gas*) is an independent body that carries out regulatory tasks in the liberalised parts of the markets. Its main power is the approval of transmission and distribution tariffs. It also has an advisory role in other market areas. In addition, it carries out tasks related to the pricing of the captive market of gas and electricity.

The CREG is a relatively new organisation. It began in 1999, taking over many of the duties of two previous bodies, the CRE, the regulatory commission for electricity, and the CCEG, the control committee for gas and electricity. In addition, the CREG took over some of the tasks of the National Energy Committee, which was dissolved in 2000. The CREG is funded independently by a surcharge on all customer utility bills in order to ensure its independence and good governance. In total, the CREG has 67 employees.

In June 2005, Belgium passed legislation to move some responsibilities from the CREG to the government. A key change is to move the responsibility for developing long-term indicative investment plans for gas and electricity to the Federal Planning Bureau (BFP – *Bureau fédéral du Plan*) and the government, whereas before it had been a shared responsibility of the CREG and the government. The CREG will retain an advisory role in the process, but will lose its powers to provide incentives for infrastructure investment in locations it considers important. There are also changes in how the CREG approves costs and returns excess profits to customers or company shareholders. The CREG will now fix tariff rates over several years, instead of on an annual basis, and must guarantee an equitable profit margin to transmission grid operators. The change also moves the power to tender for new electricity capacity in the event of supply inadequacies from the CREG to the government. The legislation also limits what information the CREG can request from companies.

The National Oil Board (BNP – *Bureau national du pétrole/National Olie Bureau*) is responsible for the supply and distribution of crude oil and oil products during emergency situations. The BNP was created by royal decree in 1981 with a mandate to restrict demand and share available supplies in the

event of an oil supply shortage. The BNP is also responsible for activities related to Belgium's international commitments in energy crisis management.

The Federal Nuclear Control Agency (AFCN – *Agence fédérale de contrôle nucléaire/Federaal Agentschap voor Nucleaire Controle*) has the responsibility for the surveillance of all Belgian nuclear activities. It is an independent federal agency under the Ministry of the Interior that exercises regulatory authority over nuclear operations. The National Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF/NIRAS – *Organisme national des déchets radioactifs et des matières fissiles enrichies/Nationale instelling voor radioactief en verrijkte splijtstoffen*) is an autonomous public body legally responsible for the transportation, management and disposal of all radioactive waste in Belgium.

REGIONAL LEVEL

Within the Ministry of the Flemish Community is the Department of Economics, Employment, Internal Affairs and Agriculture. The department's Division of Natural Resources and Energy handles energy matters. At the end of 2004 it had 59 employees, an increase of 37% from 2001. In the Department of Environment and Infrastructure, environmental matters are handled by the Administration of the Environment. The Flemish Institute for Technological Research (VITO – *Vlaamse Instelling voor Technologisch Onderzoek*), and the Flemish Institute for the Promotion of Innovation by Science and Technology (IWT-Flanders – *Instituut voor de Aanmoediging van Innovatie door Wetenschap en Technologie in Vlaanderen*) play important roles in energy technology, research and development.

Flanders' electricity and gas regulatory body is the VREG (*Vlaamse Reguleringsinstantie voor de Elektriciteits- en Gasmarkt*). It appoints network managers and issues licences to suppliers. In addition, the VREG develops technical regulations for access to electricity and natural gas networks. It also monitors grid operator and supplier behaviour to ensure they are complying with all obligations, rules and regulations. It is fully financed by the Flemish government. The VREG has 20 employees.

In Wallonia, the Directorate-General for Technology, Research and Energy manages energy policies, including research and development issues. The Directorate-General for Natural Resources and Environment is responsible for energy matters. The Ministry of Equipment and Transportation also assists with R&D policy on transportation. In Wallonia, CWaPE (*Commission wallonne pour l'énergie*) is the region's gas and electricity regulator. In terms of staffing, 34 people work in the regional ministry on energy issues. CWaPE has 18 staff.

In Brussels-Capital, the IBGE/BIM (*Institut Bruxellois de Gestion de l'Environnement/Brussels Instituut voor Milieubeheer*) is responsible for all energy matters, including electricity and gas regulation.

FEDERAL-REGIONAL CO-OPERATION

The federal government and the three regional governments of Flanders, Wallonia and Brussels-Capital have created a formal body for discussions between the central government and the regions on all energy matters transferred to the regions. A formal agreement was ratified by the Council of Ministers on 18 November 1991. As a result, a structure of co-operation, the Cellule CONCERE/ENOVER (*Concertation Etat-Régions pour l'Energie/Energie-overleg*) began operating in 1992. The main tasks of the Cellule are:

- To gather information and promote its exchange between the regions and the federal government.
- To support all policy measures, including those involving both federal and regional authorities, in a spirit of international cohesion, taking into account the wide scope of responsibilities involved.
- To select and give mandates to Belgian regional delegations to international meetings.

The *Cellule's* tasks are designed to protect the autonomy of all parties, so its powers deal essentially with advice and recommendations. Plenary sessions are held monthly and several working groups on thematic subjects have been created. The Energy Administration provides secretarial assistance to the *Cellule*, which does not have an independent budget or permanent staff. The *Cellule* respects the autonomy of all parties. Its advice and recommendations are not binding.

The main forum for co-operation on climate change policy is the National Climate Commission, which was established in 2003. The Commission will propose a draft National Climate Plan to the Extended Interministerial Conference for the Environment. In addition, the federal Interdepartmental Commission for Sustainable Development has been and remains an important collaborative policy-making forum.

It should also be noted that the various regulators with responsibility for the liberalisation of the electricity and gas market (CREG, VREG, CWaPE and IBGE/BIM) decided at the end of 2003 to launch a structural consultation process between them. The primary topics covered in 2004 through this consultation process were the establishment of a common point of view on the mediation service, consultation with CONCERE/ENOVER and the finalisation of an agreement between the various regulators regarding the exchange of information.

ENERGY SECURITY

OIL

Belgium's oil supply is relatively diversified. No one country supplies more than 35% of the market, and six different countries supply the bulk of Belgium's oil.

In addition to supply diversity, emergency oil stocks are also critical to security of energy supply. However, Belgium has been non-compliant with the IEA's International Energy Program (IEP) stockholding obligation – which requires that countries maintain oil reserves equivalent to at least 90 days of their net oil imports – since the start of 2004. In December 2005, Belgium's parliament passed legislation creating a centralised oil stockholding agency, a very positive step that should bring Belgium into compliance with the IEA obligation in the future. (For more information, see Chapter 7.)

ELECTRICITY

The Belgian electricity system is part of an interconnected system stretching from Portugal to Poland. In 2003, peak load in Belgium was 13 573 megawatts (MW) and total installed capacity that year was 15 200 MW. In general, Belgium has had sufficient capacity, both from domestic generation and imports, to meet its demand and ensure security of supply.

Security of electricity supply depends on sufficient cross-border capacity. Maximum cross-border transmission capacity along the northern border with the Netherlands is 3 350 MW. To improve cross-border flows and create a more regional, robust and efficient market, Belgium has been working with its neighbours, France and the Netherlands. In July 2005 the regulators of the three countries issued a joint consultation document with the goal of better integrating the three countries' wholesale markets and harmonising cross-border operations.

In the long term, Belgium will face a security of supply challenge stemming from the phase-out of nuclear power. In addition to securing sufficient capacity sources to cover decommissioned nuclear plants, as well as fuel sources to power new plants, new transportation infrastructure will be required. Like most countries, Belgium faces so-called NIMBY ("not in my backyard") responses to building new infrastructure. In particular, new high-voltage transmission lines can take 5 to 15 years to build, making this a long-term security of supply challenge for Belgium. (For more information, see Chapter 9.)

NATURAL GAS

Given strong growth in natural gas demand, security of gas supply is a key issue for Belgium. High priority is placed on a diversity of sources. In 2003, 31% of natural gas came from the Netherlands, 18% from Algeria, 35% from Norway and 16% from other sources (mainly spot market purchases).

Post-2006 imports from Russia through Germany are considered particularly important. The Interconnector Gas Pipeline has started building compressor

stations in Zeebrugge in order to be able to reverse flows to the UK starting in 2006. It will start construction of a fourth liquefied natural gas (LNG) storage tank and additional send-out capacity at Zeebrugge, to be in operation in 2007 or 2008. The import terminal will expand from 4.5 billion cubic metres (bcm) to 9 bcm per year.

Belgium has not yet focused on adapting the natural gas transmission grid to the phase-out of nuclear power. Long-term planning will be critical, given that natural gas will fuel a large share of the electricity supply needed to replace supply currently provided by nuclear power, and that siting, permitting and building new gas transportation infrastructure is a complicated and lengthy process in Belgium, as it is elsewhere. (For more information, see Chapter 8.)

ENERGY MARKET STRUCTURE

The Belgian energy market is dominated by Suez, a French energy company. In electricity, Electrabel, which is controlled by Suez, owns 80% of generation, and supplies 80% of the market. Electrabel shares with SPE a 30% stake in Elia, the transmission system operator (TSO). Suez also has a 57% stake in both Distrigas, the dominant gas supplier, and Fluxys, the gas pipeline operator.

The market has evolved from a vertically integrated regulated monopoly structure, to a more liberalised market. The current structures of the natural gas and electricity markets are shown in Tables 3 and 4. New entrants have begun to emerge, but Suez-owned companies continue to dominate in both the gas and electricity sectors.

Table 3

New Electricity Market Structure

Unbundled activity	*Players*	*Status*
Generation	Electrabel, SPE, EdF and local producers	Free competition
Transmission network	Elia	Regulation (CREG)
Distribution network	27 designated network operators	Regulation (CREG/regional regulators)
Supply	Electrabel, ECS, Luminus, RWE, Nuon, EDF, Ecopower, Essent, Citypower, etc.	Free competition
Taxes	Federal and regional governments	Laws and decrees (through TSO, DNO, generators, suppliers)

Sources: Country submission.

Table 4

New Natural Gas Market Structure

Unbundled activity	*Players*	*Status*
Imports	Distrigas, GDF, Wingas, BP	Free competition
Transportation network	Fluxys, Fluxys LNG	Regulation (CREG)
Distribution network	19 designated network operators	Regulation (CREG/regional regulators)
Supply	Distrigas, ECS, Luminus, Nuon, GDF, etc.	Free competition
Taxes	Federal and regional governments	Laws and decrees (through TSO, DNO, suppliers)

Source: Country submission.

With respect to the electricity market, the three regions are at different stages of market opening. In Flanders, all customers are free to choose electricity suppliers. In Wallonia and Brussels, non-residential customers are currently eligible. Residential customers will be eligible in 2007.

On 20 May 2005, Belgium passed energy laws that fully transpose the EU's second Directive on Gas and Electricity Market Opening. Organisational changes required by the directives have already been made. A federal regulator for gas and electricity, the CREG, is in place, as are regional regulators. (For more information, see Chapters 8 and 9.)

SUPPLY-DEMAND BALANCE

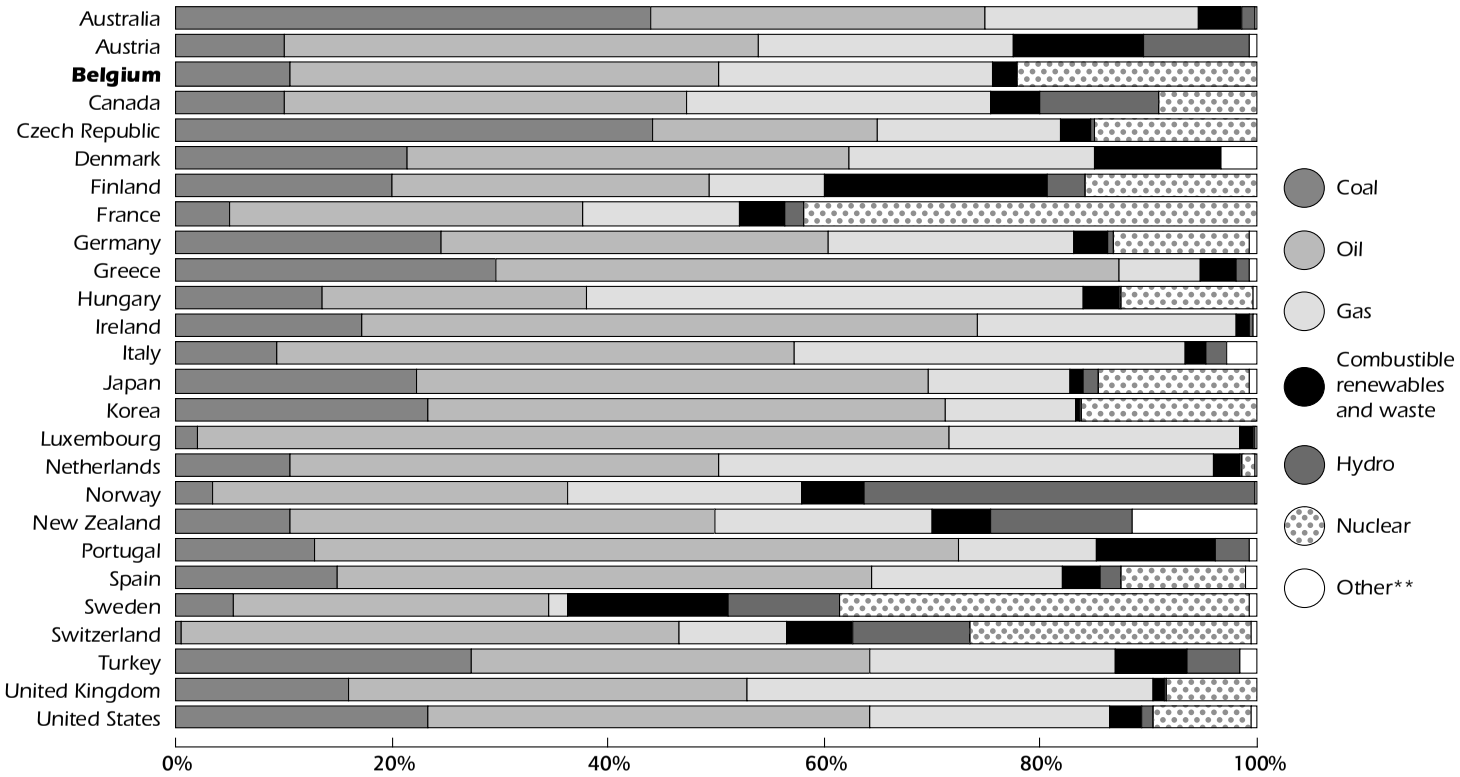
ENERGY SUPPLY

Belgium imports nearly all of its energy supply as the country has very limited indigenous energy resources. It has indigenous coal resources, but because of the high cost of production, all coal mines were closed – the last one in 1993. As shown in Figure 3, the energy mix in Belgium is relatively diversified when compared with other IEA countries. Over 97% of its energy supply comes from four main sources – coal, oil, gas and nuclear. Over 20% of total primary energy supply (TPES) comes from nuclear power, the fourth-highest share of all 26 IEA countries (15 IEA countries have operational nuclear power plants).

In 2003, TPES was 59.2 million tonnes of oil equivalent (Mtoe), a rise of 4.6% from 2002 (see Table 5). In percentage terms, the largest growth was in renewable energy sources (including combustible renewables and waste, geothermal, solar, wind and others), which grew by 27% between 2002 and 2003. But in absolute terms, the growth was only 0.25 Mtoe, bringing its overall share of TPES to 2.0% from 1.6%. In absolute terms, the largest increase was in oil, which rose from 22.9 to 24.8 Mtoe, an 8.1% increase to 41.8% of the overall

Figure 3

Total Primary Energy Supply in IEA Countries, 2004*



* preliminary data. ** includes geothermal, solar, wind and ambient heat production.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005.

TPES. In percentage terms, natural gas grew by a similar amount, 7.7%, to 14.4 Mtoe, which is a 24.3% share of TPES. Coal exhibited the only decline, both in its share of TPES and in absolute consumption.

Table 5

Total Primary Energy Supply, 2002 and 2003

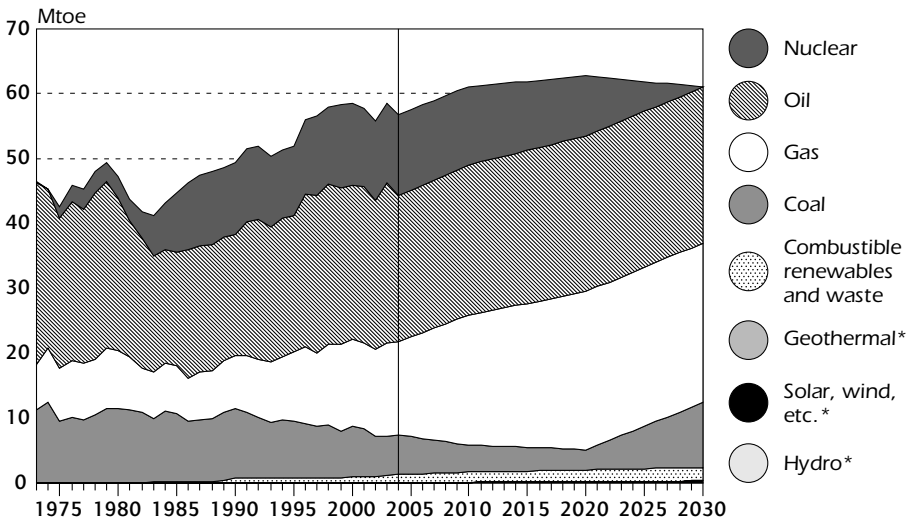
	2002	*2003*	*Change (2002 to 2003)*		*2002*	*2003*
	Mtoe	*Mtoe*	*ktoe*	*%*	*% of total*	*% of total*
Coal[1]	6.3	5.9	–409	–6.5	11.2	10.0
Oil	22.9	24.8	1 859	8.1	40.5	41.8
Natural gas	13.4	14.4	1 024	7.7	23.7	24.3
Combustible renewables & waste[2]	0.9	1.2	243	26.5	1.6	2.0
Nuclear	12.3	12.3	5	0.0	21.8	20.9
Other	0.7	0.6	–109	–15.8	1.2	1.0
Total	**56.5**	**59.2**	**2 613**	**4.6**		

1. Includes lignite.
2. Comprises solid biomass, biogas, industrial waste and municipal waste.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

Figure 4

Total Primary Energy Supply, 1973 to 2030



* negligible.

Note: Data past 2003 are based on the BFP's "reference scenario"; they also include some additional energy supply not included in the BFP's forecasts.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

Figure 4 shows the long-term trends in overall energy supply since 1973. Apart from the introduction and growth of nuclear, the most significant trend has been a reduction in the use of coal. Concurrently, the use of natural gas has grown particularly strongly starting in the early 1990s. The increase in supply from nuclear power levelled out in the late 1980s.

ENERGY DEMAND

In 2003, total final consumption (TFC) of energy was 43 Mtoe, a rise of 4.3% over 2002 (see Table 6). While combustible renewables and waste had the largest percentage increase, in absolute numbers the rise was just 90 thousand tonnes of oil equivalent (ktoe). The largest absolute increase was in oil, which made up nearly 80% of the total increase in TFC between 2002 and 2003.

Table 6

Total Final Consumption by Source, 2002 and 2003

	2002	*2003*	*Change (2002 to 2003)*		*2002*	*2003*
	Mtoe	*Mtoe*	*ktoe*	*%*	*% of total*	*% of total*
Coal[1]	1.8	1.8	36	2.0	4.3	4.2
Oil	21.2	22.6	1 376	6.5	51.7	52.9
Natural gas	10.4	10.5	97	0.9	25.4	24.6
Combustible renewables & waste[2]	0.4	0.4	90	25.1	0.9	1.1
Electricity	6.7	6.9	111	1.6	16.5	16.1
Other	0.5	0.5	37	7.8	1.2	1.2
Total	**40.9**	**42.7**	**1 747**	**4.3**		

1. Includes lignite.
2. Comprises solid biomass, biogas, industrial waste and municipal waste.

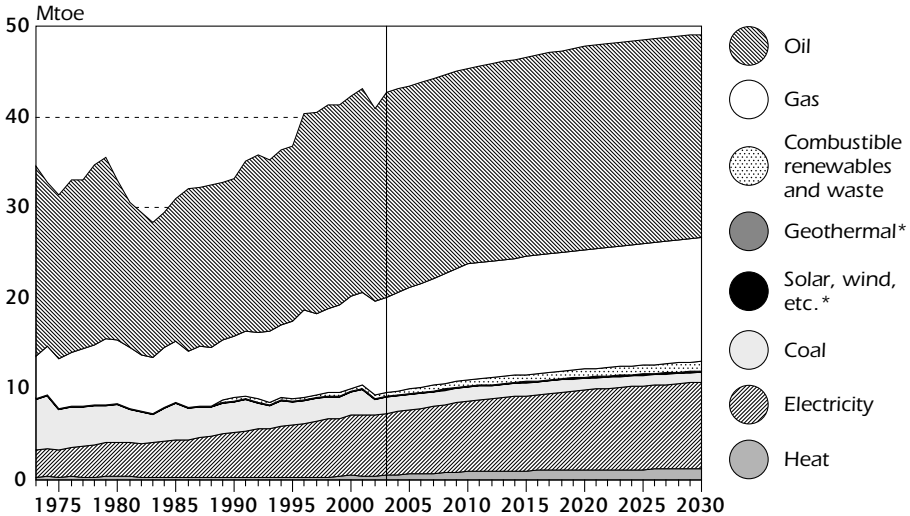
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

As seen in Figure 5, over the longer term, the most prominent change in TFC between 1973 and 2003 was the steady growth in the consumption of both natural gas and electricity. Both sources grew by about 130%. In contrast, oil consumption has risen only by 7.5% – from 21.2 to 22.6 Mtoe – over the last 30 years. Given this very modest long-term growth, the 6.5% increase between 2002 and 2003 is remarkable. This sharp short-term increase can be partially explained by weather, since climatic severity increased by 4.4% in 2003 as compared with 2002. Nonetheless, the sharp rise is particularly notable given the long-term trend in oil consumption.

Again, the long-term and steady decline in coal consumption is notable. Over the last 30 years, coal consumption has dropped by nearly 70%, from 5.7 to 1.8 Mtoe.

Figure 5

Total Final Consumption by Source, 1973 to 2030



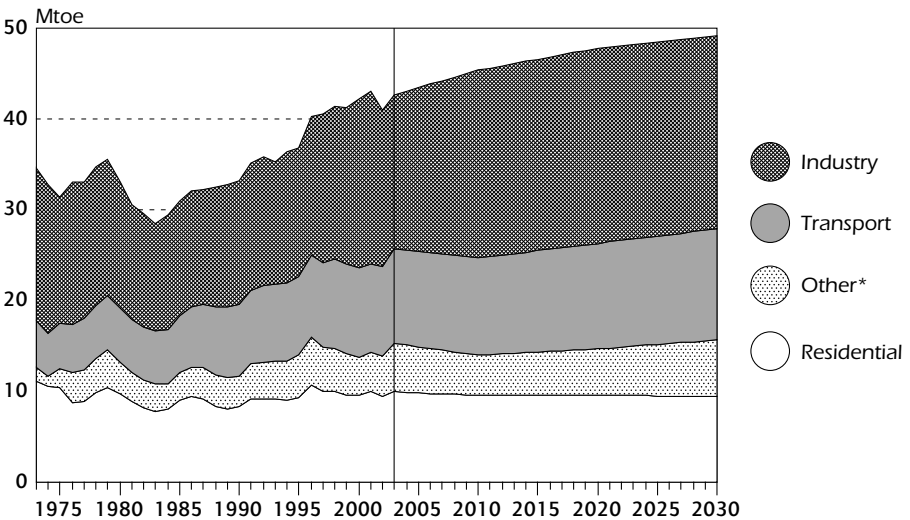
* negligible.

Note: Data past 2003 are based on the BFP's "reference scenario"; they also include some additional energy consumption not included in the BFP's forecasts.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

Figure 6

Total Final Consumption by Sector, 1973 to 2030



* includes commercial, public service and agricultural sectors.

Note: Data past 2003 are based on the BFP's "reference scenario"; they also include some additional energy consumption not included in the BFP's forecasts.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

As highlighted in the sectoral breakdown in Figure 6, industry accounts for the largest share of energy consumption, 40% of the total (about 17 Mtoe) in 2003. This is a 5% decline from 2002 and a nearly 20% decline from 1973, when industrial consumption was half of all consumption. Between 1973 and 1990, transport consumption rose by nearly 70% to 10.4 Mtoe, now accounting for a quarter of total consumption. Residential and tertiary sector consumption (identified as "Other" in Figure 6) has remained relatively flat at about 35% of total consumption combined.

ENERGY FORECASTS

TOTAL PRIMARY ENERGY SUPPLY

Between 2003 and 2030, the Federal Planning Bureau (BFP) forecasts the total energy supply to grow from 59.2 to 61.4 Mtoe, a total increase of 3.8% (see Table 7). Given the legally required phase-out of nuclear power, forecasts in Belgium predict a very different energy mix in 25 years. Nuclear, which now accounts for over 20% of TPES and will be phased out between 2015 and 2025, will largely be replaced by natural gas. The share of natural gas in Belgium's total energy supply will grow at an average annual rate of 2.1% between 2000 and 2030, from 13.4 Mtoe or 23% of total supply to 24.6 Mtoe or 40% of total supply in 2030. This rate of increase is less than half that of the 1990s, when natural gas consumption rose by 5% annually. By 2030, coal is also expected to replace some supply that had been met by nuclear. However, before rising to 10 Mtoe or 16% of total supply in 2030, coal supply will first fall from 5.9 Mtoe or 10% of TPES in 2003 to 3.1 Mtoe or 5% of TPES in 2020. Renewables, including wind, solar, waste and combustibles, will grow at high annual rates, but they are still only expected to make up less than 4% of total supply in 2030.

The long-term forecasts presented above are based on the BFP's "reference scenario" (REF), which, among other things, assumes that energy policies remain the same as those in place in 2001. BFP has also estimated long-term energy supply and demand using four additional scenarios. The HGP scenario assumes higher gas prices than in the reference scenario – 18% higher in 2020 and 32% higher in 2030 – due to greater demand in Asia and elevated gas supply costs from Russia. The RES+CHP scenario assumes that by 2010 Belgium will have met the objectives of the EU Directives on Renewable Energy and Co-generation. BFP also modelled two nuclear scenarios. The first, NUC1, assumes that nuclear power plant licenses are extended from 40 to 60 years, effectively postponing the nuclear phase-out by at least 20 years. NUC2 is similar to the NUC1 scenario, but also assumes that new nuclear power plants are built – up to a maximum of 60% of total capacity – starting in 2020. There is no scenario that includes emissions trading or a price on carbon dioxide (CO_2).

Table 7

Projections of TPES by Fuel, 1990 to 2030

Units: Mtoe							*Average annual growth*	
		1990	*2000*	*2010*	*2020*	*2030*	*1990–2000*	*2000–2030*
Coal[1]		10.7	7.9	4.2	3.1	10.0	–3%	0.8%
% share of total		*22%*	*13%*	*7%*	*5%*	*16%*		
Oil		18.7	23.8	23.2	24.0	24.1	2%	0.0%
% share of total		*38%*	*40%*	*38%*	*38%*	*39%*		
Natural gas		8.2	13.4	20.0	24.4	24.6	5%	2.1%
% share of total		*17%*	*23%*	*33%*	*39%*	*40%*		
Combustible renewables & waste[2]		0.7	0.8	1.6	1.9	2.1	2%	3.1%
% share of total		*1%*	*1%*	*3%*	*3%*	*3%*		
Nuclear		11.1	12.6	12.1	9.2	0.0	1%	–100.0%
% share of total		*23%*	*21%*	*20%*	*15%*	*0%*		
Solar/wind/other renewables		0.0	0.0	0.1	0.1	0.3	6%	7.0%
% share of total		*0%*	*0%*	*0%*	*0%*	*1%*		
Total	**49.1**	**58.9**	**61.5**	**63.1**	**61.4**	**2%**	**0.1%**	

Note: Data past 2003 are based on the BFP's "reference scenario"; they also include some additional energy supply not included in the BFP's forecasts. Total also includes electricity and heat.
1. Includes lignite.
2. Comprises solid biomass, biogas, industrial waste and municipal waste.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

Summary TPES results comparing the five scenarios are presented in Table 8. The results show that apart from the 2030 results in the two nuclear scenarios, expected TPES results are fairly similar and robust. In 2030 the two nuclear scenarios show TPES levels significantly higher than in the reference scenario. The renewables and CHP scenario predicts slightly lower overall primary energy consumption than the other scenarios.

Table 8

Projections from Different Scenarios of TPES, 2000 to 2030

Units: ktoe	*2000*	*2010*	*2020*	*2030*
REF	57 040	61 257	62 862	61 290
HGP	57 040	61 304	62 972	61 779
Difference from REF		*0.1%*	*0.2%*	*0.8%*
RES+CHP	57 040	60 627	61 927	59 352
Difference from REF		*–1.0%*	*–1.5%*	*–3.2%*
NUC1	57 040	61 255	64 016	66 433
Difference from REF		*0.0%*	*1.8%*	*8.4%*
NUC2	57 040	61 247	64 545	69 500
Difference from REF		*0.0%*	*2.7%*	*13.4%*

Source: *Perspectives énergétiques pour la Belgique à l'horizon 2030, Bureau fédéral du plan*, January 2004.

FINAL ENERGY CONSUMPTION

Under the reference scenario, TFC is expected to rise from 42.7 Mtoe in 2003 to 49.1 Mtoe in 2030, a rise of 15% (see Table 9). Given the large difference with the rise in TPES over the same period (less than 4%), this implies a significant increase in the efficiency of energy conversion. This expected increase in energy efficiency is detailed in Table 10, which shows primary energy efficiency improving by 1.7% annually whereas final energy intensity improves by 1.3% annually. Both of these rates are significant improvements in energy efficiency given the rates observed in the 1990s, which were much lower and, in the case of final energy intensity, actually moving in the opposite direction.

The low or negative growth rates for natural gas and coal shown in Table 9 indicate that most of the additional supply of these two sources will be used for electricity production.

Table 9

Projections of TFC by Fuel, 1990 to 2030

Units: Mtoe						*Average annual growth*	
	1990	*2000*	*2010*	*2020*	*2030*	*1990–2000*	*2000–2030*
Coal[1]	3.5	2.6	1.7	1.4	1.2	–2.7%	–2.7%
% share of total	*11%*	*6%*	*4%*	*3%*	*2%*		
Oil	17.3	22.0	21.6	22.4	22.4	2.4%	0.1%
% share of total	*52%*	*52%*	*48%*	*47%*	*46%*		
Natural gas	6.8	10.2	12.7	13.2	13.6	4.1%	1.0%
% share of total	*21%*	*24%*	*28%*	*28%*	*28%*		
Combustible renewables & waste[2]	0.3	0.3	0.7	0.9	1.0	0.3%	3.9%
% share of total	*1%*	*1%*	*2%*	*2%*	*2%*		
Solar/wind/other	0.0	0.0	0.0	0.0	0.1	0.0%	13.7%
% share of total	*0%*	*0%*	*0%*	*0%*	*0%*		
Electricity	5.0	6.7	7.7	8.8	9.6	2.9%	1.2%
% share of total	*15%*	*16%*	*17%*	*18%*	*20%*		
Total	**33.2**	**42.3**	**45.4**	**47.8**	**49.1**	**2.4%**	**0.5%**

Note: Data past 2003 are based on the BFP's "reference scenario"; they also include some additional energy consumption not included in the BFP's forecasts. Total also includes heat.
1. Includes lignite.
2. Comprises solid biomass, biogas, industrial waste and municipal waste.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

Summary results comparing forecasts of final energy consumption based on BFP's five scenarios are presented in Table 11. These results show even more robust results for TFC than for TPES. No result – even in 2030 – is expected to be more than 1% different from the reference scenario result.

Table 10

Projections of Energy Intensity, 1990 to 2030

						Average annual growth	
	1990	*2000*	*2010*	*2020*	*2030*	*1990–2000*	*2000–2030*
GDP (billion 2000 USD)	217	269	334	398	468	2.2%	1.9%
Primary energy intensity (TPES/GDP)	0.23	0.22	0.18	0.16	0.13	–0.3%	–1.7%
Final energy intensity (TFC/GDP)	0.15	0.16	0.14	0.12	0.10	0.3%	–1.3%

Note: Data past 2003 are based on the BFP's "reference scenario"; they also include some additional energy supply and consumption not included in the BFP's forecasts. GDP data use purchasing power parities. Annex A reports GDP and energy intensity using 2000 USD.

Source: Energy Balances of OECD Countries, IEA/OECD Paris, 2005.

Table 11

Projections from Different Scenarios of TFC, 2000 to 2030

Units: ktoe	*2000*	*2010*	*2020*	*2030*
REF	36 908	39 315	40 999	42 256
HGP	36 908	39 347	40 853	41 948
Difference from REF		*0.1%*	*-0.4%*	*-0.7%*
RES+CHP	36 908	39 362	41 127	42 431
Difference from REF		*0.1%*	*0.3%*	*0.4%*
NUC1	36 908	39 314	40 997	42 357
Difference from REF		*0.0%*	*0.0%*	*0.2%*
NUC2	36 908	39 315	41 002	42 397
Difference from REF		*0.0%*	*0.0%*	*0.3%*

Source: *Perspectives énergétiques pour la Belgique à l'horizon 2030, Bureau fédéral du plan*, January 2004.

CO_2 EMISSIONS

As shown in Table 12, BFP's reference scenario forecasts that carbon dioxide (CO_2) emissions related to energy use will fall by 0.3% annually between 2000 and 2010, but will then start to rise, growing at a relatively high 2.1% annual rate between 2020 and 2030. High gas prices would raise the growth of CO_2 emissions slightly, whereas implementation of CHP and renewables policies would slow the growth somewhat, in comparison to the reference scenario. Should Belgium continue to rely on nuclear power, CO_2 emission growth rates would drop dramatically. In the case of the NUC2 scenario, total CO_2 emissions would in fact begin to decline after 2020. As previously discussed, these scenarios do not assume an emissions trading scheme, which is now under way in Europe, or a price on carbon dioxide. Despite these exclusions, the results of these scenarios indicate that it will be very

challenging for Belgium to meet its commitment to reduce its emissions by 7.5% from 1990 levels under the EU Kyoto Protocol burden-sharing agreement. However, studies show that realistic improvements in energy efficiency alone could provide sufficient reductions in CO_2 emissions for Belgium to meet its Kyoto target. Additional CO_2 emissions forecasts and analysis on Belgium's progress towards meeting its Kyoto commitment are provided in the chapter on energy and the environment.

Table 12

Projections of Energy-related CO_2 Emissions, 2000 to 2030

Units: $MtCO_2$					*Average annual growth rate*		
	2000	*2010*	*2020*	*2030*	*2000 to 2010*	*2010 to 2020*	*2020 to 2030*
REF	115 883	112 437	118 956	146 600	–0.3%	0.6%	2.1%
HGP	115 883	112 509	122 789	155 671	–0.3%	0.9%	2.4%
Difference from REF		*0.1%*	*3.2%*	*6.2%*			
RES+CHP	115 883	109 366	114 626	136 921	–0.6%	0.5%	1.8%
Difference from REF		*–2.7%*	*–3.6%*	*–6.6%*			
NUC1	115 883	112 431	115 144	125 303	–0.3%	0.2%	0.8%
Difference from REF		*0.0%*	*–3.2%*	*–14.5%*			
NUC2	115 883	112 409	113 834	108 602	–0.3%	0.1%	-0.5%
Difference from REF		*0.0%*	*–4.3%*	*–25.9%*			

Source: Perspectives énergétiques pour la Belgique à l'horizon 2030, Bureau fédéral du plan, January 2004.

ENERGY STATISTICS

Since the last in-depth review, Flanders has made changes to its data collection processes. Since 1994, VITO has been commissioned by Flanders to draw up annual energy balances. After liberalisation in the electricity market, the electricity sector became less inclined to provide data to the government for drawing up energy balances. As a result, in a March 2002 decision on the obligations of public services, data obligations were imposed on electricity distribution network operators (DNOs), requiring them to annually submit to the government data on consumption by final users connected to their networks. In July 2004, Flanders extended the compulsory survey of data to electricity transport network managers, natural gas network managers, fuel suppliers, exploiters of combined heat and power, renewable energy and self-generating plants.

Similarly, owing to the greater difficulty in obtaining data from producers and marketers since market liberalisation, Wallonia passed new regulations in April 2003 that impose data reporting obligations on electricity and grid managers.

At the federal level, in order to minimise the administrative burden of entities already required to submit energy data to the Flemish government, data collection protocols of the Energy Balances working group of the National Climate Commission will be used. This group works to co-ordinate the collection of federal and regional energy statistics.

ENERGY TAXES, PRICES AND SUBSIDIES

ENERGY TAXES

Energy taxes are federal, but proceeds can flow back to the regions. A summary of energy taxes is presented in Table 13.

Since 1 August 1993, a special tax on domestic energy products, *la cotisation sur l'énergie*, has been levied on gasoline, light heating oil, natural gas, liquefied petroleum gas and electricity. Coal, electricity and gas under social tariffs and diesel fuel were exempted, with the goal of supporting employment. This tax is calculated on the energy component, not the CO_2 of energy products. In practice, households are the primary contributors to the energy levy. Industrial energy consumption is exempt, with the exception of light heating oil.

In September 2005, the federal government announced a set of measures to cushion the impact of rising oil prices. An important measure is related to heating oil: the government will compensate customers for an amount equal to the 17.35% value-added tax (VAT) levied on the bill of domestic users that applies to heating oil prices above EUR 0.5/litre*. In other words, customers are reimbursed for VAT charges attributable to heating oil prices above EUR 0.5/litre, but not for any VAT charges stemming from prices below the 0.5 threshold. This measure is applicable from 1 October 2005. A similar measure has been developed for natural gas, which will come into force from 2006 onwards.

In 1993, heavy fuel oil for industry and electricity generation was subject to an excise tax of EUR 19/tonne for heavy fuels containing 3% sulphur and EUR 6/tonne for fuels with a 1% sulphur content. On 1 January 1996, additional excise taxes were placed on motor fuels.

As from 1 January 1996, electricity and natural gas for households have been subject to a 21% VAT rate. Gasoline is also subject to the general VAT rate of 21%. There are no taxes on coking coal or steam coal for industry and electricity generation. A reduced VAT rate of 12% is placed on steam coal for households.

In 2003, two federal levies came into force, one on electricity and another on natural gas (*la cotisation fédérale*). These federal levies are to finance certain public service obligations.

* On average in 2004, one euro = USD 1.237.

As of 1 January 2005, the federal levies for electricity amount to:

- EUR 0.1144/MWh to finance costs related to the regulation and control of electricity and natural gas markets by the CREG.
- EUR 0.6615/MWh to finance the decommissioning of some nuclear sites.
- EUR 0.3140/MWh to finance federal policy measures aimed at reducing greenhouse gas (GHG) emissions through the Kyoto Fund.
- EUR 0.3256/MWh to finance public social assistance centres in Belgium through the Social Fund.
- EUR 0.3176/MWh to finance measures to help protected household customers through the Fund for Protected Customers.

The electricity levy paid by industrial users that consume more than 20 MWh/year per site, and that subscribe to certain voluntary covenants (*accords de branche*) is set to reduce on 1 October 2005 according to a progressive tax schedule set in the electricity law. The electricity levy is limited to EUR 250 000/year per consumption site and per year, for electricity consumption at or above 250 000 MWh. This long-promised reduction of the levy, which funds certain public service obligations and costs linked to regulation and control of electricity market, took a year to enter legislation.

Another electricity levy has also been set up through the electricity law to compensate municipalities for the loss of revenue associated with electricity market liberalisation. This levy is EUR 4.91/MWh, but is only applicable to Flemish consumers connected to the distribution grid and is capped at 25 gigawatt-hours (GWh) of total consumption. This levy, as well as the levy financing the Fund for Protected Customers, is not part of the so-called *cotisation fédérale*.

As of 1 January 2005, the federal levies for gas amount to:

- EUR 0.0223/MWh to finance costs related to the regulation and control of electricity and natural gas markets by the CREG.
- EUR 0.1016/MWh to finance public social assistance centres in Belgium through the Social Fund.
- EUR 0.0481/MWh to finance measures to help protected household customers through the Fund for Protected Customers.

The natural gas levies do not finance the decommissioning of some nuclear sites or costs related to the reduction of GHG emissions. Similarly, there is no levy charged to gas consumers to compensate for the loss of municipalities' revenue associated with the liberalisation of the gas market.

Taxes on motor fuels are lower in Belgium than in neighbouring countries, in particular for gasoline.

Table 13

Energy Taxes in Belgium in 2005

Units: EUR	*Excise tax*	*Special excise tax*	*Other tax*	*Energy levy*	*Total*
Petrol (per 1 000 l)					
Regular unleaded	245.41	318.14	0.00	28.63	592.19
95 ron	245.41	318.14	0.00	28.63	592.19
98 ron-50S[1]	245.41	318.14	0.00	28.63	592.19
98 ron	245.41	333.02	0.00	28.63	607.06
Kerosene (per 1 000 l)					
Jet fuel	294.99	256.82	0.00	28.63	580.44
Large industrial/commercial	9.30	1.20	0.00	0.00	10.50
Industrial/commercial	13.94	1.81	0.00	0.00	15.75
Other industrial/commercial	18.59	2.41	0.00	0.00	21.00
Large commercial heating	0.00	0.00	0.00	8.97	8.97
Commercial heating	0.00	0.00	0.00	13.46	13.46
Other commercial heating	0.00	0.00	0.00	17.95	17.95
Residential heating	0.00	0.00	0.00	17.95	17.95
Gasoil (per 1 000 l)					
Diesel	198.31	166.99	0.00	14.87	380.18
Diesel 50S	198.31	152.12	0.00	14.87	365.31
Large industrial/commercial	9.30	1.20	0.00	0.00	10.50
Industrial/commercial	13.94	1.81	0.00	0.00	15.75
Other industrial/commercial	18.59	2.41	0.00	0.00	21.00
Large industrial/commercial 50S	9.30	1.20	0.00	0.00	10.50
Industrial/commercial 50S	13.94	1.81	0.00	0.00	15.75
Other industrial/commercial 50S	18.59	2.41	0.00	0.00	21.00
Large commercial heating	0.00	0.00	5.00	4.24	9.24
Commercial heating	0.00	0.00	7.50	6.36	13.86
Other commercial heating	0.00	0.00	10.00	8.49	18.49
Large commercial heating 50S	0.00	0.00	5.00	3.55	8.55
Commercial heating 50S	0.00	0.00	7.50	5.33	12.83
Other commercial heating 50S	0.00	0.00	10.00	7.10	17.10
Residential heating	0.00	0.00	10.00	8.49	18.49
Residential heating 50S	0.00	0.00	10.00	7.10	17.10
Heavy fuel oil (per 1 000 kg)					
Large commercial	6.50	1.00	0.00	0.00	7.50
Commercial	9.75	1.50	0.00	0.00	11.25
Other commercial	13.00	2.00		0.00	15.00
Residential	13.00	2.00	0.00	0.00	15.00
Liquid petroleum gas (LPG; per 1 000 kg)					
Motor fuel	0.00	0.00	0.00	0.00	0.00
Large industrial/commercial	18.59	1.91	0.00	0.00	20.50
Industrial/commercial	27.89	2.86	0.00	0.00	30.75
Other industrial/commercial	37.18	3.82	0.00	0.00	41.00
Heating	0.00	0.00	0.00	0.00	0.00

Table 13 *(continued)*

Energy Taxes in Belgium in 2005

Units: EUR	*Excise tax*	*Special excise tax*	*Other tax*	*Energy levy*	*Total*
Butane (bottles; per 1 000 kg)					
Motor fuel	0.00	0.00	0.00	0.00	0.00
Large industrial/commercial	18.59	1.91	0.00	0.00	20.50
Industrial/commercial	27.89	2.86	0.00	0.00	30.75
Other industrial/commercial	37.18	3.82	0.00	0.00	41.00
Large commercial heating	0.00	0.00	0.00	8.55	8.55
Commercial heating	0.00	0.00	0.00	12.83	12.83
Other commercial heating	0.00	0.00	0.00	17.10	17.10
Residential heating	0.00	0.00	0.00	17.10	17.10
Propane (bottles; per 1 000 kg)					
Motor fuel	0.00	0.00	0.00	0.00	0.00
Large industrial/commercial	18.59	1.91	0.00	0.00	20.50
Industrial/commercial	27.89	2.86	0.00	0.00	30.75
Other industrial/commercial	37.18	3.82	0.00	0.00	41.00
Large commercial heating	0.00	0.00	0.00	8.68	8.68
Commercial heating	0.00	0.00	0.00	13.01	13.01
Other commercial heating	0.00	0.00	0.00	17.35	17.35
Residential heating	0.00	0.00	0.00	17.35	17.35
Propane (bulk; per 1 000 l)[2]					
Motor fuel	0.00	0.00	0.00	0.00	0.00
Large industrial/commercial	9.48	0.97	0.00	0.00	10.46
Industrial/commercial	14.22	1.46	0.00	0.00	15.68
Other industrial/commercial	18.96	1.95	0.00	0.00	20.91
Large commercial heating	0.00	0.00	0.00	4.42	4.42
Commercial heating	0.00	0.00	0.00	6.64	6.64
Other commercial heating	0.00	0.00	0.00	8.85	8.85
Residential heating	0.00	0.00	0.00	8.85	8.85

1. 50S = low in sulphur.
2. Converted using a density of 0.510 g/l.
Source: Country submission.

ENERGY PRICES AND PRICING POLICIES

In the liberalised parts of the natural gas and electricity markets, prices are determined by the market, but the Ministry of Economic Affairs can define price ceilings. Transmission tariffs, proposed by the transmission operators, and distribution tariffs, proposed by the distribution grid managers, are subject to approval by the federal regulator, the CREG. The pricing of oil products is liberalised, but prices have to be below the price ceiling set daily by the Programme Contract. (For more information, see Chapter 7 on oil.)

For captive customers unable to choose their own suppliers, uniform prices for gas and electricity are set by the federal government throughout the country. The CREG proposes tariffs that are subject to approval by the Ministry of Economic Affairs. Legislation stipulates the conditions for setting price ceilings for captive markets. Cross-subsidies between energy products and classes of customers are not allowed. In Flanders, preliminary results indicate that electricity prices have remained the same or fallen for customers free to choose their own suppliers. (For more information, see Chapter 9.)

Generally, prices for principal energy products rose between 2002 and 2003, as shown in Table 14.

Table 14

Energy Prices, 2000 to 2003

Units: EUR/litre	*2000*	*2001*	*2002*	*2003*	*Change (2000 to 2003)*	*Change (2002 to 2003)*
Road diesel	0.8106	0.7811	0.7654	0.8025	–1.0%	4.8%
Road diesel 50 S	N/A	N/A	0.7534	0.7659	N/A	1.7%
Gas oil for heating	0.3669	0.3329	0.3057	0.3163	–13.8%	3.5%
Unleaded super fuel 95	1.0682	1.0322	1.0090	1.0260	–4.0%	1.7%
Unleaded super fuel 98	1.1088	1.0806	1.0682	1.0689	–3.6%	0.1%
Unleaded super 98 fuel 50 S	N/A	N/A	1.0610	1.0644	N/A	0.3%
Natural gas – tariff B[1]	0.0326	0.0361	0.0327	0.0323	–0.7%	–1.0%
Electricity – normal tariff[2]	0.1525	0.1574	0.1553	0.1607	5.4%	3.5%
Electricity – excl. night tariff	0.0578	0.0593	0.0598	0.0610	5.5%	2.0%

1. Only the proportional term (VAT included).
2. Only the proportional term (normal tariff > 2 500 kWh/year and > 6 kilovolt amperes (kVa), VAT included). In general, 2003 was characterised by a general rise in petroleum prices as influenced by the strong crude oil price increase on the international market (15.8% rise in the average Brent oil rate in 2003), although this was compensated in part by a weakness of the dollar (on average 16.6% fall between 2002 and 2003 in proportion to the euro).

Source: Country submission.

ENERGY SUBSIDIES

The energy laws of 1999 not only prohibit cross-subsidisation but also require increased productivity and lower tariffs. The CREG monitors the market to ensure that no cross-subsidisation between different consumer groups exists. However, several subsidies remain. At the federal level, a social fund for

heating oil provides rebates to low-income heating oil customers during periods of high prices. In addition, different taxation levels for different classes of customers function as cross-subsidies. For example, industrial exemptions from the special tax on domestic energy products provide a subsidy from residential to industrial customers.

Annually, Flanders provides free to each household 100 kilowatt-hours (kWh) of electricity, plus an additional 100 kWh of free electricity for each household member. This is provided to all households, not just low-income ones. It effectively provides a small subsidy from small households to larger ones.

CRITIQUE

Since the last in-depth review, there have been a number of positive developments. Electricity and natural gas market reforms have further progressed in such areas as independent functioning of the electricity TSO, allocation of cross-border electricity transmission capacity at the northern border using market-based mechanisms, the entry of new market players and the development of an electricity exchange, Belpex. Belgium is also working with its neighbour France and the Netherlands to further integrate their markets and improve and increase cross-border exchange of electricity capacity. The regions and the federal level are taking measures to tackle climate change and achieve their part of the Kyoto commitment through such measures as rigorous building performance measures and green certificate trading schemes. A notable recent development is the decision to create a centralised oil stockholding agency. This is a very positive step, as it will not only help Belgium meet its IEA stockholding requirement, but also enhance the country's overall security of supply.

Despite this progress, Belgium still faces many challenges, the most important of which are as follows:

- Its extremely complicated regulatory structures that segment the market, reduce market efficiency within the country and hinder the development of integrated European energy markets.
- The lack of a long-term strategy to replace nuclear power, which provides about 55% of its electricity and is scheduled to be phased out beginning in 2015.
- The dominance of Suez in all areas of natural gas and electricity market operations.

As a federal country, Belgium's government structure is complex. Under the resulting division of responsibilities between the federal and regional governments, it is challenging to achieve national energy policy goals, such as energy security, market liberalisation and sustainable development. For example,

the pace of market opening is different between the three regions. In addition, the systems to pursue public service obligations and to promote renewable energy and CHP are not fully compatible among regions. These differences reduce the efficiency and effectiveness of the energy systems of Belgium as a whole. Furthermore, lack of integration between the regions of Belgium will necessarily hinder the country's integration with its neighbouring countries and with the larger European market, integration that Belgium has committed to through its membership in the EU as well as its joint implementation agreement with France and the Netherlands. Thus Belgium should continue to harmonise its regional energy markets' rules and régulations – a process that does not require all regions to adopt the same energy policies and goals – while it also works to integrate a cohesive Belgium with its neighbouring countries and Europe.

The main forum for federal-regional co-operation, in order to ensure coherent and consistent design and implementation of policies, is CONCERE/ENOVER. The forum, which meets monthly, only has the authority to make recommendations. The federal and regional governments should strive to strengthen their co-operation and co-ordination with a view to harmonising their energy policies and measures. One area where such consultation would be particularly beneficial is in long-term planning. It would be useful for the federal and regional governments to develop scenarios as an evolving reference for considering combined impacts of federal and regional policies.

In 2003, Belgium passed legislation requiring the phase-out of nuclear power between 2015 and 2025. Nuclear energy presently supplies about 55% of the country's electricity generation. As a result, this huge supply gap will have to be covered by a combination of energy savings, electricity imports or additional electricity generating capacity based on renewable sources, gas and/or coal. The effects of the phase-out will vary considerably, depending on how nuclear power is replaced. The government has studied various scenarios and their implications on energy mix, gas and electricity imports and CO_2 emissions. Judging from these scenarios, the nuclear phase-out will increase CO_2 emissions substantially in 2030, while it is neutral for Belgium's short-term compliance with the Kyoto target. However, the study does not provide a broader assessment of the effect of the phase-out on matters such as the national economy, including energy prices, required electricity and gas transmission infrastructure and emissions of other pollutants, nor does it take into account the potential for energy savings through demand-side management and energy efficiency measures. The federal government should conduct more comprehensive long-term studies on the effects of the phase-out of nuclear power and the available options to replace nuclear on energy security, environmental protection and economic growth. Such studies should be made public so that all stakeholders will understand the implications of the nuclear phase-out.

Regardless of the future of nuclear power, it is clear that the electricity and gas grids need to adapt to long-term changes in the generation and fuel mix. Like

many other countries, Belgium also suffers from NIMBY phenomena about planning, siting and building of energy-related infrastructure. Such processes should be streamlined as much as possible under close co-operation between the federal and regional governments.

A law recently passed transfers some powers currently resting with the federal regulator to the federal government. The government should ensure that this transfer does not weaken the power and effectiveness of the regulator, or the ability of the regulator to provide incentives so that optimal infrastructure investments are made to ensure third-party access (TPA). As Belgium moves towards competitive markets, it should strengthen stability and regulatory certainty in order to remove barriers to entry and increase market efficiency.

The existence of the federal regulator and the regional regulators derives from the country's federal structure. However, the federal structure does not necessarily preclude the possibility of having more co-ordinated and national regulation. For example, in Australia, a new single regulator, the AER, will replace the current 8 gas regulators and 13 electricity regulators, which will facilitate a more nationally focused market, minimise regulatory overlap and ease the burden of companies working in multiple states. The federal and regional governments should review the current multi-layer and multi-regulator structure. At the very least, the co-ordination and co-operation among the regulators should be further strengthened to avoid segmentation of the market and complex regulatory procedures. Market harmonisation between the regions should be a short-term energy policy goal. As discussed earlier, it is also a pre-requisite for integration with European energy markets, which should be a longer-term energy goal. To this end, the collaboration with France and the Netherlands on cross-border electricity trade is a good first step. By enlarging the geographic size of its energy markets through better connections to, and co-ordination with, neighbouring countries and the greater European market, Belgium can both improve its security of supply and create more efficient, competitive markets for Belgian customers.

Belgium has had a vertically integrated monopoly energy supplier of gas and electricity, which has since been legally unbundled. However, there is still cross-ownership and the supply companies, Distrigas and Electrabel, continue to have a dominant share of the Belgian gas and electricity markets. This structure could prevent the development of a well-functioning Belgian energy market. Appropriate measures should be taken to reduce the dominance of these incumbents. Furthermore, sufficient resources to prevent anti-competitive behaviour and to intervene, when necessary, should be given to relevant regulators and authorities.

Cross-subsidisation still exists between energy users to meet social objectives, either through direct subsidies or partial or full tax exemptions for specific energy products. In particular, granting free electricity to small end-users in

Flanders could affect energy efficiency. In addition, in September 2005, the federal government announced a set of measures to cushion the impact of rising oil prices. Consumers generally use energy more efficiently if prices accurately reflect costs. The government should strive to rectify the situation. Social policy objectives are better achieved by direct support rather than distorting energy prices.

RECOMMENDATIONS

The government of Belgium should:

- *Strengthen the collaborative process of the federal and regional governments – through CONCERE/ENOVER and any other forums – paying close attention to reducing any disjoints between energy policies that would significantly reduce efficiency.*
- *Harmonise energy policies and measures both between federal and regional levels and across regional levels.*
- *Deepen collaboration with neighbouring countries in order to increase the effectiveness of energy policy. This includes continuing the efforts to create a real single energy market with neighbouring countries, and eventually an integrated European market.*
- *Continue to develop scenarios as an evolving reference for considering the combined impacts of all federal and regional policies and measures.*
- *Conduct long-term quantitative studies assessing the effects of the phase-out of nuclear power and the available options to replace nuclear on energy security, environmental protection, energy prices and economic growth, and make the results publicly available and understood.*
- *Ensure that the gas and electricity grids are able to adapt to long-term changes in the generation and fuel mix.*
- *Streamline the process of planning, siting and building energy infrastructure.*
- *Take measures to reduce the dominance of the incumbent actor in the gas and electricity markets to improve competition.*
- *Give relevant regulators and authorities the necessary means to prevent anti-competitive behaviour and intervene when necessary.*
- *Review the need for four independent regulators in the electricity and gas sectors. If multiple regulators are needed, further strengthen co-ordination among them.*

- *Ensure that the transfer of responsibilities from the independent regulator to the federal government does not diminish the regulator's effectiveness.*
- *Phase out energy subsidies to consumers, including the provision of "free" electricity and other subsidies or rebates that shield consumers from accurate price signals, and instead use social policy instruments to provide economic subsidies.*

ENERGY AND SUSTAINABLE DEVELOPMENT

In the autumn of 2004, Belgium passed the Federal Plan for Sustainable Development (2004–2008), a key goal of which is climate change mitigation and more intensive use of clean energy, addressed by:

- Strengthened federal co-ordination, including the development of a green tax system for buildings, companies and transport and electricity sectors.
- Fair prices, including the progressive limitation of existing advantages on certain products or activities, and reform of the taxation system (shifting from the taxation of work towards taxation of resource consumption).
- Flexible mechanisms, including proactive dialogue with developing countries, strengthened financial and technical assistance and capacity building.
- Promotion of alternative energies, including fiscal incentives and research focused at the regional level, plus promotion of biofuels.
- Clean buildings, including streamlining investments in energy efficiency, most notably through third-party financing.
- Transport sector activities, including public transport programmes, clean car technologies and tax incentives that take into account environmental performance and miles driven.

CLIMATE CHANGE

KYOTO TARGET

Belgium has ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol and has agreed to reduce emissions by 7.5% below 1990 levels based on the EU burden-sharing Agreement. Through a burden-sharing agreement among the federal and regional governments, the three regions have different targets (see Table 15). Wallonia will reduce its emissions by 7.5% below 1990 levels during the 2008–2012 period. Flanders will reduce its emissions by 5.2%. The Brussels-Capital region can increase its emissions by 3.5%. The federal authority will compensate the difference between the total emissions under Belgium's regional burden-sharing agreement and its commitment under the Kyoto Protocol (2.46 Mt/year) by

acquisition of emissions credits on the international market.[1] The gap must be filled by joint implementation (JI) early credits and clean development mechanism (CDM) projects through 2007. After 2007, the Belgian government may purchase reductions on the international market from countries with excess assigned amount units (AAUs)[2]. For example, many countries with economies in transition are expected to more than meet their Kyoto targets and can offer their excess AAUs to the international market. However, the federal government has decided that AAUs from the international market will only be purchased if JI and CDM options exceed the available budget allocated to the Kyoto Fund. The EU Directive on Emissions Trading[3] has been fully transposed by all three regions.

Table 15

Internal Belgium Burden-sharing Agreement to Meet Kyoto GHG Commitment

Units: $MtCO_2eq$	*1990 GHG emissions[1]*	*2008–12 GHG emissions (annual)*	*Change from 1990*
Wallonia	54.3	50.2	–7.5%
Flanders	88.0	83.4	–5.2%
Brussels-Capital	4.0	4.1	+3.475%
Total	146.2	137.7	–5.8%
Kyoto commitment	146.2	135.3	–7.5%
Difference from Kyoto commitment (to be purchased by the federal government)		2.5	

1. The numbers for 1990 GHG emissions are the estimates that prevailed at the time of the negotiation of the national burden-sharing agreement. Recently, estimates of 1990 emissions data have been amended. The most up-to-date figures can be found in the 2005 national GHG inventory to the UNFCCC. The figures presented in this table are used throughout this report.

Source: National Allocation Plan.

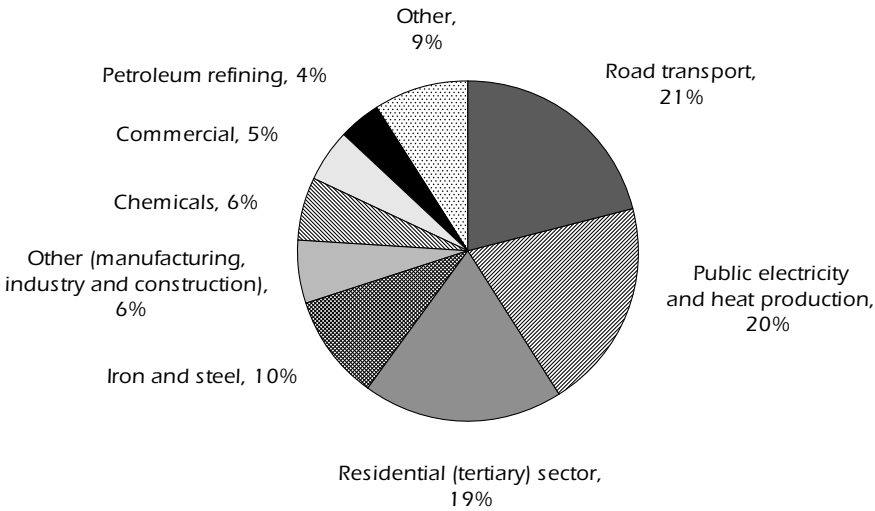
TRENDS IN CO_2 EMISSIONS

In Belgium, energy accounts for 81% of total GHG emissions. The largest sources of energy-related emissions are highlighted in Figure 7.

1. The regions will also likely fulfil part of their emissions target through the purchase of reductions on the international market, depending on, in part, to what extent they reach their targets internally.
2. The assigned amount is the total amount of GHG that each Annex B country is allowed to emit during the first commitment period of the Kyoto Protocol. An Assigned Amount Unit (AAU) is a tradable unit of 1 tCO_2-eq. Annex B countries are the 39 emissions-capped countries listed in Annex B of the Kyoto Protocol.
3. EU Directive 2003/87/EC establishing a scheme for GHG emission allowance trading within the Community, 13 October 2003.

Figure 7

Sources of Energy-related CO_2 Emissions, 2003



Source: Country submission.

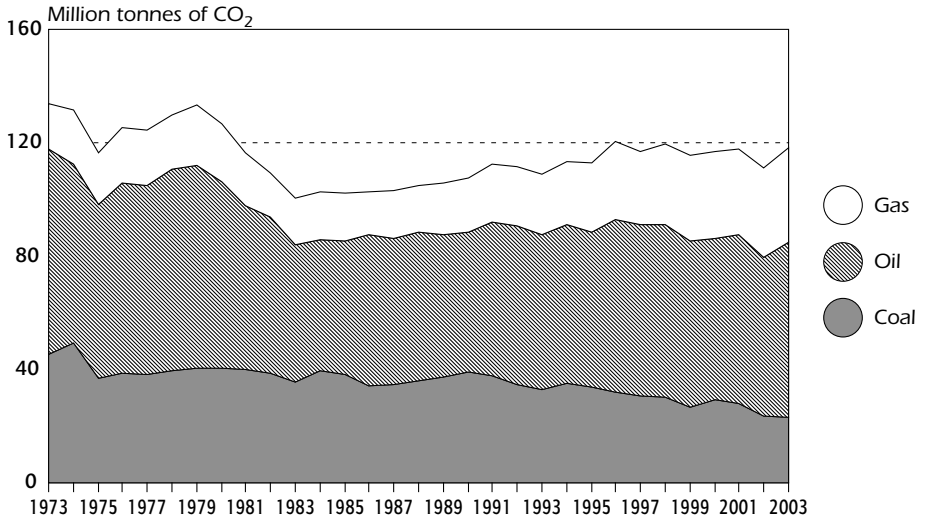
In 2003, according to IEA/OECD data[4], total CO_2 emissions were 120 Mt, an 11% increase from 1990 when emissions were 109 Mt (see Figure 8). During that time, emissions grew at an average annual rate of 0.8%. Emissions from coal dropped by more than 40% due to fuel switching from coal to natural gas for electricity generation, as well as to restructuring in the iron and steel industry, which has decreased its annual consumption by 3.5% per year since 1998. Emissions from coal now account for a fifth of CO_2 emissions. Emissions from oil have grown by 25% since 1990; oil emissions now account for just over half of total emissions. The largest growth in emissions was from natural gas, where emissions grew by over 75%. Emissions from natural gas now account for about 30% of total CO_2 emissions.

The main drivers of the increase in emissions are increases in road transport and the commercial and industrial sectors (primarily heating). Emission decreases occurred in the iron and steel sectors and in the manufacturing industry and construction.

4. Figures in the IEA/OECD database are based on data submitted by member countries. However, these data do not match GHG emissions estimates submitted by Belgium to the UNFCCC because of data treatment differences. According to Belgium's 2005 submission to the UNFCCC, CO_2 emissions from fuel combustion activities were 116.1 Mt in 2003, a 5.6% increase from 1990's emissions of 109.9 Mt. The average annual growth rate was 0.42%.

Figure 8

CO_2 Emissions by Fuel*, 1973 to 2003



* estimated using the IPCC Sectoral Approach.

Source: *CO_2 Emissions from Fuel Combustion*, IEA/OECD Paris, 2005.

Like many parties to the Kyoto agreement, Belgium's current GHG emissions are higher than emissions in 1990. On the basis of 2003 emissions, annual GHG emissions will have to fall by over 12.4 million tonnes of carbon dioxide equivalent ($MtCO_2$-eq) to meet the 2008–2012 annual targets of the Kyoto Protocol, a reduction of 8.4% – greater than the 7.5% reduction originally envisioned in the agreement. However, because Belgium intends to meet a portion of its commitment – 2.46 $MtCO_2$-eq/year – by federal government purchases of emissions reductions on the international market, the regions must actually reduce their emissions by about 10 $MtCO_2$-eq annually through emissions trading and other domestic measures.[5] This corresponds to a reduction of about 7% from 2003 levels. Table 16 details GHG emissions by region and for all of Belgium, comparing 1990 emissions, 2003 emissions and the 2008–2012 Kyoto target. Given the decline in emissions in Wallonia between 1990 and 2003 and the Brussels-Capital region's small share overall of emissions, the greatest share of reductions, over 75%, will have to be made by the Flemish region to meet the Kyoto target.

5. As noted in footnote 1, the regions have also indicated that they intend to purchase a portion of their required emissions reductions on the international market; the amounts of these purchases are undefined, unlike the federal purchases, and excluded from Table 16.

Table 16

Progress Towards the Kyoto GHG Emissions Target by Region

($MtCO_2eq$)	*1990 emissions*	*2003 emissions*	*Kyoto target under Belgium's burden-sharing agreement[2] (2008–2012)*	*Difference between 2003 emissions and Kyoto target*
Wallonia	54.3	50.6	50.2	0.3
Flanders	88.0[1]	91.1	83.4	7.7
Brussels-Capital	3.99	4.49	4.13	0.36
Total	146.2	147.7[3]	137.7	10.0

1. The most recent figure for 1990 emissions in Flanders is 87.83 $MtCO_2eq$, according to CRF2005.
2. Actual Kyoto target is 135.27 $MtCO_2eq$/year. Belgium intends to purchase 2.46 $MtCO_2$/year to make up the difference.
3. 2003 emissions do not add up to total 2003 emissions because of different methodological approaches for the estimation of emissions from transport in the regional and the federal statistics. Furthermore, according to Belgium's 2005 submission to the UNFCCC, total national emissions were 145.66 $MtCO_2eq$ in 1990 and 147.7 in 2003. It should also be noted that Belgium will likely make use of the provision of the Kyoto Protocol that allows the use of 1995 as the base year for fluorinated GHGs. Using this option, emissions for the "reference year" (not 1990) are 146.8 Mt, which gives a Kyoto target of 135.8 Mt/year; and a "distance-to-target" in 2003 of 8.1 Mt.

Source: National Allocation Plan and Annual European Community greenhouse gas inventory 1990–2003 and inventory report 2005.

In its country submission to the EU European Environment Agency, Belgium has reported its overall progress towards its greenhouse gas commitments.[6] Belgium noted that in 2002 its GHG emissions were 6.6% above the level necessary to meet its Kyoto commitment, assuming a linear path from 1990 emissions to 2010 target emissions. It also noted that only with additional measures would it be able to meet its Kyoto commitment.

Over the long term, in the absence of emissions trading or a carbon price, long-term CO_2 emissions are expected to rise through 2030. As shown in Table 12 in Chapter 3, the BFP's modelling results predict that under the reference scenario, though CO_2 emissions related to energy use will fall by 0.30% annually between 2000 and 2010, they will then start to rise, growing at a relatively high 2.1% annual rate between 2020 and 2030. A scenario assuming high gas prices would raise the growth of CO_2 emissions slightly, whereas implementation of CHP and renewables policies would slow the growth somewhat, in comparison to the reference scenario. Should Belgium continue to rely on nuclear power, CO_2 emission growth rates would drop dramatically. In the case of the NUC2 scenario, total CO_2 emissions would in fact begin to decline after 2020. These scenarios do not assume emissions trading or a price on carbon dioxide.

6. European Environment Agency, *Analysis of greenhouse gas emission trends and projections in Europe 2004*, Annex 1, EEA Technical Report No. 7/2004.

Modelling exercises conducted by the Fraunhofer Institute in 2003 suggest that Belgium can meet its Kyoto reduction targets, and even go further, but only if efforts to improve energy efficiency are considerably larger than in the previous decade. This does not seem out of scope given the comparatively high level of energy consumption in Belgium on a European scale, but such changes are not likely to arise in an autonomous way. The results of the modelling exercises are shown for three different scenarios in Table 17.

The "reference scenario" is defined to closely match the scenario used when developing the 3rd National Communication to the UNFCCC on GHG emissions. The "benchmarking scenario" assumes potential efficiency improvements similar to those achieved by other European countries. The "economic potential scenario" assumes international best practices in Belgian, and also incorporates demand reduction potentials derived from other Belgian studies. In terms of costs, the benchmarking and economic potential scenarios are assumed to have net zero costs to the economy on a life cycle basis. In reality, however, this ignores a number of costs including transaction costs and some investment costs.

Table 17

Modelled Energy-Related CO_2 Emissions, 1990 to 2020

	2012 emissions compared with 1990	*2020 emissions compared with 1990*	*2012 emissions compared with 2001*	*2020 emissions compared with 2001*
Reference scenario	8.3%	15.5%	8.4%	15.6%
Benchmarking scenario	–8.1%	–7.7%	–7.6%	–7.2%
Economic potential scenario	–14.4%	–18.7%	–13.9%	–18.2%

Source: *Energy Efficiency in the Framework of Belgium's Efforts to Reduce Greenhouse Gas Emissions*, Fraunhofer Institute for Systems and Innovation Research, 31 May 2003.

ACTIONS TAKEN TO MEET THE KYOTO TARGET

National climate plan

In order to reach their internal burden-sharing agreements, each of the three regions has come up with a climate plan. A comprehensive national climate change plan to meet Belgium's Kyoto GHG emissions commitment is under development. Work is also ongoing on harmonising national and regional projections, federal and regional statistics, and on the co-ordination of flexible mechanisms.

To achieve the goals of the National Climate Plan, a number of policies and measures were decided upon in 2004 to be implemented at the federal level:

- Offshore wind energy plant in the North Sea (Thornton Bank).
- Switching two coal-fired power plants (Mol, Awirs) to biomass by 2009.
- Fiscal advantages to promote biofuels uptake (2% biomass content in 2005).
- Implementing the EU CO_2/cars strategy (final objective of 120 g CO_2/km, 140 g CO_2/km by 2008–2009).
- Switching federal administrations' car fleet to "clean technologies" through public procurement rules and management agreements with state-owned enterprises.
- Government funding scheme for third-party financing (FEDESCO established, EUR 1.5 million starting capital).
- Measures to promote more economic driving behaviour (through a sustainable mobility plan).
- Promoting the EU energy labelling scheme for household appliances.
- Regional Express Network around Brussels (RER).
- Promoting public transport (civil servants to commute by train free of charge, reducing fiscal deductibility of car use for home-to-workplace travel).
- Subsidies for freight transport by rail (EUR 30 million in 2005 compared to EUR 15 million in 2004).
- Sustainable energy use in federal administrations through environmental management schemes.
- Enhanced tax incentives for investments in energy efficiency and renewable energy by households.
- Enhanced tax deductibility for energy efficiency investments in industry; technical working group chaired by Finance Minister.
- Tax advantage for cars with low emissions (already implemented).

Flanders

At the regional level, the Flemish climate policy plan 2002–2005 foresees a stabilisation of GHG emissions by 2005 compared to 1990. This objective was made conditional on the federal authority taking helpful measures in the fiscal area and with regard to transport and product policy. Flanders' efforts to meet its commitment under the burden-sharing agreement take action in many different sectors of the economy:

- Operational benchmarking agreement with large energy-intensive industrial companies (for more information, see Chapter 5).
- Energy audit agreements with medium-sized energy-intensive industrial companies (final approval by the Flemish government was received on 10 June 2005).

- Green certificate scheme (for more information, see Chapter 6 on renewable energy).
- Approval of legislation on energy performance standards for buildings.
- Optional voluntary agreements with local authorities on sustainable development.
- Public service obligations for electricity grid operators.
- CHP certificates (system operational from January 2005 onwards).
- Comprehensive mobility plan, including changing transport modes, increasing public transport and infrastructure, promotion of cleaner vehicles and cleaner driving, introduction of biofuels.
- Set-up of platform on environment and innovation.
- Subsidies for energy investments by industry.
- Implementation of energy efficiency rules for waste incineration plants.
- Definitive approval of legal obligations on energy savings in environmental legislation.
- Approval in principle of a certification scheme for cooling technicians.
- Reduction plan on fluorinated greenhouse gases.
- Negotiations with industrial sector on nitrous oxide (N_2O) emissions from nitric acid (HNO_3) production.
- Execution of the Climate Action Plan for the agricultural sector.
- New demonstration projects in social housing.
- Monitoring of energy use of 255 public buildings and energy auditing of the 100 largest public buildings and of public buildings with comfort and/or energy plans.
- Maximising valorisation of landfill gases.
- Introduction of energy-efficient criteria for evaluating investments in the welfare sector.
- Continuous information campaigns on the efficient use of energy.

On 6 June 2005, the Flemish Climate Conference was established. This is a broad-based consultation process with all economic sectors, social unions, environmental groups, local authorities and numerous experts, through which the Flemish government and the target groups signed a declaration of commitment. The target groups commit themselves to support the Kyoto objective of the Flemish government and to contribute to the development of a long-term strategy for reducing GHG emissions after Kyoto. In working groups, new instruments and solutions are discussed in the area of strategy, science and innovation, transport, buildings, energy production, agriculture

and industry. The result of the consultation process will be integrated in the new Flemish Climate Plan 2006–2012, of which a first draft will be submitted to the Flemish government in the autumn of 2005.

Wallonia

To meet its commitment under the burden-sharing agreement, Wallonia has a number of policies:

- Voluntary energy-audit covenant agreements with energy-intensive industry (for more information, see Chapter 5 on energy efficiency).
- Green certificate scheme (for more information, see Chapter 6 on renewable energy).
- Promotion of renewable energy sources and cogeneration.
- Implementing the EU Emissions Trading Scheme.
- Policies to promote the rational use of energy in industry, tertiary and residential sectors.
- Strengthened standards and compliance monitoring for insulation, boilers, etc.
- Financial incentives for energy audits.
- Implementation of the biodiesel directive.
- Public transit improvements.
- Promotion of green mobility.
- Creation of a multimodal transport platform.
- Regulation of nitrogen fertilisation on agricultural lands.
- Preservation of forest integrity.
- Reduction of waste production at the source.
- Methane recovery at waste dump sites.

Brussels-Capital

In November 2002, the Brussels-Capital government adopted an eight-year air and climate plan, the "Plan for Structural Improvement in Air Quality and Fight Against Climate Change, 2002–2010". This plan has 81 prescriptions concentrated on concrete actions to reduce the main air pollutants and GHGs. The most efficient prescriptions for reducing GHG emissions are in three areas:

- Road transportation: Actions in traffic and parking management, mobility plans for public transport, clean vehicles, etc.
- Energy consumption of building heating systems: Actions in thermal regulation, control, energy certification, eco-construction, etc.
- Commercial consumption: Regulation and control of refrigeration installations, etc.

In general, the cost-effectiveness and the potentials of various efforts to achieve GHG emissions reductions have not been evaluated. More has been carried out at the regional level than at the federal level. There are plans to evaluate proposed and operational policies and measures the basis of on these criteria in the future.

National allocation plan

Belgium is a party to the European Union Emissions Trading Scheme (EU ETS), which is a mandatory cap and trade emissions market for industrial and combustion installations. Though it is not directly linked to the UN Framework Convention on Climate Change and the Kyoto Protocol, it is a key mechanism that the EU is using to meet a significant portion of its larger Kyoto commitment. Whereas the Kyoto Protocol covers the 2008–2012 period, the first period of the EU ETS is 2005–2007. Details for later periods, including those that overlap with the Kyoto compliance period, have not yet been fully determined.

As part of the EU ETS, each country establishes a National Allocation Plan, which is an accounting of the total quantity of CO_2 emissions that EU member countries allocate to their energy and industrial companies and installations, which can then be bought or sold in the EU-ETS market. Belgium completed its National Allocation plan in June 2004; it was accepted by the European Commission in October 2004. Details of Belgium's National Allocation Plan are provided in Table 18.

Table 18

National Allocation Plan Allowances by Region and Sector

Units: $MtCO_2$	*2003 emissions*	*Average annual emissions allocations (2005–07)*	*Difference from 2003*
Wallonia	**26.7**	**25.9**	**–0.8**
Electricity sector		*7.3*	
Other sectors		*18.6*	
New entrants reserve[1]		*2.0*	
Flanders	**37.1**	**34.3**	**–2.8**
Industry (existing)		*17.8*	
Opt-out		*0.3*	
Energy production (existing; incl. CHP, blast furnace gas)		*15.7*	
New entrants reserve		*0.5*	
Brussels-Capital	**0.09**	**0.093**	**+0.003**
Energy		*0.006*	
Industry		*0.050*	
Tertiary		*0.030*	
New entrants reserve		*0.007*	
Total	**63.9**	**60.3**	**–3.6**

1. This reserve is not counted in the total. It includes 1.787 $MtCO_2$/year set aside for special steel reserves and mothballed plants.

Sources: National Allocation Plan; Data for Flanders are from the Flemish Allocation Plan for CO_2-emission allowances 2005–2007, as approved by the Flemish Government on 18 Feb 2005 (available in Dutch on http://lucht.milieuinfo.be/custom7_02.cgi?id_tab=20&code_hoofdinhoud=72&code_subinhoud=126).

Wallonia has allocated allowances totalling 25.9 $MtCO_2$ to energy and industrial installations (excluding reserves). This corresponds to a 0.8 $MtCO_2$ reduction from 2003 emissions in these sectors. Flanders has allocated 34.3 $MtCO_2$ to sectors covered by the EU-ETS, corresponding to a 2.8 $MtCO_2$ reduction from 2003. Finally, Brussels-Capital has allocated allowances totalling 0.093 $MtCO_2$ to energy and industrial sectors, corresponding to an increase from 2003 emissions. Overall, Belgium expects to reduce emissions by 3.6 $MtCO_2$ from 2003 emissions in sectors covered by the EU-ETS.

The regional authorities are responsible for allocations to almost all installations. Only backup installations of nuclear power plants fall under federal jurisdiction. However, Belgium wants these installations, as well as military installations (except in the Brussels-Capital region), the compression installations on the natural gas transport grid and Flanders building heating installations to be exempt from EU-ETS allocation requirements. An application from Belgium is currently under consideration by the European Commission, covering less than 0.3 Mt/year, about 0.5% of the total allocation.

Allocation rules are different for the energy production sector, the industrial sector and the tertiary sector. They also differ between the regions. Approximately 9 $MtCO_2$ was set aside to accommodate any new market participants in "new entrants reserves." These reserves are not interchangeable between regions.

Industrial installations were allocated allowances on the basis of benchmarking agreements in Flanders or energy audit covenants in Wallonia. Energy plants received emission allocations on the basis of historical data and several growth and reduction scenarios.

Sources of reductions to meet the Kyoto commitment

On the basis on the EU-ETS allocation for the 2005–2007 period, Belgium intends to reduce emissions by 3.6 $MtCO_2$ from 2003 levels through the EU-ETS (see Table 19). Given that the total reduction below 2003 levels necessary to meet the Kyoto target is 10 $MtCO_2$, this indicates that, to fill the shortfall, an additional 6.3 $MtCO_2$ of reductions – about two-thirds of all reductions – must come from actions taken apart from the Emissions Trading Scheme. It must be noted that this is only an estimate, as the calculation is made using both *i)* expected reductions from EU-ETS, which has a first compliance period from 2005 to 2007, and *ii)* total Kyoto target reductions, which has a compliance period from 2008 to 2012. Should Belgium's EU-ETS allocation in the second period be substantially different from that of the first period, this would alter the amount of reductions necessary from actions taken apart from emissions trading. Nonetheless, this rough calculation of 6 $MtCO_2$ provides a good estimate of emissions reductions necessary in addition to those to be achieved by the EU-ETS.

Regionally, Wallonia expects to more than meet its emissions target through reductions in sectors covered by the trading scheme; it will not need to achieve

further reductions in sectors not covered by EU-ETS. On the other hand, Flanders' reductions are coming primarily from the EU-ETS. About two-thirds of its total necessary reductions will need to come from sectors not covered by the EU trading scheme. As just 2% of CO_2 emissions in Brussels-Capital are in the industrial and energy sectors covered by the EU-ETS and that activity in this sector is expected to grow somewhat, all of the region's emissions reductions will need to come from outside emissions trading.

Table 19

Reductions Necessary to Meet the Kyoto Target

Units: $MtCO_2eq$	*Annual emissions reductions necessary to reach Kyoto target under Belgium burden-sharing agreement[1] (2008–2012)*	*Annual emissions reductions to be achieved from EU ETS (in the 2005–2007 period)*	*Remaining reductions that must come from other actions*	*Percentage of total necessary reductions from actions other than the EU ETS*
Wallonia	0.3	0.8	-0.5	0%[2]
Flanders	7.7	2.8	4.9	63%
Brussels-Capital	0.361	-0.003	0.364	100%[3]
Total	**10.0**	**3.6**	**6.3**	**64%**

1. Actual Kyoto target is 135.27 $MtCO_2eq$/year. Belgium intends to purchase 2.46 $MtCO_2eq$/year to make up the difference.
2. In fact, Wallonia would achieve more than its necessary reductions from savings through EU-ETS; emissions from other sectors could grow by 0.05 $MtCO_2eq$, while Wallonia would still meet its emissions target.
3. No reductions are expected from the trading sector in Brussels-Capital.

Source: National Allocation Plan and Annual European Community greenhouse gas inventory 1990-2003 and inventory report 2005.

AIR POLLUTION

The regions have made significant progress in reducing other emissions. In Flanders, for example, SO_2 and NO_x emissions have fallen 92% and 66% respectively since 1980, outpacing expectations. The voluntary agreements that achieved these reductions will be continued in Flanders, but have not been extended in other regions. Flanders' agreements with the electricity industry will limit SO_2 emissions, which were 25 000 tonnes in 2002, to 7 500 tonnes in 2008. NO_x emissions will be limited to 14 000 tonnes, down from 29 000 tonnes in 2002. In the Flemish electricity sector, continued reductions will be achieved by further implementation of primary and end-of-pipe techniques, and a further switch to cleaner fuels and cleaner production.

In Wallonia, domestic energy consumption is rising, electricity generation in particular. Atmospheric emissions of acidifying pollutants, however, have decreased by 24% over the last decade. This is mainly because of the use of

less polluting fuels. Nevertheless, levels of tropospheric ozone often exceed 2010 targets, mainly in rural areas.

In the Brussels-Capital region, SO_x, NO_x and particulates emissions decreased by 57%, 20% and 5%, respectively, from 1990 to 2002. These decreases are primarily due to the closure of the cokery, the switch to the use of less polluting fuels, the implementation of a smoke-cleaning system at the waste incinerator and the improvement of the vehicle car park.

CRITIQUE

Belgium's 2003 GHG emissions slightly exceed 1990 emissions, meaning that it has to reduce its total emissions by 8.4% to meet its Kyoto commitment – a greater reduction than the 7.5% reduction originally envisioned. However, because the federal government intends to purchase a portion of its reductions on the international market, Belgium must in fact reduce its emissions by about 7% below 2003 levels, and possibly less as the regions also intend to purchase some emissions on the international market. Regardless of the exact amount of international purchases, it will still be a very challenging mission for Belgium to meet its GHG target. Not only does Belgium's emissions path since 1990 show that it is currently not on target to meet its Kyoto commitment, but modelling results also show that energy-related CO_2 emissions will surpass 1990 emissions by 8.3% in 2012 under one scenario. Nevertheless, studies suggest that Belgium can meet its Kyoto target, but this will necessitate significant actions to dramatically improve energy efficiency and fully implement the EU-ETS. As noted to the European Environment Agency, additional measures will also probably be necessary. Furthermore, the nuclear phase-out beginning in 2015 will make it much more difficult to achieve further CO_2 emissions reduction beyond the first Kyoto commitment period, unless measures to tap the country's extensive energy efficiency potential are taken without further delay. Given the phase-out policy, Belgium should ensure that plans to meet any CO_2 emission commitments beyond 2015 take into account the emissions of CO_2 from any sources that replace nuclear.

Federal and regional governments have decided to implement various policies and measures to achieve the national goals. A national climate change plan is under development, the first draft of which is expected in October 2005. However, thus far little analysis on the cost-effectiveness and the potential emissions reductions of individual implemented measures has been carried out at the federal level, although some analyses have been carried out at the regional level. In developing the national climate change plan, careful calculations of emissions reduction potentials and costs of policies and measures are essential to ensure the cost-effectiveness and the sustainability of Belgium's climate change mitigation efforts.

Based on the division of energy and environment policy responsibilities, the regional governments develop climate change mitigation strategies to achieve their targets. In fact, they are adopting similar policies and measures such as green certificates, incentives for energy-efficient investment and voluntary covenants. While taking into account the specific circumstances in each region, the harmonisation of these policies and measures should be pursued in order to maximise their total impacts. As discussed in the chapter on renewable energy, the harmonisation of green certificate schemes would be a beneficial first step towards maximising the benefits of actions to reduce CO_2 emissions. In this context, it is encouraging that work is ongoing to harmonise federal and regional projections, statistics and implementation of flexible mechanisms.

As the EU-ETS has been established, it will be the combination of emissions reductions from the EU-ETS based on the allocated amount of emission allowances to the sectors covered by the EU-ETS and the emissions reductions achieved in sectors not covered by the EU-ETS that primarily decide whether Belgium and its regions will be in compliance with its Europe-wide burden-sharing commitment under Kyoto or not. In general, it can be more challenging to achieve emissions reductions outside the emissions trading scheme because the stakeholders in the residential/commercial and transport sectors are much more widespread and numerous compared with those covered in the EU-ETS, primarily the industrial and energy sectors. Furthermore, unlike the EU-ETS, which is a single programme with a clear mechanism to meet emissions targets and clear enforcement and penalties, the remaining reductions will come from a wide range of policies and measures that will not be subject to a single and strong monitoring and enforcement mechanism. Given that to meet its Kyoto commitment about two-thirds of overall emissions reductions must come from policies and measures outside the emissions trading scheme, it is vital that great care is taken in implementing these policies and measures, particularly in monitoring their impacts.

There is a trade-off between a generous or strict allocation of emission allowances under the emissions trading scheme, an ambitious or less ambitious implementation of additional domestic policies and measures outside emissions trading and the purchase of emissions reductions on the international market by the Belgian government. A generous allocation under EU-ETS could reduce the cost for the industrial sectors and ease pressures on their international competitiveness. However, this would require more stringent domestic policies in the non-trading sector, which are likely to be more difficult to enforce and monitor compared with the emissions trading scheme, and possibly larger purchases of reductions on the international market by the Belgian government. On the other hand, a strict allocation under the emissions trading scheme could increase the cost for Belgian companies. As Belgium begins to decide on future allocations under the EU-ETS, careful analysis of the abatement costs in all sectors and of all options – including the purchase of reductions on the international market – should

be reviewed. This analysis of cost-effectiveness should be the basis for deciding how Belgium will meet its overall Kyoto commitments and how it will allocate reductions to emissions trading, how much should be expected from domestic policies that are in addition to emissions trading and how much should be purchased by the government from the international market, including credits from JI and CDM projects.

RECOMMENDATIONS

The government of Belgium should:

- *Give priority to the development and implementation of a National Climate Plan, which includes the calculation of emissions reduction potentials and cost-effectiveness of all policies and measures.*
- *Strive to harmonise, where possible, the policies and measures at federal and regional levels with a view to maximising their effects at national level.*
- *Ensure effective implementation and monitoring of policies and measures not covered by the EU-ETS.*
- *Ensure a balanced and cost-effective approach between developing domestic policies and measures apart from the emissions trading scheme, the government purchase of emission allowances on the international market and the allocation of emission allowances in the EU-ETS in order to meet the Kyoto target.*
- *Clarify how changes to Belgium's energy supply and demand profile due to the phase-out of nuclear power beginning in 2015 will affect CO_2 emissions, paying particular attention to how realising Belgium's significant energy efficiency potential may reduce these emissions.*

CURRENT ENERGY EFFICIENCY INDICATORS AND TRENDS

Energy efficiency for Belgium and its regions is in many respects low compared to other European countries as well as the EU average (evident in relatively high energy intensity, energy use per capita and CO_2 emissions per capita). This is in part due to a very energy-intensive industrial sector with a large share of manufacturing and production of iron, steel, cement, chemicals and sugar. It can also be attributed to a long-neglected energy demand policy. Furthermore, Belgium has historically had relatively poor energy performance of buildings, due in part to low compliance with building codes. With the passage of federal and regional legislation and plans, Belgium has reinforced its current focus on energy efficiency.

Considering realistic estimates on compliance with energy efficiency regulations in the 1990s, the overall impact of measures taken in that decade has been estimated at around 1 $MtCO_2$. These savings are due primarily to EU-wide negotiated car manufacturing agreements and EU labelling effects on appliance efficiency. There may have been some effects from regional thermal building codes.

In addition, in all regions there have been fiscal incentives for energy-saving investment in industrial, commercial and agricultural sectors since 1982. In the Flemish region, additional energy efficiency measures were put in place in the 1990s, such as subsidies for energy efficiency investments in industry and agriculture and subsidised energy efficiency demonstration projects. Since 2000, in Wallonia specific energy efficiency policies (information, formation, subsidies, etc.) have been reinforced in different sectors and at several government levels, improving the region's energy efficiency.

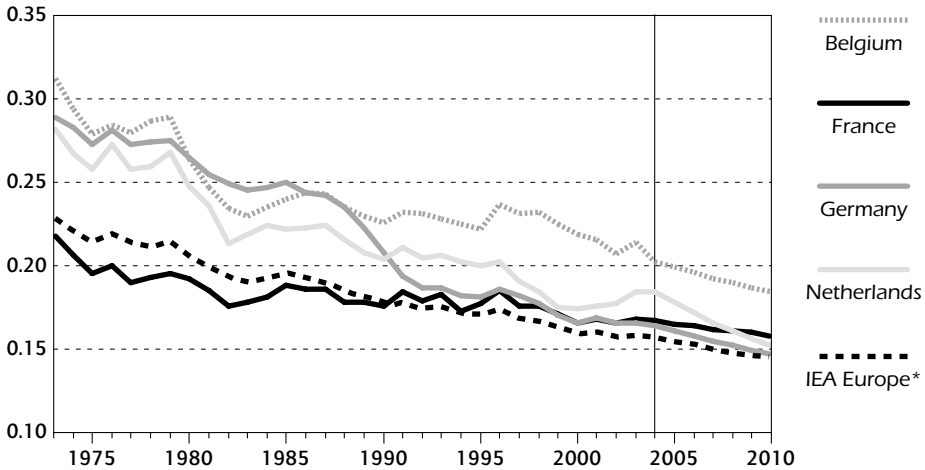
Energy intensity (total primary energy supply divided by GDP) in Belgium is considerably higher than that of other nearby countries, and has been falling at a slower rate than that of other nearby countries (see Figure 9). Since 1993, energy intensity has been falling at an average annual rate of 0.6% in Belgium, and has fallen at a rate of 0.9%, 1.1% and 1.2% in France, the Netherlands and Germany, respectively, over the same period. The rate at which energy intensity declines is expected to nearly triple in the future. Between 2003 and 2010, energy intensity is forecast to decline in Belgium by an average annual rate of 2.1%.

Another measure of energy efficiency is energy use per capita. Compared with other countries, Belgium's TPES on a per person basis is relatively high (see Figure 10). This is partly due to the large amount of energy-intensive industry in the region. This ratio is expected to climb at a relatively measured pace over the rest of the decade – 0.7% per year compared with 1.6% per year between 1990 and 2003.

Figure 9

Energy Intensity in Belgium and in Other Selected IEA Countries, 1973 to 2010

(toe per thousand USD at 2000 prices and purchasing power parities)



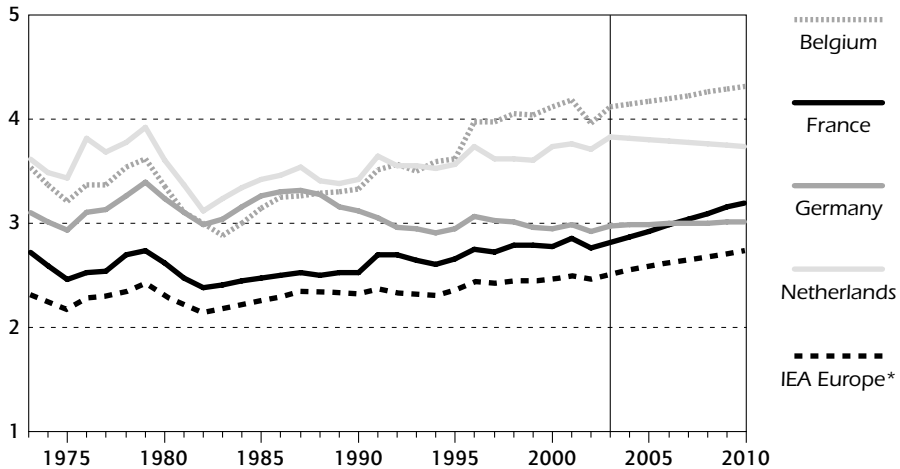
* excluding Luxembourg and Norway throughout the series, as forecast data are not available for these countries.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; *National Accounts of OECD Countries*, OECD Paris, 2005; and country submissions.

Figure 10

Energy Consumption per Capita in Belgium and in Other Selected IEA Countries, 1973 to 2010

(toe per person)



* excluding Luxembourg and Norway throughout the series, as forecast data are not available for these countries.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005; *National Accounts of OECD Countries*, OECD Paris, 2005; and country submissions.

ENERGY EFFICIENCY POTENTIAL

Modelling efforts indicate that there is strong potential for Belgium to dramatically improve its energy efficiency over time. In 2003, the Fraunhofer Institute released a comprehensive study on energy efficiency potential in Belgium, the results of which are presented in Table 20. The study compares three scenarios: *i*) a reference scenario that was defined to closely match the scenario used when developing the 3rd National Communication to the UNFCCC on GHG emissions, *ii*) a benchmarking scenario that assumed potential efficiency improvements similar to those achieved by other European countries and *iii*) an economic potential scenario that assumes international best practices in Belgium, and also incorporates demand reduction potentials derived from other Belgian studies. The study shows that energy efficiency strategies can provide efficiency improvements of up to 16% by 2012 and 26% by 2020, under the economic potential scenario. In terms of costs, the benchmarking and economic potential scenarios are assumed to have net zero costs to the economy on a lifecycle basis. In reality, however, this ignores a number of costs, including transaction costs and some investment costs.

Table 20

Modelling Results of Energy Efficiency Using Three Different Scenarios, 1995 to 2020

	1995	*2001*	*2007*	*2012*	*2020*
Total consumption (Mtoe)					
Reference scenario	*34.0*	*36.9*	*38.7*	*40.8*	*42.6*
Benchmarking scenario	*34.0*	*36.8*	*36.8*	*36.1*	*34.8*
Economic potential scenario	*34.0*	*36.8*	*36.1*	*34.2*	*31.4*
IEA estimates[1]	*36.7*	*43.1*	*44.2*	*45.8*	*47.8*
Energy intensity (Mtoe/GDP)					
Reference scenario	*0.16*	*0.16*	*0.15*	*0.14*	*0.13*
Benchmarking scenario	*0.16*	*0.16*	*0.14*	*0.12*	*0.10*
Economic potential scenario	*0.16*	*0.16*	*0.14*	*0.12*	*0.09*
Differences between scenarios (%)					
Benchmarking to reference scenario	*0%*	*0%*	*–5%*	*–12%*	*–18%*
Economic potential to reference scenario	*0%*	*0%*	*–7%*	*–16%*	*–26%*

1. IEA estimates based on Belgium's reference scenario included for comparison.

Source: *Energy Efficiency in the Framework of Belgium's Efforts to Reduce Greenhouse Gas Emissions*, Fraunhofer Institute for Systems and Innovation Research, 31 May 2003.

POLICIES AND MEASURES

Policies and measures focused on improving energy efficiency are derived primarily from implementation of EU directives into regional legislation, as well as other regional legislation. One exception is transportation energy efficiency policy, which is heavily influenced by federal policy in addition to regional policies.

FEDERAL POLICIES

Fiscal incentives for the residential sector

The federal law of 10/08/01 on reform of residential fiscal policy foresees that investment to improve energy efficiency may provide tax reductions for incomes from 2003. A budget of EUR 37 million has been assigned for these tax reductions.

Investments made to replace boilers that are 20 years old or older with new condensation or solar boilers provide a 15% deduction. Double-glazing, roof insulation, the installation of a central heating regulator and energy audits provide a 40% deduction. Total tax deductions may not exceed EUR 500 (1992 values) per household in the first year, but might be increased in following years. These deductions came into force by royal decree as of 1 January 2003.

Recently, the federal law of 23/08/04 modified fiscal deductions for energy-saving investments by households, applicable to 2005 revenues:

- 40% of investments are deductible, up to EUR 620 for new houses and EUR 750 for renovations, for all eight types of energy efficiency investment defined by the federal government.
- Only tenants can apply for these fiscal deductions.

FEDESCO

The Belgian government established an energy services company (FEDESCO) to promote energy efficiency, primarily in public buildings. FEDESCO began with EUR 1.5 million of government capital from the Kyoto Fund and is seeking EUR 5 million of private funding. FEDESCO will invest in profitable energy efficiency projects where the initial investment cost for the building owner or administrator is too high. The savings on energy bills first pay back the investment cost to FEDESCO; additional benefits accrue to the client.

IMPLEMENTATION OF EU DIRECTIVES

Four key directives inform EU energy efficiency requirements, one on labelling of household appliances, one on the fuel economy of passenger vehicles, one on the energy performance of buildings and one on combined heat and power (or co-generation). Belgium has implemented the directives related to appliance labelling and fuel economy. The regions are currently in various stages of developing and implementing the EU Directive on Building Codes and the General Energy Performance of Buildings, which are regional responsibilities. Currently, Flanders and Wallonia, but not Brussels-Capital, have implemented the EU Directive on CHP. More detailed discussion of Belgium's energy efficiency efforts related to building codes and CHP is provided later in this chapter.

INDUSTRIAL SECTOR

Because Belgium has a large share of energy-intensive industry, energy efficiency policy in Flanders and Wallonia focuses on efforts to improve industrial efficiency. Given the small scale of the industrial sector in Brussels-Capital – industrial consumption accounts for just 4% of overall consumption – the region has a much more limited programme focussed directly on industrial energy efficiency.

Flanders

Flanders' efforts to improve the energy efficiency of the industrial sector rely heavily on two types of voluntary agreements: benchmarking covenants and audit covenants. In return for entering into and keeping to these agreements, the federal government exempts the companies from additional energy efficiency requirements from the Flanders government, including any CO_2 taxes, and will do everything possible to exempt these companies from additional Belgian or European measures. Companies operating under benchmarking covenants are allocated sufficient emission allowances under the EU-ETS and receive more investment support for the rational use of energy.

Benchmarking covenants

Benchmarking covenants are voluntary agreements made with large energy-intensive companies with an annual consumption of at least 0.5 petajoules (PJ) or companies that fall under the EU-ETS. Under the covenant, companies agree to be among the top world performers in terms of energy efficiency by 2012. To accomplish this, independent experts develop efficiency obligations for the end of 2005, the end of 2007 and the end of 2012. These obligations are based on benchmarking calculations, as well as the assumption that all measures with an internal rate of return (IRR) of 15% after tax must be taken as quickly as possible, and by the end of 2005 at the latest. If these measures are insufficient to achieve the top performance level, less profitable measures – down to an IRR of 6% after tax – must be taken as quickly as possible, and by the end of 2007 at the latest. Top world performance must be achieved by 2012. Additional measures are applied if top world performance standards are not met by 2007. Top world performance standards and energy efficiency plans are revised every four years.

According to a 2004 benchmarking report that evaluated the agreements, in the absence of benchmarking covenants, new production activities and economic expansion of the industrial companies would have resulted in a 19% increase in industrial energy consumption in 2012 as compared to 2002. However, thanks to the benchmarking covenants, energy consumption growth is expected to be restricted to 11%. Companies will have improved their energy efficiency by 7.8% as compared to 2002.

As described above, individual companies that sign on to benchmarking covenants commit to being at the best international level of energy efficiency by 2012. A 2004 review of the agreements indicates that 60% of the 180 or so companies that have signed on to benchmarking agreements are already at this level of energy efficiency. Nonetheless, 30% of energy-saving measures in all energy plans will be executed by those companies already at world-class levels in 2003 because they are still rewarded through the benchmarking covenants. If companies implement energy-saving investments more rapidly or if they increase their energy efficiency efforts, they still receive the emission allowance corresponding to their approved energy plan and can then sell the exceeding emission allowances on the trading market. In addition, economic support for energy investments is restricted to companies in the benchmarking covenant target group that have signed covenants. Economic support is linked to emissions reductions resulting from new energy investments. Large companies could receive a 4% subsidy for each 1% of emissions reductions, up to a maximum subsidy equalling 25% of the cost of the investment. This subsidy would encourage all companies – even those already at top world class levels – to invest in energy efficient technologies.

Audit covenants

Flanders is in the process of developing audit covenants, which are voluntary agreements aimed at medium-sized energy-intensive companies that do not fall under the EU-ETS, with annual usage of between 0.1 and 0.5 PJ. Under these agreements, an audit determines the energy savings potential of a company and what energy-saving measures are possible. In the case of the audit covenants, the best available technology is the reference level. Investment obligations of the covenant are negotiated on a case-by-case basis. During the course of the audit covenant, investments must be undertaken that have an IRR of at least 15% (equivalent to a payback period of approximately five years or less). During the second round, investments must be undertaken with an IRR of at least 13%.

In return for entering into and keeping these agreements, the federal government exempts the companies from additional energy efficiency requirements from the Flanders government, including any CO_2 taxes, and will do everything possible to exempt these companies from additional federal or European measures. In addition, the Belgian government can focus economic support for energy investments on companies of the audit covenant target group that have signed the covenant.

Fiscal incentives

Fiscal incentives are provided to industrial, commercial and agricultural sectors. These incentives, which began in 1982, provide an additional fiscal depreciation abatement of 10% on taxable profits for investments aimed at

improving energy efficiency in industrial processes and, in particular, recuperating energy used in industry. In general, 13.5% of energy efficiency investments can be deducted from taxable income.

Wallonia

Information and technical assistance

Wallonia provides significant information and technical assistance, particularly through its energy website.[7] In addition, a quarterly magazine is published for energy experts and managers to help them reduce their energy consumption, thereby lowering energy bills. Targeted workshops for small and medium-sized enterprises (SMEs) and industry are also financed by the region. An "industry facilitator" has been appointed to provide free advice to industry and SMEs in the energy field.

Voluntary agreements

Like Flanders, Wallonia relies on voluntary agreements with industry to increase energy efficiency in the sector. Wallonia has signed voluntary agreements with 117 energy-intensive firms, covering more than 90% of Wallonia's industrial energy consumption or 47% of Wallonia's total energy consumption. These voluntary agreements include individual action plans for each firm and require them to provide annual information. In return, these firms are given subsidies for energy accountancy and audits, no additional regulatory regional obligations on energy efficiency, CO_2 tax exemptions (if CO_2 taxes are implemented in the future), quota allocations of CO_2 under the EU-ETS that are realistic given existing emissions and exemptions from green certificate requirements.

Energy audits

Wallonia is working towards providing subsidised energy audits for the industrial sector. Subsidies to conduct CAFÉ (*Comptabilité analytique des fluides et des énergies*) audits would underwrite 50% of expert advice expenses (75% if the firm has signed a voluntary agreement).

Fiscal incentives

In Wallonia, fiscal incentives are provided to the industrial, commercial and agricultural sectors. These incentives, which began in 1982, provide an additional fiscal depreciation abatement of 10% on taxable profits for investments aimed at improving energy efficiency in industrial processes and, in particular, recuperating energy used in industry. In general, 13.5% of energy efficiency investments can be deducted from taxable income.

7. http://energie.wallonie.be.

BRUSSELS-CAPITAL

Instead of relying on voluntary agreements, the Brussels-Capital region, which has a small industrial sector, has introduced a voluntary labelling programme called "Eco-dynamic enterprise". To obtain the label, an entrepreneur signs a charter obliging him to respect a number of principles of ecological management and energy efficiency.

ENERGY PERFORMANCE OF BUILDINGS

Historically, Belgium has had relatively poor energy performance of its buildings. Two key sources of this inefficiency are poor compliance with existing building standards and a heavy reliance on electricity for residential heating. Efforts to improve the efficiency of buildings focus primarily on implementing the EU Directive on the Energy Performance of Buildings, which will both strengthen building code standards and increase monitoring and enforcement.

Flanders

In May 2004, the Flemish parliament approved the Energy Performance Act, which provides the basis for the introduction of minimum energy performance requirements for buildings. Implementation of the EU Directive on the Energy Performance of Buildings is expected to go into effect on 1 January 2006.

This legislation will affect thermal insulation, ventilation and energy performance of new buildings and conversions or expansions of existing buildings, dividing projects into three categories:

- Residential, office and school buildings.
- Industrial buildings.
- Conversions of existing buildings.

Future legislation will focus on areas such as boilers, sun protection and lighting; the current legislation requires strict enforcement. Administrative fines will be levied on buildings that do not meet the requirements. In order to provide strong incentives for compliance, fines will be levied on building owners and will be at least as high as the cost of the avoided expenses. In addition, "reporters" (*e.g.* architects, engineers) who provide false reports will also be liable for fines. Funds collected from the fines will be used to subsidise other energy savings programmes.

Actions to support successful implementation of the legislation include communication to building professionals, private citizens and municipalities through websites, models and other examples. Education on the building requirements took place during the last quarter of 2005. In addition, software

that will perform energy calculations on building plans is under development and will be provided free of charge. A help desk will also be provided. An energy performance database is also under development, and is scheduled for June 2006.

Wallonia

Currently, energy efficiency policies focused on buildings take the form of financial incentives for heating systems, insulation, energy audits, efficient new lodgings, thermo-regulation and ventilation systems. These incentives are provided through the Energy Fund, which is funded by charges for new and existing connections to the gas and electricity grids and income from green certificate fines. So far, the fund has provided about EUR 13–30 million in financial incentives. Electricity and gas suppliers are responsible for some of the financial measures.

Wallonia also supports public awareness programmes related to the energy efficiency of buildings, including local information centres, quarterly energy journals and "energy days". In addition, professional training is provided for architects, training officers, professors, building contractors and building workers.

Insulation standards have been enforced in Wallonia for many years. New buildings must comply with the K55 or Be 450 standard. A ventilation rate also applies.

The Build with Energy programme anticipates the implementation of the EU Directive on the Energy Performance of Buildings on a voluntary basis and provides services for architects and Building contractors to incorporate new concepts on building performance, helping them construct buildings of lower energy consumption. Wallonia is currently studying how it will implement the EU directive. Currently, strategies are not expected to be significantly different from those undertaken in Flanders.

Brussels-Capital

The existing building regulations in Brussels-Capital include minimum performance for buildings built or renovated since 2000. To comply with the EU directive, additional requirements are under preparation that will include minimum global energy performance requirements for new and renovated buildings, improved performance requirements and inspection systems for combustion and cooling installations, and the introduction of maintenance requirements.

Currently, Brussels has a voluntary "energy advice" procedure, which provides the housing sector with energy efficiency certification audits. It is in the process of making these certifications mandatory as part of efforts to comply with the EU Directive on the Energy Performance of Buildings.

Brussels also has some economic instruments that provide financial support to individuals for purchases of energy-efficient electrical appliances, low-temperature and condensation boilers and thermal regulation devices. In addition, Brussels provides technical support to private companies and public institutions in the form of energy audits, training of energy managers and information on best available technologies.

TRANSPORT SECTOR

Owing to a number of factors – suburbanisation, development of the services sector, increases in disposable income, fiscal incentives for company car purchases, the growth of Brussels as a working capital luring large numbers of car commuters – vehicle transport and ownership rates in Belgium has grown and is higher than in other European countries. In particular, fiscal incentives have led to a relatively high and increasing number of company cars in the country, an ownership structure that encourages both more intensive car usage and the purchase of larger, less efficient cars. In 2001, 34% of new registered passenger cars were company cars, with fuel consumption on average 8% higher for gasoline-powered cars and 22% higher for diesel-fuelled cars than that of cars purchased privately.

Federal level

To counter Belgium's rising vehicle transport and ownership trend, the federal government employs a variety of policies and measures, including to:

- Reduce taxes on less polluting vehicles (LPG and EURO 4).
- Exempt employer expenses related to employees' commuting costs (depending on the method used).
- Reform taxes relating to personal transport, in favour of transport by means other than cars (*e.g.* via carpools, foot, bicycle).
- Provide free travel between home and work for all federal workers and all workers whose employers pay 80% of travel expenses (in place since 1 March 2004).
- Provide tax cuts for purchases of low CO_2-emitting vehicles: a 15% tax cut for vehicles with emissions of less than 105 grams (g) CO_2/km (up to EUR 4 000); a 3% tax cut for vehicles with emissions of between 105 and 115 g CO_2/km (up to EUR 750). This took effect on 1 January 2005.
- Promote rail transportation of goods through lower rail transport rates.
- Promote modal shifts from roads to trains and ships. In February 2002, a European support programme called "Marco Polo" was launched to promote rail and maritime freight transportation for the 2003–2007 period.

- Require federal authorities to ensure that as vehicle fleets are replaced, half of all purchases are of environment-friendly, efficient vehicles.
- Increase the use of cycling. A comprehensive cycling plan is currently being integrated into the transportation plan. The plan will include many measures to encourage the use of bicycles in areas such as safety, taxation and information. In addition, new bike lanes have been developed on major thoroughfares.
- Increase car-pooling among commuters. In September 2004, the highway code was modified in order to promote car-pooling, giving highway managers the ability to reserve a traffic lane for public transport as well as car-pooling vehicles.
- Promote efficient driving behaviour through drivers' training.
- Promote alternative modes of transportation, through public awareness and improved public transportation. For example, tickets for major forms of public transport have been integrated and the reliability and punctuality of trains has been improved. Plans to improve the regional express network (RER) are also under way.
- Reduce road speeds through public awareness and stricter speed limit enforcement.
- Increase rail transport. In 2001 the government adopted the objective of increasing rail transport of goods and travellers by 15% by 2010. More high-speed links have been added and trains have been added to lines with heavy traffic.

In 2003, a law passed requiring companies and public institutions with more than 100 employees to conduct studies on workers' commutes every four years and provide the results to the federal government. The first set of results will arrive in April 2006 and will be used to inform the Federal Transportation Plan and to help develop partnerships between the private and public sectors relating to worker transportation.

The Federal Plan for Sustainable Development (2000–2004) recommended the creation of a National Transportation Plan. Drafting of the plan began in 2002, but has been suspended so that the new government can review the plan and provide advice. Many of the policies and measures discussed above are included in the plan, among others.

Flanders

In October 2003, the Flemish government approved a draft set of mobility plan policy recommendations. The recommendations highlight five main goals to meet the objective of stabilising CO_2 emissions at 1990 levels by 2010:

- More and better alternatives for transportation.
- Improvement in infrastructure.
- Efficient use of transport means and infrastructure.
- Changes in the mentality towards safe and environmentally-friendly driving.
- Vehicle car park conversion.

Public awareness is a large component of Flanders' policies to improve the efficiency of transportation. In 2003, the government ran a press programme to encourage efficient driving behaviour ("ecodriving"). VITO, the Flemish Institute for Technological Research, teamed up with a driving school to provide ecodriving instruction. In addition, the government maintains a public database that contains key efficiency descriptions of almost all cars distributed in Belgium.

Wallonia

Wallonia is engaged in a number of efforts to improve transportation energy efficiency. A recent degree has set up the framework and provided funding for municipal mobility plans, which give local municipalities tools to improve transportation efficiency through specific investments and partnerships with public and private actors. In another programme, school moving plans encourage parents, schools, students, police officers and others to select transportation modes to school other than by car. Currently, 44 schools from 9 municipalities are involved in school moving plans, which are financed partially by the regions. Similar to both the municipal and school mobility plans, Wallonia also supports company mobility plans.

Public awareness campaigns are also a part of Wallonia's overall strategy. Multimodal accessibility cards are sent to residents with information on bus and trains, including timetables. In addition, Wallonia subsidises "mobility weeks" and the position of "mobility advisor".

Low transport fares for public buses are an important part of Wallonia's efforts. Season ticket prices for public transport passes have not risen since 1999. Beginning in September 2004, season ticket prices for large families were reduced by 20%. Seniors receive free transit and some classes of customers receive reduced tariffs. Free services in Mons have started and a Conforto bus to Brussels has also been introduced.

Car-pooling has developed in four cities: Namur, Dinant, Louvain-la-Neuve and Liège. More than 400 clients make use of this service.

In order to assess household mobility, the Mobility Observatory has been established to collect, analyze and disseminate information at the local, regional, federal and European levels to better understand transportation behaviour, forecast its evolution and optimise the use of all modes of transport.

Efforts are also focused on freight transport. Wallonia has adopted two programmes, *Schéma de développement intégré des réseaux et terminaux de fret en Wallonie* and the *Schéma logistique Hennuyer* to promote efficient modal shifts for freight transport. In addition, by July 2003, 21 measures had been adopted to promote waterway transport.

Brussels-Capital

Brussels' efforts at increasing the energy efficiency of transport focus on improving the region's public transport through federal-regional co-operation. In addition, a 1993 policy in Brussels led IBGE/BIM, the environmental institute, to successfully negotiate with companies on a requirement that caps company parking spaces at one-quarter of total employees.

CHP

CHP development has been modest in Belgium. Since 1995 CHP has developed at an average pace. All three regions have implemented the new EU Directive on the Promotion of CHP. To meet the associated commitments, the regions have developed various strategies to increase CHP capacity in Belgium.

Flanders

Flanders has introduced a CHP certificate system in order to comply with the EU directive on CHP. The certificates are awarded by the regional regulator of the electricity and gas market (VREG) to high-quality CHP installations. These certificates must be purchased by electricity suppliers. The CHP certificates are valued in units of energy savings achieved by the installation concerned in comparison with a reference value, which is the amount of primary energy that would be necessary for the separate production of the same amount of heat and power in modern, high-technology production plants. It is possible for Flanders to allow certificates from other sources – including other countries and from other Belgian regions – to be used to meet suppliers' requirements.

A CHP certificate is issued for every MWh of primary energy savings in relation to the reference that is established. For every MWh of electricity supplied to an end-user in 2005, suppliers must return 0.011 CHP certificates to the regulator by 31 March 2006, otherwise a penalty of EUR 40/MWh is assessed. On the basis of electricity supplied in 2006, 0.0216 certificates must be presented per MWh supplied, otherwise a penalty of EUR 45/MWh is assessed. The annual quota will be systematically increased up to 0.0523 in 2013 and all subsequent years. Fines for missing CHP certificates will remain at EUR 45 from 2007 onwards.

In addition, CHP investments can also profit from tax benefits as investments can be deducted from taxable income. Flanders also subsidises COGEN Vlaanderen, a non-profit organisation in charge of the promotion of CHP. COGEN Vlaanderen collects and provides information to potential CHP investors in Flanders.

Flanders has set a CHP target of 1 198 MW_e in 2005 and 1 832 MW_e in 2012. This is respectively 303 and 937 MW_e more than the capacity available at the end of 2002. When the objective is met in 2010, 19% of electricity supply in Flanders will be produced from high-quality CHP. Considering current levels of quality CHP production, this objective appears attainable. In 2003, of 49 566 GWh supplied in Flanders, 5 484 GWh, or 11%, was produced by quality CHP. During the 2003–2010 period when production of electricity from CHP must increase by 88% to account for a 19% share of total expected generation, installed capacity is expected to grow by 117%. Over two-thirds of this new capacity (700 MW_e) are being built today and will be operational by the end of 2006.

Wallonia

In August 2004, 19 CHP installations provided 132 242 kW_e of electricity and 10 biomass CHP installations provided 35 225 kW_e of electricity. Wallonia aims to have 15% of its electricity supplied from CHP by 2010; currently CHP provides 3.4% of the region's electricity. To achieve this goal and meet the EU directive on CHP, Wallonia uses a green certificates market. In addition to electricity produced by traditional renewable resources such as wind and solar, green certificates are issued to electricity produced from high-quality CHP installations on the basis of avoided CO_2 emissions. These certificates can be sold to suppliers or exchanged for production aid financed by Wallonia's Energy Fund, amounting to EUR 65 per green certificate.

In addition, CHP investments can also take advantage of tax benefits (investments can be deducted from taxable income). In addition, through a programme called UREBA, the Energy Fund can provide a subsidy of up to 30% for CHP investments in public buildings. Wallonia also subsidises COGENSUD, a non-profit organisation in charge of the promotion of CHP. COGENSUD collects and provides information to potential CHP investors in the Walloon region.

Brussels-Capital

Brussels-Capital has also instituted a certificate scheme in order to promote CHP. Its green certificate programme is linked to the Walloon programme, both of which cover not only renewable generation, but also CHP generation. The coupling of the programmes allows for an exchange of credits. In order to promote the growth of CHP (and renewables) within the Brussels-Capital region, the credit conversion factors favour Brussels generation over Wallonia generation by 30%. Like Wallonia, the Brussels scheme is based on avoided CO_2, not electricity production.

RATIONAL-USE-OF-ENERGY PUBLIC SERVICE OBLIGATIONS

All three regions have rational-use-of-energy (RUE) public service obligations incorporated into their energy policies. These obligations, which are placed on different market participants in different regions, require savings of electricity consumption over previous years.

Federal level

An environmental management system will become compulsory for all federal agencies by the end of 2005. For this purpose, "sustainable development units" will be implemented in each federal agency.

Flanders

A 2002 decree imposes RUE public service obligations on the region's distribution network operators (DNOs). Each DNO must submit an annual RUE plan to the Flemish government, including cost information, public awareness campaign plans and calculation methods for determining energy savings for the following year. The primary energy savings targets are outlined in Table 21.

Table 21

Flanders' Rational-Use-of-Energy Public Service Obligation Targets

Low-voltage clients (<1 000 volts)	*High-voltage clients (>1 000 volts)*
• 2003: 1% of electricity supplied • 2004: 2% • 2005: 2.1% • 2006–07: 2.2% • 2008+: 1%	• 1% each year

Source: Country submission.

Programme evaluation reports must be submitted to the VREG each year. If targets are not achieved, the VREG can collect fines from grid operators. All costs from the plans are incorporated into electricity tariffs, but any fines – which are calculated at ten eurocents for each kWh of energy savings not achieved – cannot be incorporated into electricity rates. Any savings in excess of the target can be banked for later years.

Also part of the plan is an obligation to provide every head of household a voucher for an energy-saving light bulb, an energy-saving shower head or an energy meter in 2004 or 2005. In 2006 or 2007, every remaining family member will be given a voucher for an energy-saving light bulb. Flanders has calculated the primary energy savings achieved by these and other residential actions (see Table 22).

Table 22

Energy Savings from Rational-Use-of-Energy Public Service Obligation Efforts

	Premium to customer	*Primary electricity savings/year*
Energy-saving bulb	Free	168 kWh
Energy-saving shower	Free	1 311 kWh
Condensing boiler	EUR 125	7 800 kWh
Solar boiler	EUR 625	2 410 kWh
Roof insulation	EUR 1.25/m^2	158 kWh/m^2

Note: Primary electricity savings = Electricity savings*2.5.

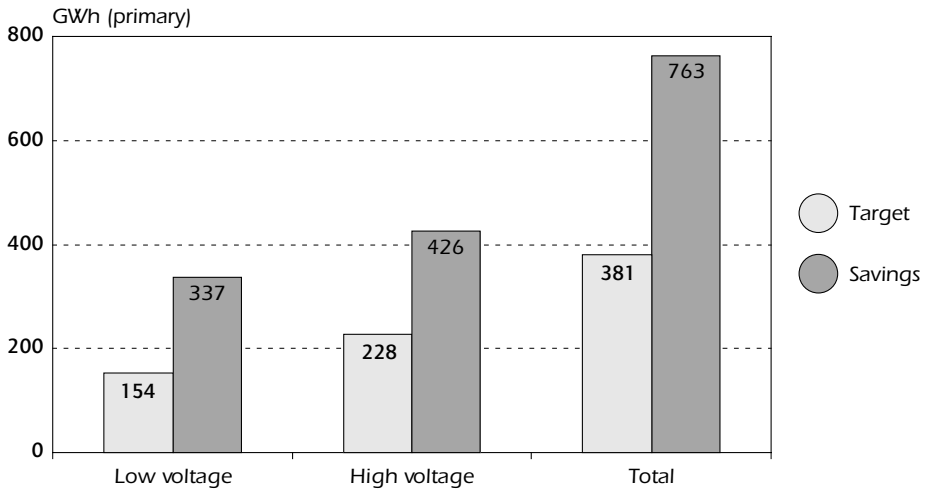
Source: Country submission.

In 2003, savings from both low- and high-voltage clients exceeded targets (see Figure 11). In 2003 all distribution network operators reached their targets, except for the high-voltage target of one operator of a municipal authority. Programme costs were EUR 6.83 million for low-voltage customers and EUR 4.94 million for high-voltage customers. The overall target was reached with a lower budget than planned. The average cost-effectiveness of the actions targeted at households was 1.3 eurocents per kWh of primary energy savings.

Other public service obligations require that grid operators provide energy advice, information and historical electricity consumption data to customers. Electricity suppliers must comply with several conditions regarding billing.

Figure 11

Primary Energy Savings from Flanders' RUE Public Service Obligation Efforts, 2003



Source: Country submission.

Wallonia

Wallonia places the public service obligation (PSO) on electricity and gas suppliers, instead of on the grid operators. The programme is funded through the Energy Fund, a three-year programme that finances the regulator (CWaPE) and social energy policy, among other things. The PSO requires that suppliers ensure that bills are easy to read and understand, and include information on efficient energy use. In addition, suppliers must grant subsidies, as specified by the regional government that promote renewables or efficient use of energy (*e.g.* grants for low-consumption refrigerators). Any grants are refunded through the Energy Fund.

Brussels-Capital

Brussels-Capital also has a public service obligation regarding energy efficiency. Similar to Flanders, this obligation is placed on the DNOs.

CRITIQUE

Since the last in-depth review, the federal government and all three regions have taken significant steps in many different areas to improve Belgium's energy efficiency. Given that energy intensity, energy use per capita and CO_2 emissions per capita are relatively high in Belgium compared to neighbouring and similar countries, Belgium has the opportunity to make large improvements in efficiency more easily than other countries. As a heavily industrial country, a primary focus of regional efforts has been on working directly with industry to improve companies' efficiency through voluntary agreements. In addition, the regions are working towards robust implementation of the EU Directive on the Energy Performance of Buildings. Flanders has already implemented it and Wallonia is working towards a programme that includes not only a comprehensive set of standards to dramatically improve the efficiency of the building stock, but the regions are putting the needed efforts behind enforcement of these regulations, something that has been neglected in the past.

It seems generally accepted in Belgium that there is the opportunity for substantial energy efficiency improvements, which would, among other things, help Belgium meet its Kyoto target and adapt to the phase-out of nuclear production. The 2003 Fraunhofer Gesellschaft study, for example, indicates that Belgium's Kyoto target could be entirely met by efficiency improvements throughout the system. However, it is clear that this would require a significant strengthening in the implementation of policies and measures to increase energy efficiency. Belgium should do everything it can to implement such measures, including those outlined in the Fraunhofer study. Critical to this effort is improved monitoring of the results and cost-

effectiveness of various policies and measures. It is encouraging that cost-effectiveness will be used as a criterion when selecting energy efficiency policies and measures in the future.

All of the regions and the federal government are targeting energy savings in buildings, efforts which should be commended. Much of this new legislation is being developed within the framework of the EU Directive on the Energy Performance of Buildings. Given the importance of the residential sector in Belgium's energy consumption, standards on the energy performance of buildings should be stringent enough to improve the sector's efficiency and bring it in line with EU standards. Just as critical is to ensure that the standards are effectively implemented. In particular, it is positive to see that emphasis will be placed on monitoring and enforcement, areas that have suffered in Belgium in the past. Ongoing efforts to monitor and enforce compliance with the new standards will be critical to the policies' success.

Belgium could also benefit from programmes to closely meter a few buildings to ensure that new building standards actually provide the modelled energy efficiency improvements. In addition, given that the Brussels-Capital region is relatively homogeneous, with a large share of office buildings, there exist potentially easier opportunities for large improvements in efficiency; individual policy efforts focused on this sector would affect a large source of energy consumption.

All three regions have public service obligations on the rational use of energy. In Flanders and Brussels-Capital, these obligations are primarily placed on DNOs, whereas in Wallonia these obligations are placed on energy suppliers. The effectiveness of the two different measures – and any other ways of achieving a targeted reduction in customer-level electricity consumption – should be evaluated and the measures should be harmonised before full energy market opening. In particular, the effectiveness of giving retail energy suppliers the responsibility of reducing energy consumption should be closely evaluated. There are similar obligations for retail energy suppliers in France, the UK and Italy, and these countries are introducing "white certificates", which enable the trading of obligations among retail energy suppliers under obligation. Such an approach could enhance the cost-effectiveness of the obligation scheme and the forthcoming experience of these countries could be used as a model for the regions of Belgium.

Voluntary agreements in Flanders and Wallonia target energy-intensive industry for energy efficiency gains. It is commendable that these covenants have clear targets with strong incentives to achieve them. Linking the achievement of the targets and the allocation of emission allowances is a good approach. Audit covenants in Flanders for medium-sized energy-intensive industries outside those covered by the EU-ETS are also useful for expanding the coverage of the voluntary agreements. In Flanders, regional authorities should ensure that policies provide incentives for companies both

below and above world-class levels, as the policy intends. In addition, the regions should ensure that penalties for failing to meet the requirements of the agreements are transparent and enforced. As with all energy efficiency policies and measures, the regions should ensure that industry sector efficiency and voluntary agreement costs are monitored so that the cost-effectiveness of the voluntary agreements can be assessed.

All three regions are encouraging high-quality combined heat and power through certificate systems and obligations on suppliers. As well as improving energy efficiency, CHP can provide a significant contribution to Belgian electricity supply and encourage new entry. Thus, the effectiveness of support schemes should be maximised, in part by ensuring that CHP certificates are tradable across all regions. It is encouraging that Wallonia and Brussels-Capital have already harmonised their systems so that permits are tradable, and that Flanders has systems in place that would allow non-Flanders permits to be used in the Flanders market. To effectively enlarge the CHP permit market and improve its efficiency, these two regions and Flanders should now work to develop transparent and uncomplicated conditions for trading permits within all three regions. Since the Walloon and Brussels-Capital regions use comprehensive green certificate schemes based on avoided CO_2 emissions and Flanders uses a separate CHP permit scheme based on electricity production, harmonising conditions may require modifications to existing trading schemes. In particular, the relationship between a CHP certificate scheme based on avoided CO_2 emissions and emissions trading should be clarified.

A major area in which energy efficiency lags behind that of other nearby countries and in which overall energy consumption is growing is the transport sector. For both environmental and security of supply reasons, the efficiency of the transport sector could be improved and energy consumption growth decreased. While all three regions and the federal government have many small programmes designed to improve transport efficiency, a more comprehensive and co-ordinated approach to transport policy would likely result in more efficiency gains. For example, the strict enforcement of the speed limit or other measures could encourage more fuel-efficient transport choices and curb the growth of road transport energy use. In addition, fiscal incentives have led to a relatively high share of cars owned by companies as opposed to households in the country, and this trend is increasing. Because companies tend to purchase cars with larger engines, this has led to the purchase of less fuel-efficient cars. Higher company car rates can also lead to heavier usage of the cars than if they were owned by households. Belgium should work to remove incentives for company car ownership. The experiences of other countries on company car policies could provide lessons for Belgium. For example, in the UK the company car tax was significantly reformed to improve energy efficiency in the transport sector. From April 2002, cleaner, more fuel-efficient cars are to be rewarded by linking the tax charge to the car's exhaust emissions, in particular its CO_2 emissions.

It is commendable that all regions, as well as the federal government, have implemented fiscal incentives to encourage investments that improve energy efficiency. The governments should continue these efforts, paying particular attention to incentives that make private-sector third-party financing investments fiscally attractive to banks and other entities.

RECOMMENDATIONS

The government of Belgium should:

- *Continue to work to implement energy efficiency policies and measures, including those outlined in the Fraunhofer study.*
- *Strengthen monitoring of sectoral energy efficiency improvements.*
- *Ensure that standards on the energy performance of buildings are not only sufficiently stringent but also effectively implemented and enforced.*
- *Evaluate the effectiveness of the two different measures on the rational-use-of-energy public service obligations in Wallonia and Flanders and harmonise them before full energy market opening.*
- *Monitor and evaluate the cost effectiveness of all energy efficiency measures, including voluntary agreements with industrial companies, and ensure that these findings are used as criteria when selecting policies and measures in the future.*
- *Ensure that voluntary agreements with industry provide incentives for companies operating at energy efficiency rates that are both below and above world-class levels, as the policies intend.*
- *Ensure that CHP certificates are tradable in all regions.*
- *Further co-ordinate transport efficiency efforts across regions and the federal government.*
- *Remove fiscal policies that provide incentives for companies to purchase inefficient cars.*
- *Take necessary steps to improve private-sector investment in energy efficiency (*e.g. *through third-party financing by banks) by making these investments fiscally attractive.*

CURRENT AND PROJECTED SUPPLY

The share of total primary energy supply (TPES) that comes from renewable energy sources is small in Belgium – 2% in 2003 (see Figure 12). The 2004 share is estimated at 2.3%, a rise of 14%. Biomass is by far the largest source of renewable energy supply (97%). Hydro supplies about 2%.

When compared with that of other countries, Belgium has the fifth-smallest share of TPES supplied from renewables of the 26 IEA countries (see Figure 13).

Wallonia reports that 2% of total final consumption was from renewables in 2000, which they hope will grow to 4% in 2010. Currently, 2.6% of electricity production is from renewables; Wallonia's objective is to raise the figure to 8% by 2010. Wallonia's 2003 and 2004 renewable energy capacity and production are presented in Table 23. While renewable capacity grew by just 4% between 2003 and 2004, total production grew by 16%. The largest sectoral growth was in wind energy. Though wind capacity grew by a negligible amount, total production nearly quadrupled.

Table 23

Renewable Electricity Capacity and Production in Wallonia, 2003 and 2004

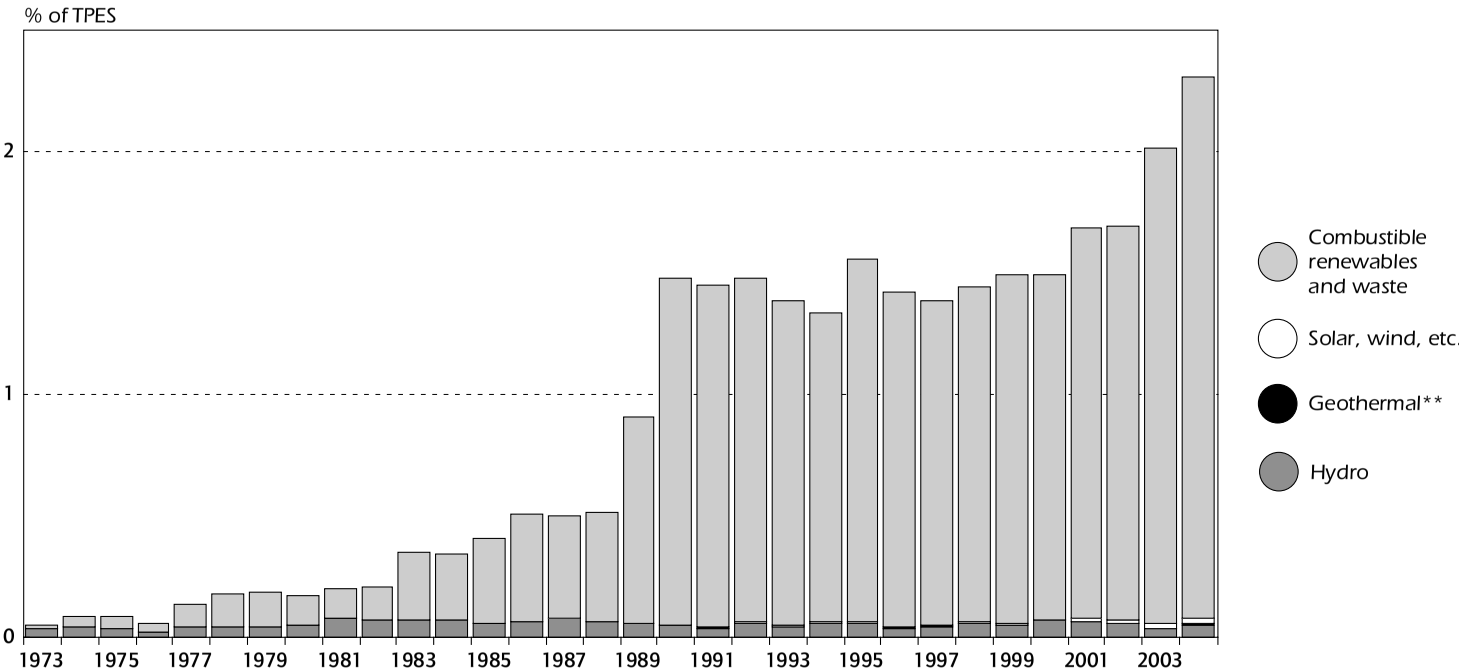
	2003		*2004*	
	Capacity MW	*Production MWh*	*Capacity MW*	*Production MWh*
Solar PV	0	0	0	0
Hydro	101	315 903	104	302 993
Wind	22	13 914	23	51 339
Biomass	14	58 560	16	90 833
Biomass co-generation	36	131 235	41	180 309
Fossil fuel co-generation	122	232 110	123	246 545
Total	**295**	**751 723**	**306**	**872 020**

Source: *Rapport Annuel Specifique 2004*, CWaPE, May 2005.

Projections for electricity produced from renewables in Wallonia in 2010 are presented in Table 24.

Figure 12

Renewable Energy as a Percentage of Total Primary Energy Supply in Belgium, 1973 to 2004*



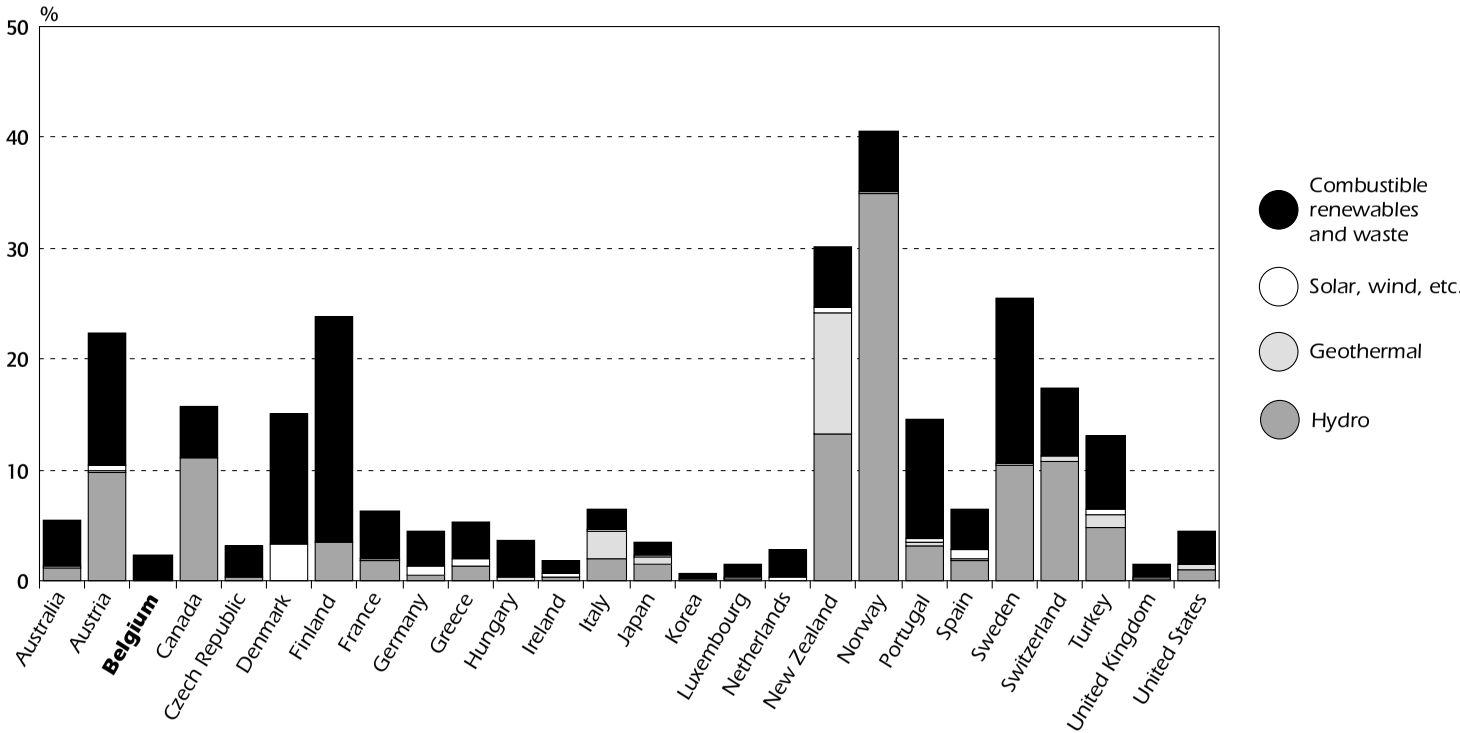
* estimates.

** negligible.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005.

Figure 13

Renewable Energy as a Percentage of Total Primary Energy Supply in IEA Countries, 2004*



* estimates.

Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005.

Table 24

Projections for Electricity Production from Renewables in Wallonia, 2010

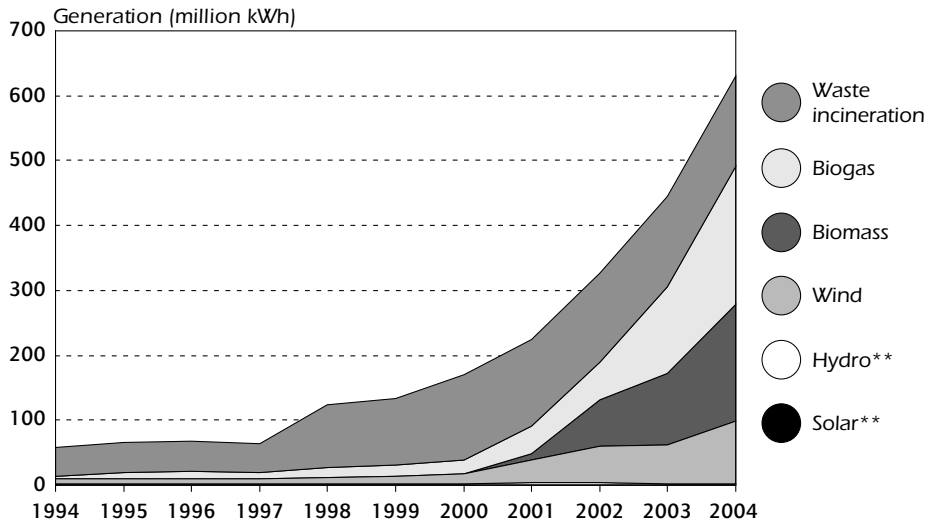
	Production MWh
Hydro	440 000
Wind (onshore)	370 000
Biomass (including biomass co-generation)	370 000
Landfill gas	225 000
Total	**1 405 000**

Source: Country submission.

In Flanders, generation from renewable sources is also expected to be at about 2% in 2004, rising to 6% by 2010. Though it remains a small share of total electricity production, renewable electricity production has risen dramatically since 1997, as shown in Figure 14.

Figure 14

Renewable Energy Production in Flanders, 1994 to 2004*



* estimate.
** negligible.
Source: Country submission.

In Flanders, there are plans to install a capacity of approximately 750 MW of wind energy by 2010, of which two-thirds will be on land and one-third at sea. This corresponds to approximately 300 wind turbines in total, 75% on land and 25% at sea, producing approximately 1 600 GWh annually.

On the basis of projects that are already planned and for which there is a reasonable expectation of being built, it is assumed that approximately 60% of the objective for onshore wind energy can be achieved by placing wind turbines in port areas and on large-scale industrial sites, and approximately 30% of the objective can be achieved by placing wind turbines on locations selected for wind turbines in Regional Execution Plans for Town and Country Planning. A number of projects are already possible in definitively approved Regional Execution Plans for Town and Country Planning. The feasibility of additional plans is still being examined.

Biomass is expected to make up Flanders' remaining electricity generated from renewable energy sources in 2010, about 1 600 GWh of the 2 900 total annually. In absolute figures, the strongest growth is expected in biomass produced from timber, and the production of green electricity from timber waste is expected to triple.

In Flanders, electricity from hydroelectric power and solar energy will only make a marginal contribution in 2010 (40 GWh). A more substantial contribution from solar energy is expected in 2020. The application possibilities of hydroelectric power will remain limited in Flanders.

Given its small size and limited electricity generation supply, Brussels-Capital has few renewable energy facilities. The region has several large demonstration projects of solar thermal panels.

POLICIES AND MEASURES

GREEN CERTIFICATES

Flanders

Flanders has had a green certificate scheme since January 2002, through which a producer is awarded one certificate for every 1 MWh generated from a renewable energy source. In 2004, electricity suppliers had an obligation to acquire green certificates for at least 2% of the electricity provided to customers. This obligation rises to 6% in 2010, in accordance with the 2001 EU Directive on Renewable Electricity Generation. Together with the distinct co-generation certificate scheme, generation from renewables and co-generation will be 25% by 2010, a quota that Flanders sees as reasonable.

If a supplier does not provide the regulator, VREG, with a sufficient number of certificates, a fine is imposed. The fine is equal to EUR 75 per missing 1 000 kWh certificate in 2002, EUR 100 in 2003 and EUR 125 from 2004 onwards. Fines are paid into the Fund for Renewable Energy Sources.

On 5 March 2004, Flanders amended the green certificate scheme, allowing electricity generated from the organic-biological share of residual waste, on the condition that the processing plant achieves primary energy savings of 35% of the energy content of the waste materials processed in the plant by means of energy recuperation.

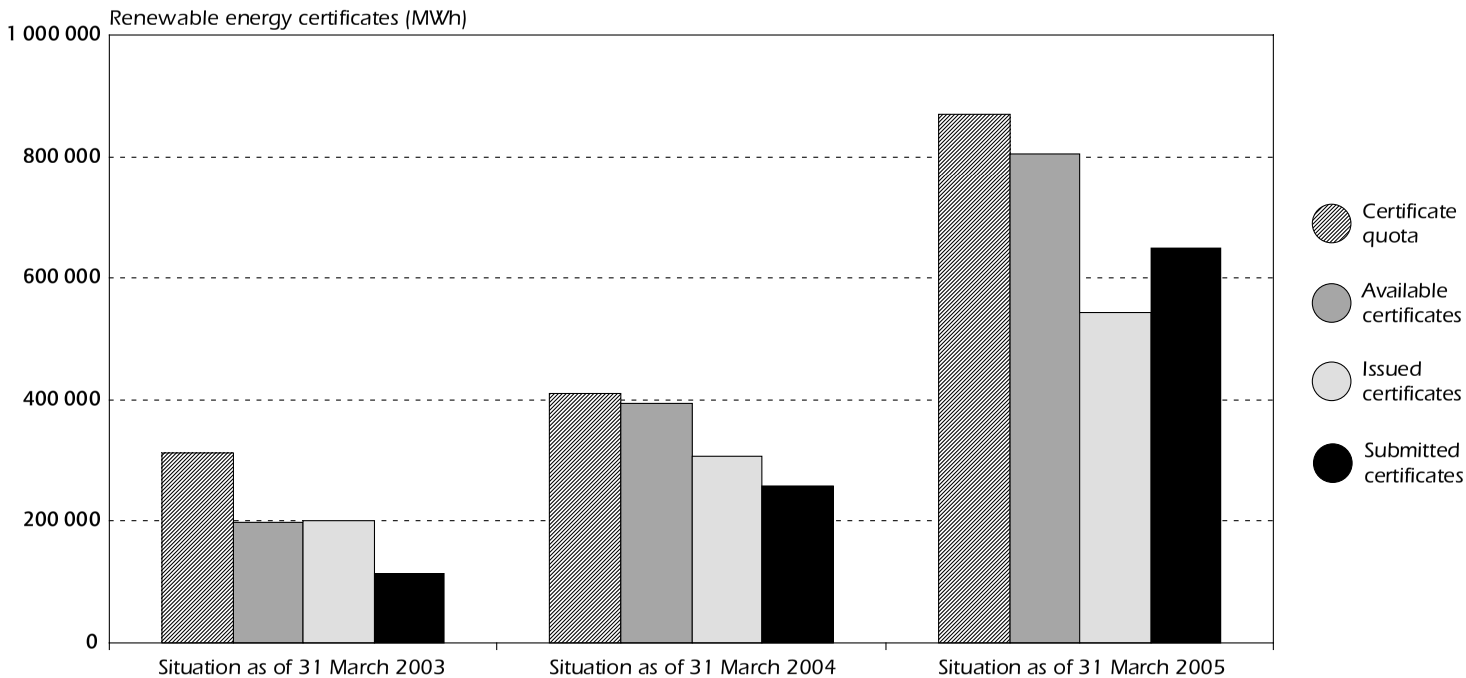
In order to minimise competitive disadvantages for energy-intensive enterprises competing against companies without green certificate requirements, Flanders imposed a progressive exemption for such enterprises in 2004. Individual enterprises that use between 20 and 100 GWh annually have their green certificate obligation reduced by 25%. The exemption rises to 50% for enterprises that use more than 100 GWh annually. Electricity suppliers that deliver electricity to large electricity consumers and large enterprises that self generate must submit fewer certificates to the VREG. In addition, large electricity consumers that self-generate do not have to pay the costs associated with the green certificate obligation that is imposed on electricity suppliers.

The green electricity certificate system has served as a stimulus for investment in green electricity in Flanders in recent years. In 2003, 291 568 green certificates were issued. Of these, 58 946 were for wind energy (20%) and 230 677 were for biomass-based installations (79%). In 2004, 543 981 certificates were issued (17% for wind energy and 83% for biomass-based installations). However, a number of obstacles were encountered in the practical implementation. Though the electricity sector was given significant information in advance of the green certificate scheme's implementation, it is clear that some parties in the market did not adequately prepare themselves. As shown by the difference between the certificate quota and submitted certificates in Figure 15, a significant share of suppliers did not purchase the required certificates in 2003 and 2004, incurring fines instead. However, the percentage of missing certificates has fallen significantly, from 63% in 2003, to 37% in 2004 and to 25% as of September 2005. In addition, there is evidence that some suppliers have chosen to hold on to certificates and not submit them to the VREG for compliance, consequently incurring the non-compliance fines. One explanation for this behaviour is that the certificates – which are valid for five years – are more valuable in later years when fines increase, so suppliers may have chosen to incur less expensive fines in earlier periods instead of risking more expensive fines in the future.

In addition, in 2004, to provide renewable energy suppliers with greater investment security, Flanders implemented a system of minimum certificate prices based on generation source, according to the prices in Table 25. Minimum price levels were based on production costs, but also on existing support given in other countries. Solar is subsidised at a much higher level than other sources – EUR 450/MWh for solar versus about 80–95 for other types – in order to stimulate investment in the field and diversify the renewables portfolio.

Figure 15

Flanders Green Certificate Market, 2003 to 2005



Note: Issued certificates are noted in the year they are issued, but they apply to the previous year.
Source: Country submission.

The minimum price subsidy is guaranteed for installations that began operations after 7 May 2004. For solar energy installations, the minimum price subsidy is only available for installations that begin operation on 1 January 2006 or after, in order to provide a transition from the existing subsidy regulation (a direct government subsidy of 50%) to the new subsidy mechanism (higher payments in return for more limited direct subsidy).

Since the minimum prices for all sources except solar panels are below the fine level of EUR 125 per certificate, it is likely that the minimum prices will only have an effect on solar panel installations.

Table 25

Flanders Green Certificate Minimum Prices

Source of renewable generation	*Minimum green certificate price paid to generators by suppliers*
Hydroelectric power, wave and tidal energy, geothermal heat	EUR 95/MWh
Wind on land, organic-biological materials	EUR 80/MWh
Co-combustion of organic-biological materials, landfill gas, residual waste	EUR 80/MWh
Solar energy	EUR 450/MWh (+EUR 150/MWh via reverse rotation counter)

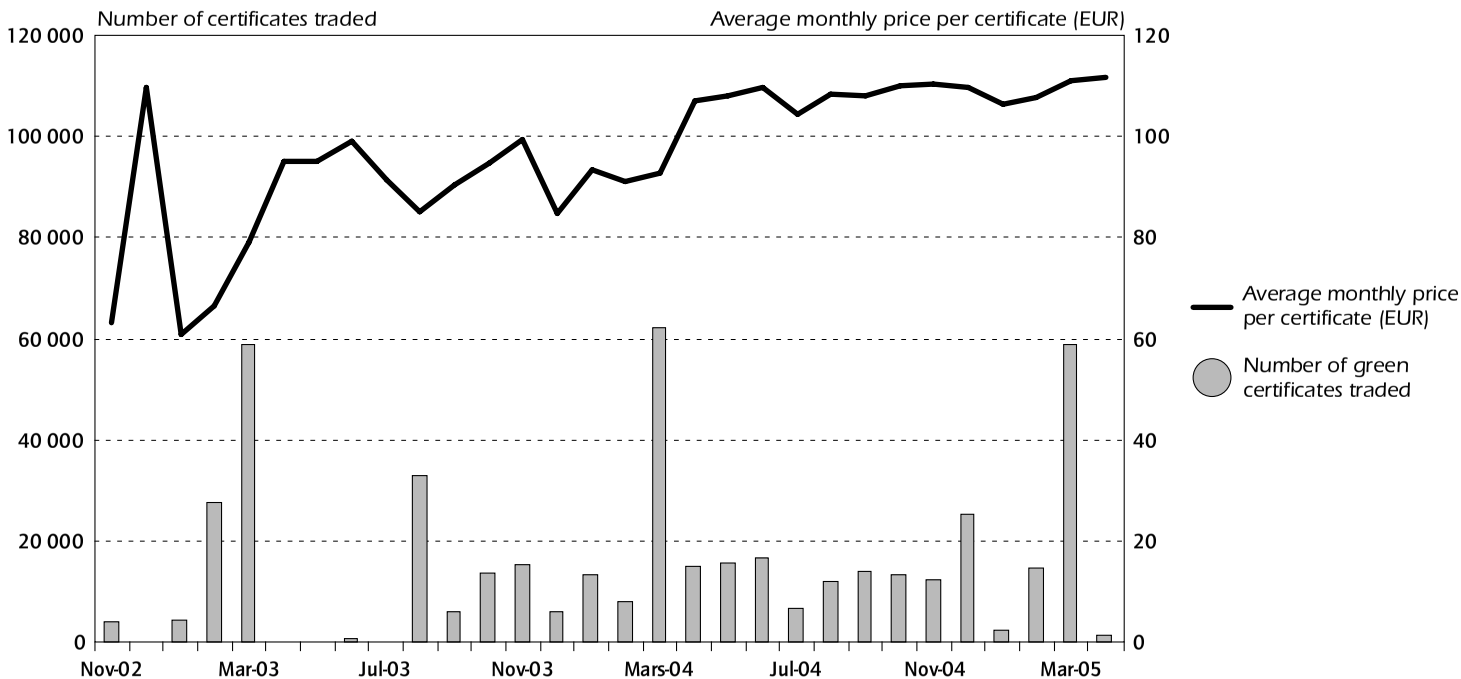
Source: Country submission.

Another challenge facing Flanders' green certificate market stems from a lack of competition in the electricity supply market. It was expected that since fines were set at levels significantly above the cost of generating 1 MWh of green electricity, suppliers would make a committed effort to comply with the green electricity obligation. While suppliers that procure green certificates instead of paying fines have a competitive advantage because of the high fine levels, this savings has not been passed on to end-use customers. There is evidence that, due to a lack of competition in the supply market, all suppliers can charge prices to end-users that are not only significantly above total costs that include green certificate costs, but also above total costs that include the higher-cost fines. Thus the financial advantage of complying with green certificate requirements is not passed on to the end-user. Nonetheless, the high cost of fines still provides incentives to suppliers to procure green certificates and support renewable energy rather than pay the associated fines.

Figure 16 gives the quantity and prices of green certificates traded in Flanders. In 2005 the average certificate prices was about EUR 109. This is slightly higher than the average 2004 price of EUR 104 per certificate.

Figure 16

Flemish Green Certificates Prices and Quantity Traded by Month, 2002 to 2005



Source: *Trade figures on green certificates*, VREG, May 2005.

Wallonia

In Wallonia's green certificate scheme, CWaPE, the region's regulator, awards one green certificate to producers for every 456 kilogram of avoided CO_2, which is equivalent to the CO_2 emitted from the production of 1 MWh of electricity from a gas turbine. In addition to electricity produced from renewable resources, generation from high-quality CHP installations are also eligible for the certificates (see Chapter 5 for further information on CHP). The avoided CO_2 calculations convert to one green certificate awarded per MWh produced by wind, small hydro, biomass and solar photovoltaic (PV) installations, one certificate per 3.3 MWh produced by natural gas co-generators and one certificate per 6.2 MWh produced by fuel oil co-generators.

Wallonia's quota requirements for suppliers will grow steadily through 2007: 4% of total generation in 2004, 5% in 2005, 6% in 2006 and 7% in 2007. In 2005, the government will define quotas for the following years. The fine for each missing certificate is EUR 100.

In 2003, CWaPE awarded 612 180 green certificates. Of the total, 52% were for hydro installation, 12% for biomass, 23% for CHP and biomass, 11% for CHP and 2% for wind. Since the end of 2003, green certificate prices have remained steady at around EUR 90 per certificate (see Figure 17). The average price of green certificates rose from EUR 86.19 in 2003 to EUR 91.74 in 2004. CWaPE estimates that 1 100 000 certificates will be awarded in 2005 (40% for biomass, 24% for hydro, 19% for CHP and biomass, 12% for wind and 5% for CHP).

To provide greater investment security, Wallonia has also implemented *de facto* minimum prices for green certificates. For installations that began operations after 1 July 2003, owners may choose not to sell the awarded green certificates to suppliers. Instead, they can be exchanged for production aid funded by the Energy Fund for the amount of EUR 65 per certificate.

Brussels-Capital

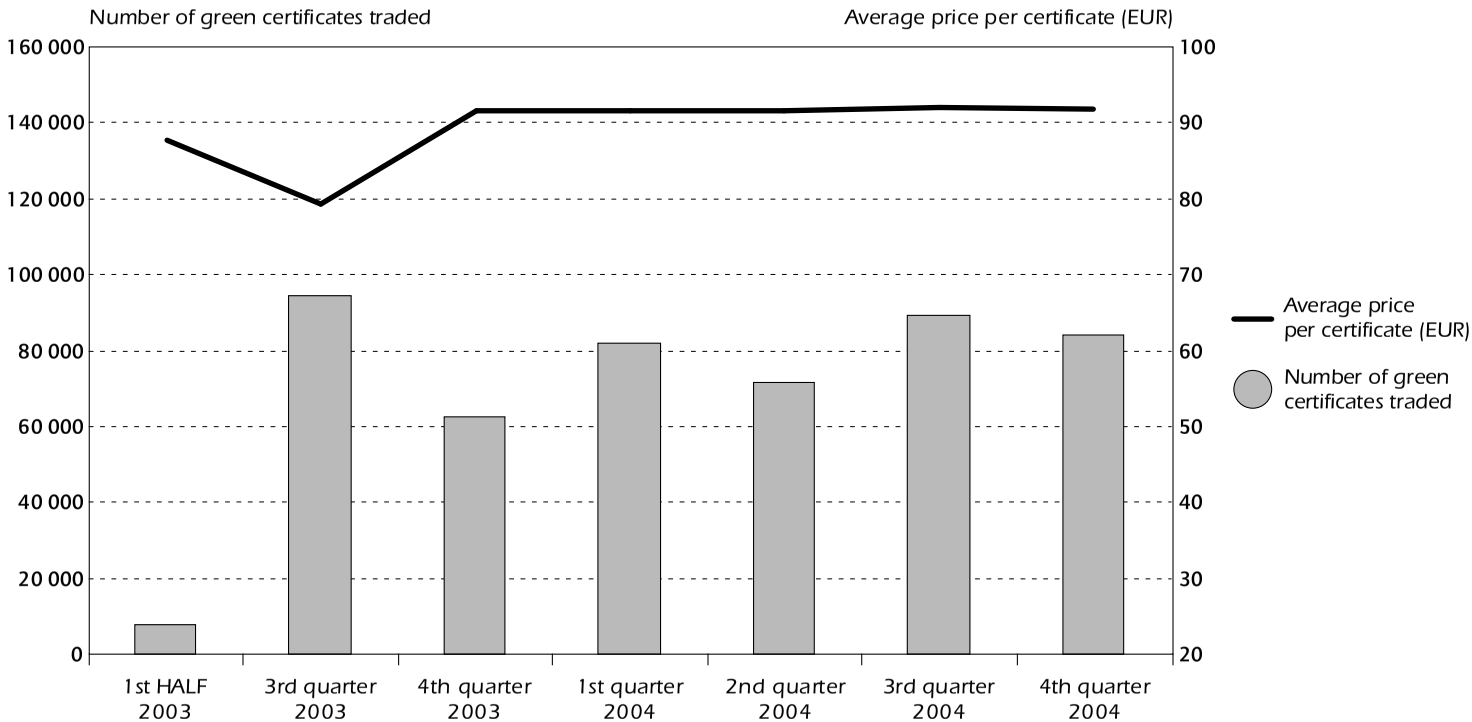
The Brussels-Capital green certificate scheme is similar to that of Wallonia, awarding green certificates on the basis of avoided CO_2. It requires suppliers to obtain green certificates to cover a share of total electricity generation: 2% in 2004, 2.25% in 2005 and 2.5% in 2006. An agreement between Wallonia and Brussels allows for the exchange of credits between the two regions. However, in order to encourage the development of green electricity sources within Brussels, Brussels discounts the value of Walloon certificates by 30%.

Federal level

In July 2002, the federal government instituted a green certificate scheme for installations that generate electricity from water or wind in the territorial sea and in the exclusive economic zone of Belgium – installations for which the

Figure 17

Prices and Quantities of Green Certificates in Wallonia, 2003 and 2004



Source: *Rapport Annuel Spécifique 2004*, CWaPE, May 2005.

federal government has jurisdiction. These certificates are given by the federal Electricity and Gas Regulatory Commission (CREG). Each certificate corresponds to 1 MWh of renewable electricity production.

The federal green certificate instrument does not assign any renewable energy target on behalf of the federal authority, as the federal government does not have the responsibility for organising a certificates market. However, it is complementary to the regional green certificate schemes. Producers may choose to sell their certificates in one of the regional certificate markets, or can request that the green certificate be purchased by the transmission system operator (TSO) at a minimum price. If producers take the latter option, the TSO has an obligation to purchase the certificate at or above the minimum prices listed in Table 26, and then sell the certificate in one of the regional markets. The difference between the purchase price of the green certificate by the grid manager and the selling price of this certificate on the market is financed by a surcharge on electricity transmission tariffs. The system provides minimum guaranteed revenues for green electricity producers.

Table 26

Federal Green Certificate Minimum Prices

Type of installation	*Minimum price*
Offshore wind energy	EUR 90/MWh
Onshore wind energy	EUR 50/MWh
Hydro	EUR 50/MWh
Solar energy	EUR 150/MWh
Other sources of renewable energies (such as biomass)	EUR 20/MWh

Source: Country submission.

FISCAL AND OTHER INCENTIVES

Federal

By virtue of royal decrees in 2000 and 2004, the Minister for Energy can provide territorial concessions for the construction of installations of water-, current- or wind-generated electricity installations in the territorial sea and the exclusive economic zone of Belgium. These concessions can provide lower-cost or free leases for offshore wind sites.

In March 2005, the federal Council of Ministers decided that two coal-fired power plants must switch to biomass.

Flanders

In June 2003, Flanders began funding the seven-position Green Energy Taskforce with the task of intensifying actions to promote green electricity and

heat production. The Green Energy Taskforce uses fines paid into the Fund for Renewable Energy Sources to promote renewable energy production, to take measures to supervise the sector, to start demonstration and market introduction projects and to promote the production of green heat. The Green Energy Taskforce is also charged with creating conditions for suppliers who fail to achieve green certificate targets, so that they can make up for missing certificates.

Wallonia

In Wallonia, the SOLTHERM programme aims to have 200 000 m^2 of solar panels installed by 2010 through the use of an information campaign and fiscal incentives. For households, there is a subsidy of EUR 1 500 for the first four m^2 plus EUR 100 for any additional m^2.

Several *facilitateurs* have been appointed as a result of their expertise in specific renewable energy fields. These *facilitateurs* are private operators subsidised by the Walloon region. They give information and advice to potential investors, but do not participate in any projects. They also advise the Walloon region on obstacles to the further development in their area of expertise. To promote renewable energy, there are five *facilitateurs*, one each for:

- wind
- hydroelectricity
- bio methanisation
- wood
- biofuels

Renewable energy supply investments may benefit from subsidies through a decree adopted in April 2004. This decree gives a new legal basis for financial incentives (*e.g.* subsidies, reimbursement of loan guarantees, tax exemptions and accelerated write-offs) for sustainable energy, investments in energy efficiency or production from renewable energy and CHP. This new legislation has been adopted according to the EU guidelines on government aid for environmental protection.

The Energy Fund finances household investments in heat production from renewable sources (*e.g.* wood heating, mass stoves). In addition, Wallonia subsidises APERE (*Association pour la promotion des énergies renouvelables*), a non-profit organisation active in the development of renewable energy sources.

A new subsidy for renewable energy investments is still under consideration. The legislation would provide financial incentives (*e.g.* subsidies, reimbursements of loan guarantees, tax exemptions and accelerated write-offs) for sustainable energy investments.

Brussels-Capital

Brussels-Capital has some fiscal incentives related to household use of renewable energy sources. To stimulate the use of solar water heaters, a subsidy of up to EUR 991 and up to 35% of the total investment is given. In addition, information campaigns were also launched through the diffusion of documents designed for the public and the organisation of both general and technical workshops. Some solar projects can have up to 50% of their costs financed by Brussels-Capital. In 2003, five such projects were supported: 2 swimming pools and 3 collective dwellings.

BIOFUELS

In the transport sector, the government has a commitment to increase the share of biofuels to 2% in 2005 and 5.75% in 2010, in accordance with the EU directive. The Belgian government agreed to the introduction of biofuels as of 1 January 2005. The royal decree permitting biofuels in the Belgian market was approved in March 2005. Belgium submitted its required national report to the European Commission (EC) on 1 July 2004.

In April 2005 the Council of Ministers took note of the draft Planning Act reducing excise duties on biofuels and approved its underlying principles. Excise duties will be lowered for diesel fuel incorporating at least 2.45% biodiesel and for petrol incorporating at least 7% bioethanol, either through direct incorporation or through the conversion to ETBE, an oxygenated additive to petrol. The amounts to be exempted from excise duties will be specified in the implementing royal decree. The EC must first approve the amount of tax reduction. In any event, reduced taxation of biofuels must be neutral to the budget. In other words, any financial losses on biofuels must be compensated for by additional income from fossil fuels. The federal parliament enacted legislation reducing excise duties on biofuels in July 2005. Implementation requires a further royal decree, to be drafted by the Minister of Finance.

One key challenge facing Belgium is that the country currently has no production capacity, so all biofuels must be imported. The government is looking into fuel mix obligations and other strategies to try to meet the target.

CRITIQUE

Since the last in-depth review, Belgium has made progress on the promotion of renewable sources of energy, as shown in the growth of renewables, which now make up over 2% of total supply. The most notable policy development is that all three regions, plus the federal government have introduced green certificate schemes that obligate energy suppliers to ensure that a growing portion of electricity comes from renewable sources. In addition, all three regions have

introduced fiscal incentives to promote the use of renewable resources. The development of green certificate markets is a commendable achievement because the market-based mechanism is more efficient than command-and-control strategies and more compatible with liberalised electricity markets.

Nonetheless, Belgium's green certificate schemes can be improved in order to maximise their efficiency and benefits. For example, currently, most certificates issued in different regions cannot be traded between regions. The notable exception is that certificates issued in Wallonia and Brussels-Capital can be exchanged. In general, the lack of transferability of green certificates harms the overall effectiveness of the programmes. A segmented market can prevent the development of more efficient renewable energy installations. Suppliers are forced to purchase more expensive green certificates – and pass those costs onto end-use customers – because they must purchase certificates from within smaller geographical areas. To increase the efficiency of the scheme, and lower the overall costs of building green energy production into the system, all regions and the federal government should strengthen existing efforts to ensure that all green certificates are transferable. Models for this process is Norway and Sweden, which are discussing an integrated green certificate trading scheme. In addition, Brussels-Capital should review its policy of discounting Walloon certificates by 30%, which may raise the cost of green certificates, ultimately imposing higher costs on end-use customers. In addition, since the Walloon and Brussels-Capital regions use comprehensive green certificate schemes that include high-quality CHP and are based on avoided CO_2 emissions, and since Flanders uses a green certificate scheme that does not include CHP and is based on electricity production, harmonisation may require modifications to existing trading schemes.

The federal government has introduced a decree that obliges grid operators to buy green certificates at differentiated minimum prices ranging from EUR 20/MWh for biomass to EUR 150/MWh for solar. The Flanders government has set even higher minimum prices (*e.g.* EUR 80/MWh for biomass and EUR 450/MWh for solar), by taking into account production costs of each type of renewable energy sources and existing support levels in neighbouring countries. On the other hand, the Walloon government has set a *de facto* uniform minimum price of EUR 65 per certificate. While such minimum prices provide certainty to potential investors, they could reduce the cost-effectiveness of green certificate schemes, and make them function more like less efficient feed-in tariff schemes. In addition, the differentiated minimum prices provide advantages to some technologies over others, in effect "picking winners" by subsidising them, and leading to inefficient and more costly renewable energy. Different types of renewable energy sources should receive the same support and compete with each other on an equal footing, as long as they each provide the same CO_2 reduction and the same reduction in dependence on fossil fuels. Furthermore, minimum price levels could block reductions in certificate price, increasing the costs of the system.

Currently, partial exemptions from green certificate obligations are offered to energy suppliers on the basis of sales to large-scale consumers. In Flanders, these exemptions are used as incentives for large-scale consumers to participate in voluntary agreements. These arrangements stem from industry concerns about international competitiveness. On the other hand, noting the volume of consumption of large-scale consumers, such arrangements may reduce the effectiveness of the green certificate system. If support is necessary, other methods should be considered rather than exempting large parts of the market from green certificate obligations.

A prerequisite for a successful green certificate scheme is that penalties for non-compliance are higher than the costs of compliance in all periods. Some evidence indicates that energy suppliers have sometimes chosen to pay penalties instead of complying because they expect penalties to increase in the following year and would rather be out of compliance when penalties are cheaper. Care should be taken so that penalty levels do not result in non-compliance.

While green certificates are the main instruments for promoting renewables, there are many other incentives such as production grants, structural funds and specific subsidies. It should be considered whether these multi-layer support schemes could be more streamlined so that they are more cost-effective. For example, the cost-effectiveness of the various support schemes for solar PV, which may in fact be relatively unsuitable for Belgium given the climate, should be re-examined. In particular, some very high minimum green certificate prices should be evaluated.

In the transport sector, stemming from the EU directive, the government has a commitment to increase the share of biofuels to 2% in 2005 and 5.75% in 2010. The federal and regional governments are in the process of identifying policies and measures to promote biofuels. One key challenge facing Belgium is that the country currently has limited production capacity, so all biofuels must be imported. Co-ordination between federal ministries on biofuels policy should be intensified. As greater use of biofuels in transportation positively affects energy efficiency and security of supply, Belgium's federal and regional governments should work together to quickly implement cost-effective market-based strategies designed to meet the goals of the EU directive.

RECOMMENDATIONS

The government of Belgium should:

- *Further strengthen the efforts to harmonise the federal and regional quota systems on green certificates with a goal of establishing a national green certificate market.*

- *Ensure that the differentiated minimum certificate prices do not reduce the cost-effectiveness of the certificate system.*
- *Ensure compliance of the quota obligation is not undermined by fines that are too low.*
- *Evaluate whether various support schemes can be more streamlined to maximise their cost-effectiveness.*
- *Consider the costs and benefits of promoting technologies not necessarily suited for the climate conditions in Belgium, such as solar photovoltaics.*
- *Create a comprehensive strategy and develop policies and measures – including fiscal incentives – to increase the use of biofuels in transportation.*

SUPPLY, DEMAND, TRADE

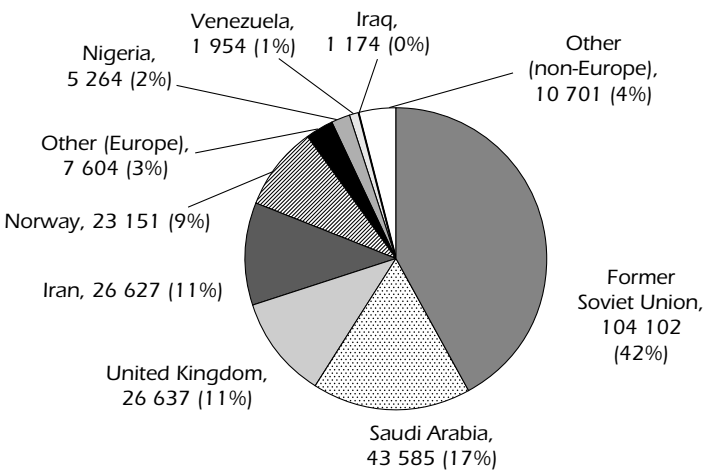
SUPPLY AND TRADE

Belgium has no indigenous oil resources; all crude oil is imported. In recent years the North Sea (Norway and the United Kingdom) and the former Soviet Union have become the country's main suppliers of crude oil. This is in contrast with previous years when the Middle East was the main supplier. For example, in 1979, OPEC countries provided 87% of Belgium's imported oil. That amount fell to 34% in 1999 and was 31% in 2004. Figure 18 provides a breakdown of the origin of Belgium's 2004 crude oil imports.

Figure 18

Countries of Origin of Crude Oil, 2004

Total : 250 799 million barrels

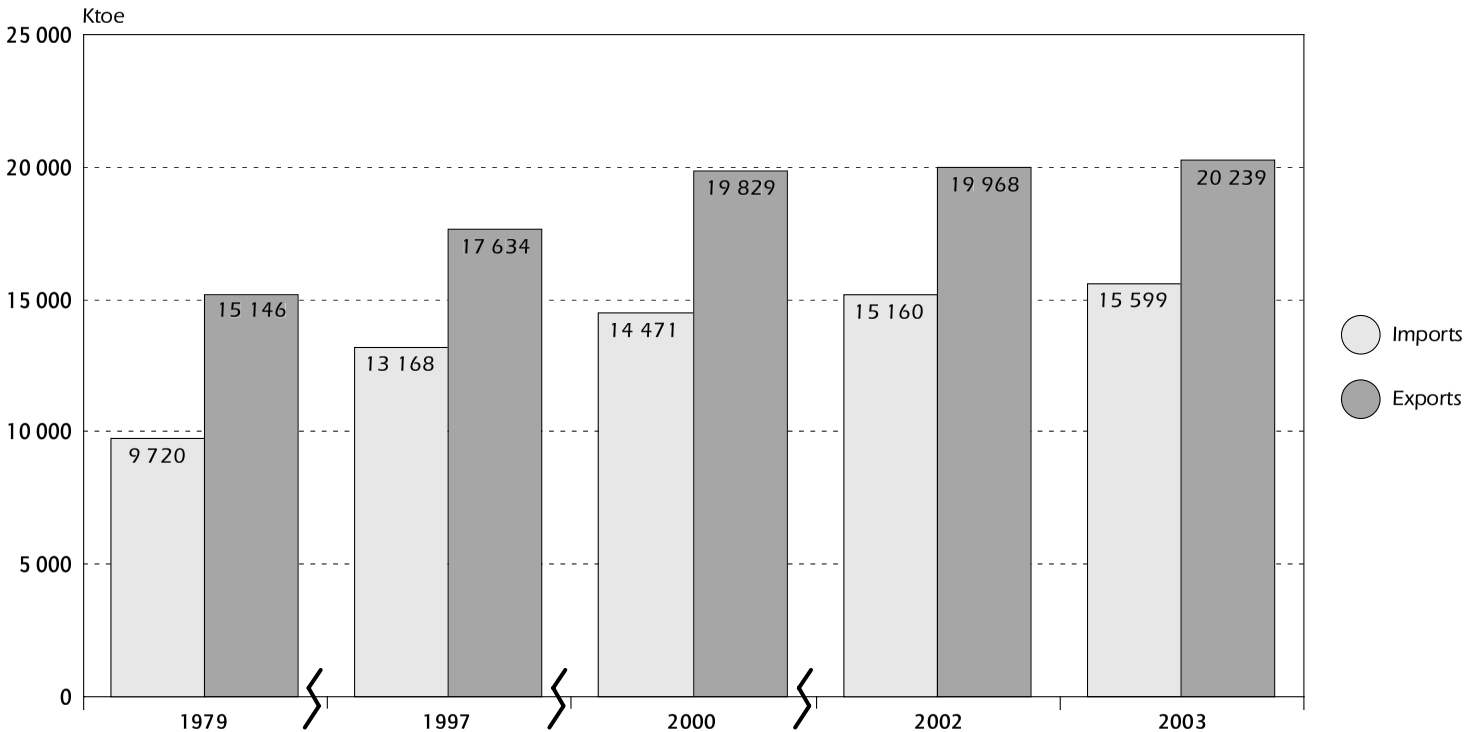


Source: Country submission.

Belgium is a net exporter of finished and intermediate products (see Figure 19). Western Europe is Belgium's primary trading partner. Over 46.6% of imported finished product is diesel oil. Diesel oil is also the main export product, primarily to the Netherlands (23.6%), Luxembourg (21.0%), Germany (14.8%) and France (14.1%). Other important export products are gasoline (of which a third is exported to the US) and fuel oil.

Figure 19

Intermediate Products Imports and Exports, 1979 to 2003



Source: Country submission.

Oil consumption rose sharply between 2002 and 2003, but this mainly reversed a similarly large drop in consumption from the year before (see Table 27). The main oil consuming sectors are transport (about 7 000 ktoe), industry (about 6 000 ktoe) and households (about 4 600 ktoe).

Table 27

Primary Oil Consumption, 2000 to 2003

	2000	*2001*	*2002*	*2003*
Primary oil consumption (ktoe)	23 690	24 033	22 338	24 153
Change from previous year		1.4%	–7.1%	8.1%

Source: Country submission.

Deliveries of gasoline increased in 2003, in contrast to the recent trend. Diesel oil deliveries continued to increase. In 2003, 53.1% of cars were gasoline fuelled and 45.4% were diesel fuelled.

Table 28 gives a complete breakdown of oil consumption by sector. Transport accounts for the largest share of petroleum use, over 45%. The share has remained fairly steady since 1990. Industrial consumption uses the next largest share – nearly 20% – most of which is used by the chemicals industry. According to a 2001 study, 43.1% of Belgian households heat their homes with heating oil, 44% with natural gas, 7.2% with electricity and 2.8% with coal. Overall, residential use – primarily heating – accounts for about 17% of total petroleum production.

Table 28

Total Final Consumption of Petroleum Products, 1990 to 2003

Units: ktoe	*1990*	*2000*	*2001*	*2002*	*2003*
Industry (not including chemicals and petrochemicals)	1 183	1 357	1 643	986	1 285
% share of total	*6.8%*	*6.2%*	*7.3%*	*4.7%*	*5.7%*
Chemicals and petrochemicals	1 985	4 075	4 190	3 943	3 184
% share of total	*11.5%*	*18.5%*	*18.7%*	*18.6%*	*14.1%*
Transport sector	7 776	9 732	9 605	9 711	10 253
% share of total	*44.9%*	*44.3%*	*43.0%*	*45.9%*	*45.5%*
Residential	3 546	3 839	3 816	3 347	3 740
% share of total	*20.5%*	*17.5%*	*17.1%*	*15.8%*	*16.6%*
Other sectors	2 833	2 978	3 099	3 189	4 089
% share of total	*16.4%*	*13.5%*	*13.9%*	*15.1%*	*18.1%*
Total	**17 323**	**21 982**	**22 353**	**21 175**	**22 551**

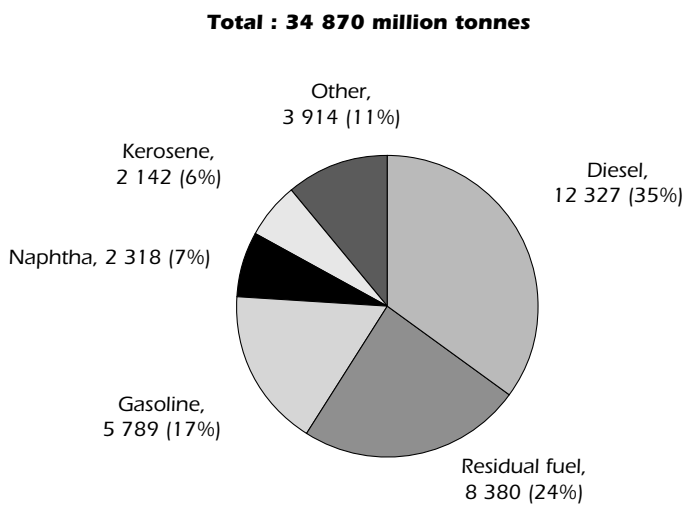
Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005.

REFINING INDUSTRY

There are four refineries in Belgium, all situated in Antwerp. The two major refineries are owned by Total (18.0 Mt of capacity in 2002) and ExxonMobil (12.8 Mt of capacity in 2002). Two smaller refineries are owned by the Belgian Refining Corporation and Petroplus. Belgium's total internal refining capacity is about 40 Mt/year, the seventh-highest in the EU-15. Total 2004 production broken down by product is shown in Figure 20.

Figure 20

Refined Product Production, 2004

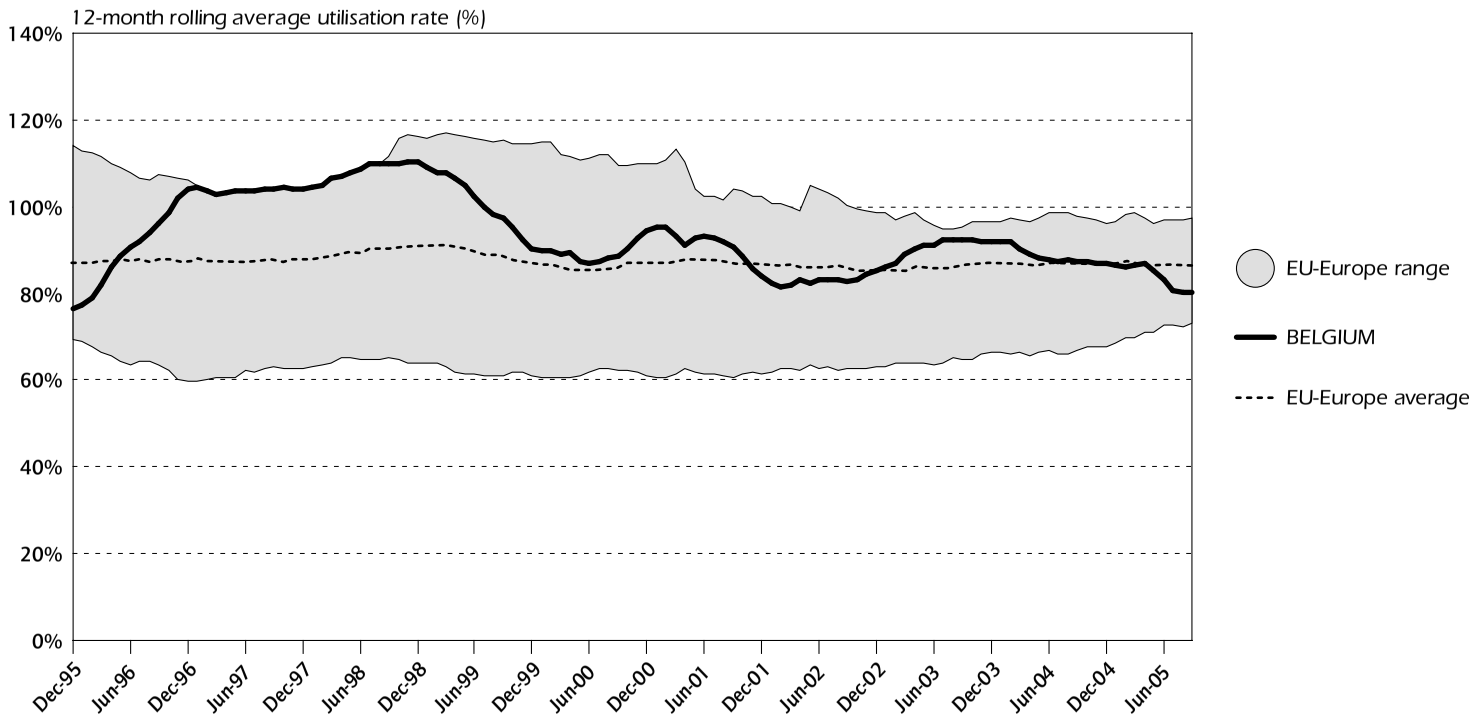


Source: Country submission.

Between 2004 and May 2005, the capacity utilisation rate of Belgium's refineries was 84.2%, slightly below the EU-15 of over 87%. About 40% of Belgium's crude comes from the Urals, 17% from Saudi Arabia, 11% from Iran, 11% from the UK and 9% from Norway. Overall, Belgium tends to process relatively sweet crude, with the exception of one refinery that processes heavy crude. Its refineries are relatively sophisticated, producing more light products and somewhat less residual fuel oil (26% of total products in 2005) than less sophisticated refineries. The country is self-sufficient in its production of gas/diesel oil and residual fuel oil; it produces considerable excess gasoline, likely for export to the US.

Figure 21

Refinery Capacity Utilisation, 1995 to 2005



Note: Utilisation rates can be above 100% because refineries are running above rated capacity or because there is a lag in the update of capacity data.
Source: *Oil Market Report*, IEA/OECD Paris, 2005.

Installed refining capacity has risen from 768 000 barrels per day (bpd) to 803 000 bpd. However, observed crude refinery intake has dropped from 687 000 bpd to 672 000 bpd, indicating that actual refinery production has decreased. This is also evident from refining capacity utilisation, where utilisation was once the highest in Europe, but has recently dropped below the European average, to just above 80%[8] (see Figure 21).

Since the last in-depth review, a new desulphurisation unit in Antwerp was constructed, a EUR 90 million investment. It went on line in October 2004.

RETAIL OUTLETS

The number of motor fuel service stations has fallen from 7 177 in 1997 to 3 663 in 2005. Soil pollution and oversupply are the primary causes of this sharp reduction. About 50% of diesel oil is not distributed by service stations, but delivered directly to private pumps for captive fleets (*e.g.* lorry and taxi companies, communities, fire stations). There are about 800 distributors of petroleum products, primarily of heating oil.

TRANSPORTATION NETWORK

NATO PIPELINE SYSTEM

A key method for transportation of oil products in Belgium is via the Central European Pipeline System (CEPS), part of the NATO Pipeline System. In future, NATO may make the decision to end funding for part of CEPS, which would affect oil transportation (especially kerosene transportation), particularly from the Antwerp port, Antwerp refineries and the Zaventem airport, which rely heavily on the pipeline system. Should NATO end funding for the system, a common carrier principle may be applied to future management of the system.

PRICING

PRICE CEILING

Most oil products sold in Belgium are subject to the Programme Contract, a maximum pricing scheme that has been in operation since 1987. Maximum prices for oil products are based on the following elements:

- Quotations of ex-refinery prices on international markets (principally the Rotterdam market).

8. Belgium reports its capacity utilisation at closer to 90%.

- An allowance for mandatory stocks, indexed quarterly, based on the value of the product, interest rates, the cost of rotating stocks and rent for storage facilities.
- A distribution margin, indexed annually, comprising a uniform element for all products and a sales margin (incorporating a fixed profit margin).
- The costs of certain policy instruments.
- Excise duties or other national duties and value-added tax.

The maximum price is calculated daily. If the change in price for each product compared with the moving average for the previous seven days exceeds a given threshold, the new tariff comes into effect the following day. In 2000, the calculation methods were modified to limit the number of price changes due to the fluctuation of international prices.

The Belgian government considers the price ceiling to be a crisis management instrument and, increasingly, a policy tool. Oil prices in Belgium are at the EU average and, according to a study by Test Achat, the Belgian consumer organisation, oil prices are also below or well below the maximum ceiling.

PRICES

Belgium's average unleaded gasoline price ranked as the fifth-highest of 26 OECD countries in the second quarter of 2005 (see Figure 22). At USD 1.58/litre, it is 21% higher than the average OECD price and 2% higher than the average price of the Netherlands, Germany and France. Looking at the ex-tax and tax components separately, Belgium's ex-tax price is 12% higher than the average price of the Netherlands, Germany and France. The tax component in Belgium is 2% lower than that of its neighbouring countries.

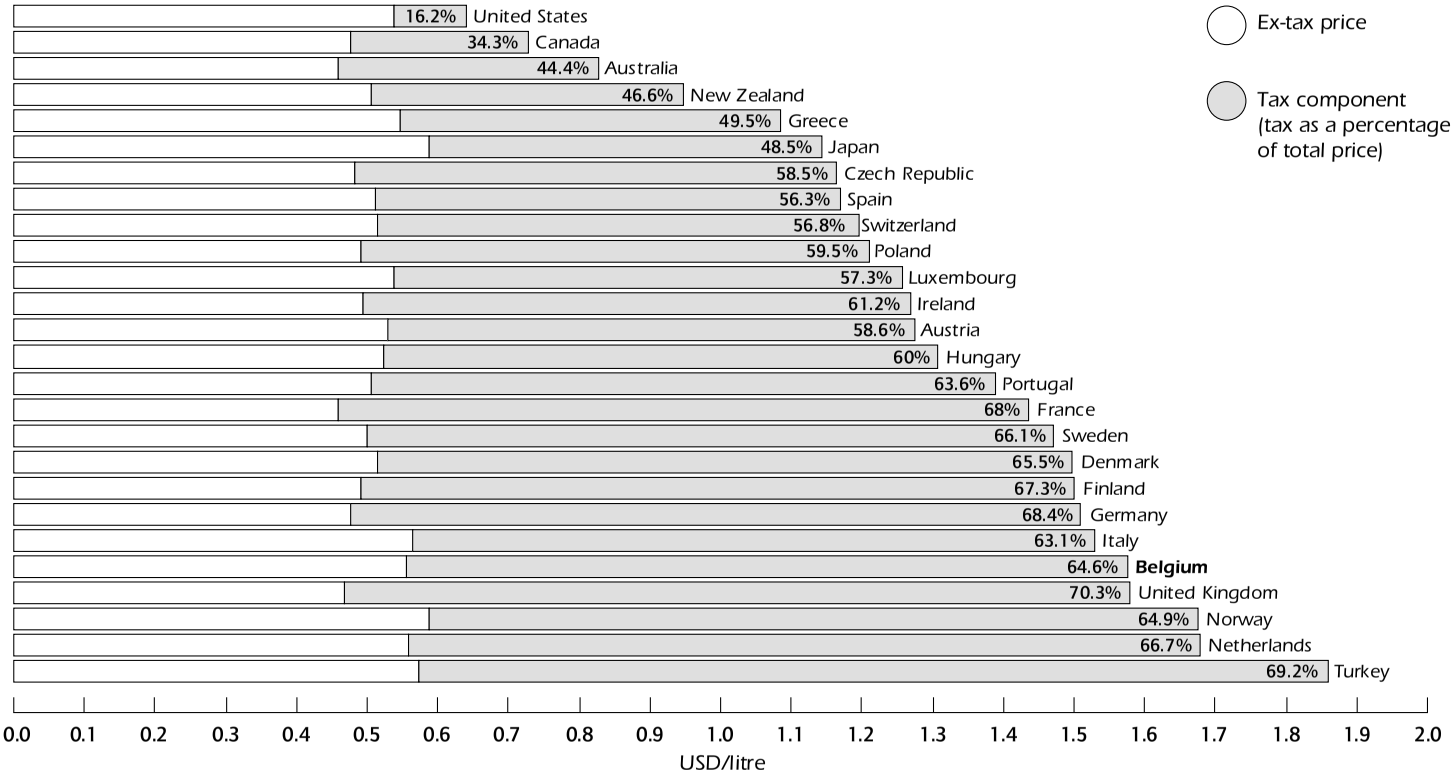
Belgium's average diesel price in the second quarter of 2005 was the seventh highest of 25 OECD countries (see Figure 23). Prices are 10% higher than the OECD average and 1% higher than the average of France, Germany and the Netherlands.

SUBSIDIES

Since the fall of 2004, Belgium has provided a social fund for heating oil purchases. Rebates for low-income consumers are based on actual invoices. About 200 000 households are eligible to receive rebates under this programme, which is paid for by the end-user and managed by the Social Heating Oil Fund, a body managed by representatives from the oil sector and the government and supervised by the government.

Figure 22

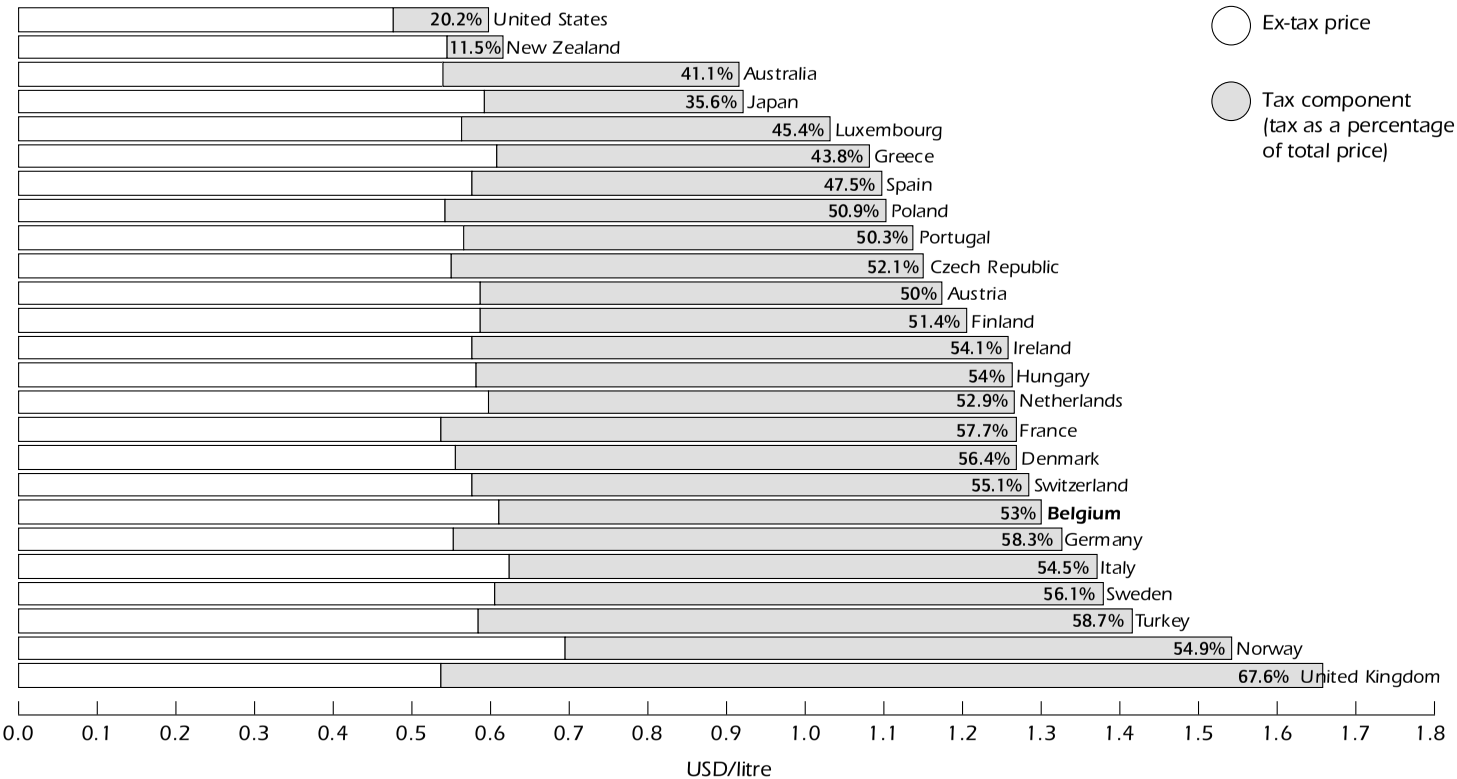
OECD Unleaded Gasoline Prices and Taxes, Second Quarter 2005



Note: Data not available for Korea, Mexico and the Slovak Republic.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2005.

Figure 23

OECD Automotive Diesel Prices and Taxes, Second Quarter, 2005



Note: Data not available for Canada, Korea, Mexico and the Slovak Republic.
Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2005.

QUALITY CHECKS

Created in 1995 and operational in 1996, the Fund for the Analysis of Oil Products (FAPETRO – *Fonds d'analyse des produits pétroliers*) carries out systematic quality checks, including both chemical make-up and temperature, on oil products on the Belgian market. FAPETRO is made up of representatives from the oil industry, government and professional organisations. It is funded by the petroleum sector.

In 2003, only 3.63% of analysed samples did not conform to quality standards. Though this is an increase over the 2000 value of less than 2% of samples, it is a sharp drop from 1995 when non-compliant samples amounted to 19.05% of all samples, as well as lower than levels in 2001 and 2002. Originally, most of FAPETRO's negative quality checks were the result of mixing heating oil and light oils – for which excise duties are not paid – with taxed diesel oils. This finding has decreased over time. Most problems today concern the flashpoint of diesel oil, which refers to the presence of gasoline.

Testing procedures for heating oil are currently under development.

ENVIRONMENTAL ISSUES

BOFAS FUND

In March 2004, Belgium's Fund for the Clean-up of Polluted Service Station Soil (BOFAS – *Bodemsaneringsfonds voor tankstations/Fonds d'assainissement des sols des stations-service*) became operational. The fund provides financial assistance for service station clean-up projects. If a service station is closing down permanently or was already permanently shut down, the fund provides 100% of the costs and carries out the clean-up project itself. If service station activities continue at the site, the fund provides only a limited share of the costs. The fund is based on a co-operation agreement between the federal and regional governments and is financed equally by the oil sector and end-use motor fuels consumers. The EUR 400 million project is scheduled to last 15 years.

FUND FOR HEATING OIL STORAGE TANKS

In addition to BOFAS, Belgium is developing another fund for the clean-up of soil polluted by heating oil storage tanks. As about half of Belgium's households heat their homes with heating oil, there are about 1 150 000 underground heating oil storage tanks. This future fund will be based on a co-operation agreement between the federal and regional governments and will be financed entirely by end-use heating oil consumers. The fund will have two primary tasks: to clean up existing soil pollution caused by leaking tanks and to prevent tanks from leaking in the future. The second task will be

accomplished by, among other things, developing quality standards for heating oil tanks, developing and promoting leak detection devices and providing information to end-use consumers. The goal of the fund is to completely eliminate leaks in the future. Owing to technical difficulties and incomplete negotiations, the programme is not yet operational and is still under negotiation. In addition, different regional laws and regulations hindered full implementation of the fund. Recently, a protocol agreement was signed between the regional and federal governments to fully implement the fund's activities as soon as possible.

EMERGENCY OIL STOCKS

Belgium has been non-compliant with the IEP stockholding obligation since the beginning of 2004. Currently, Belgian emergency stocks are held by the oil industry, which charges their costs directly to consumers. However, in December 2005, the federal parliament passed legislation that creates a centralised oil stockholding agency. This agency will hold stocks as part of the emergency reserves on top of those held by industry. The new legislation represents considerable progress in Belgium's efforts not only to achieve compliance with the IEP stockholding obligation, but also to significantly improve Belgian oil security in general.

OIL STATISTICS

Currently, about 100 oil companies submit statistics on petroleum imports, exports, bunkers, stocks and deliveries to the market. To improve the quality and level of detail of its oil statistics, the federal government is developing a new data submission form that is linked to customs documents in co-operation with the regional energy authorities and the oil sector. The project aims to provide high-quality oil statistics in order to aid Belgium's national crisis management processes and its emergency stocks policy, as well as to benefit other oil, energy and climate policies.

CRITIQUE

Belgium's recently passed legislation that creates a centralised oil stockholding facility highlights the progress the country has made on its oil policy since the last in-depth review published in 2001. In addition, FAPETRO continues to work very well in its efforts to improve the quality of oil products on the Belgian market. The share of faulty samples has dropped from 19% in 1995 to 3.6% in 2003. Nevertheless, continuous monitoring is necessary as the share of faulty samples has slightly increased in recent years.

Legislation to reduce the environmental impacts of oil distribution and storage has been strengthened. However, implementation tends to be delayed. While it is encouraging that BOFAS finally became operational in 2004 with three years' delay from the initial intention, the fund for the clean-up of soil polluted by heating oil storage tanks has yet to commence operation. It is promising that a protocol agreement has been signed by the relevant governments and that efforts are under way to commence operations as quickly as possible.

Petroleum price caps are determined using a method that includes prices of ex-refinery products on international markets and allowances for mandatory stocks, distribution and sales margins, excise duties and taxes, and certain policy instruments. In effect, the price ceiling acts as a buffer on price shocks and volatility. Belgium uses the price ceiling to protect customers in the event of short-term price spikes. Oil prices in Belgium are at the EU average and, according to one study and based on the prices noted by FAPETRO at service stations, are also below or well below the maximum ceiling. Nevertheless, the price ceiling could reduce demand response to a price spike. Such ceilings could be counter-productive, impeding the ability of higher prices to reduce demand and, ultimately, lower prices. These ceilings could also exacerbate any spot shortages of fuel due to rapid buying by both Belgian and foreign buyers. The existence of price caps could also easily lead to political pressures for market intervention during price spikes. Though a few IEA countries have imposed mandatory petroleum price caps in the past, only Belgium now imposes such caps. Belgium should consider removing these caps.

Currently, some petroleum products are transported using NATO-owned pipeline assets, but NATO has indicated that it may divest its pipeline holdings. Should this occur, Belgium should work with all affected countries to develop a new ownership and operating structure that allocates transportation in a fair and cost-effective manner, with minimal disruptions to existing supply chain systems.

Belgium's new legislation creating a centralised stockholding agency is a very positive development. The country should monitor the progress of the establishment of the agency to ensure as soon as possible long-term compliance with Belgium's IEP stockholding obligation.

RECOMMENDATIONS

The government of Belgium should:

- *Consider removing the oil price ceiling and any other oil price regulations that may inhibit demand response to oil price spikes.*
- *Put the fund for the clean-up of soil polluted by heating oil storage tanks into operation as quickly as possible.*

SUPPLY, DEMAND, TRADE

The Belgian natural gas industry started on a regional scale in 1905 with the formation of Gazelec and developed its first long-distance transport capacity in 1929 with the formation of the Distrigas company. Since then, Belgium has grown into a large consumer of natural gas as well as an important transit country, the latter owing to its strategic location linking the North Sea and the Netherlands to major European consumer countries.

NATURAL GAS DEMAND

In 2003, Belgium consumed 16.25 bcm (14.4 Mtoe) of natural gas, representing 24.3% of TPES and approximately 4.2% of the total gas consumption of the EU-15. In 2004, Belgium consumed 17.3 bcm (15.37 Mtoe), divided between industrial demand (35.4%), electricity generation (26.3%) and household demand (26.2%); the tertiary sector accounted for the remaining 12.1%. As shown in Table 29, over the next ten years the Belgian planning authority[9] has predicted that demand will grow by around 20% for all sectors apart from electricity generation, which is predicted to require an additional 75% of current gas demand.[10] This will mean that by 2014, power generation will represent the largest share of Belgian gas demand by sector, a development that has important consequences for the developing gas and electricity markets. If this coupling between the two markets is realised, gas supply will emerge at the forefront of domestic energy policy in Belgium, a change emerging in many other European countries.

Table 29

Projected Natural Gas Demand in Belgium According to the 2004 10-year Plan

Units:	*Households*	*Tertiary*	*Industry*	*Electricity*	*Total*
2004	4.53	2.09	6.12	4.55	17.30
2014	5.31	2.49	7.44	7.95	23.19
Increase	17%	19%	21%	75%	34%

Source: Country submission.

9. The competent authority for the Belgian 2004 ten-year plan was the gas and electricity regulator (CREG), but has been changed by an act of parliament (in April 2005) to the government.
10. The industrial commissioning of a new 385 MW combined-cycle gas turbine station in Zandvliet (Electrabel 50-50 partnership with RWE) is awaited for mid-2005 which will immediately add demand for approximately 0.5 Mtoe gas per annum (3.3% annual gas consumption).

According to analysis that goes out beyond 2014 and the ten-year plan, natural gas will largely replace nuclear power as it is phased out between 2015 and 2025. Fully replacing nuclear power, which currently supplies over half of Belgium's electricity, would add about another 5 bcm of gas demand annually. This would represent a huge change in the profile and location of demand, and would require significant modification of the existing gas and power infrastructure.

The domestic market for space heating and cooking is shared approximately equally between piped gas and fuel oil stored in tanks. There is a clear environmental preference for gas to be used in this domestic role, resulting in legislation to encourage builders to connect new houses to any nearby gas network (where one exists) rather than installing a fuel oil tank. Though prices for both gas and oil have risen strongly over the last 12 months, there has been a tendency towards customers switching from oil to gas, in part because gas prices are not allowed to move as quickly as oil prices. In a rising market, this lag makes gas appear cheaper than oil, whose prices are passed through to customers more quickly.

The domestic gas market is divided historically between the two qualities of gas used in Belgium. High-calorie gas[11] (H-gas) is favoured by the authorities because it is more widespread in Europe. Extensions or reinforcements to the low-calorie gas (L-gas) grid are discouraged. New connections, primarily in the domestic market, are completed by switching users to H-gas. This results in a steady demand for new domestic H-gas customers representing a 1.6% compound yearly growth in the market. This market growth provides a very important source of new customers for the competitive gas market, but it should be noted that the majority of these potential customers are also interested in the domestic electricity market through "dual fuel" marketing by suppliers of both gas and electricity – a further relationship between gas and power markets and an additional barrier to new market entrants who need to be able to offer both products.

GAS IMPORTS

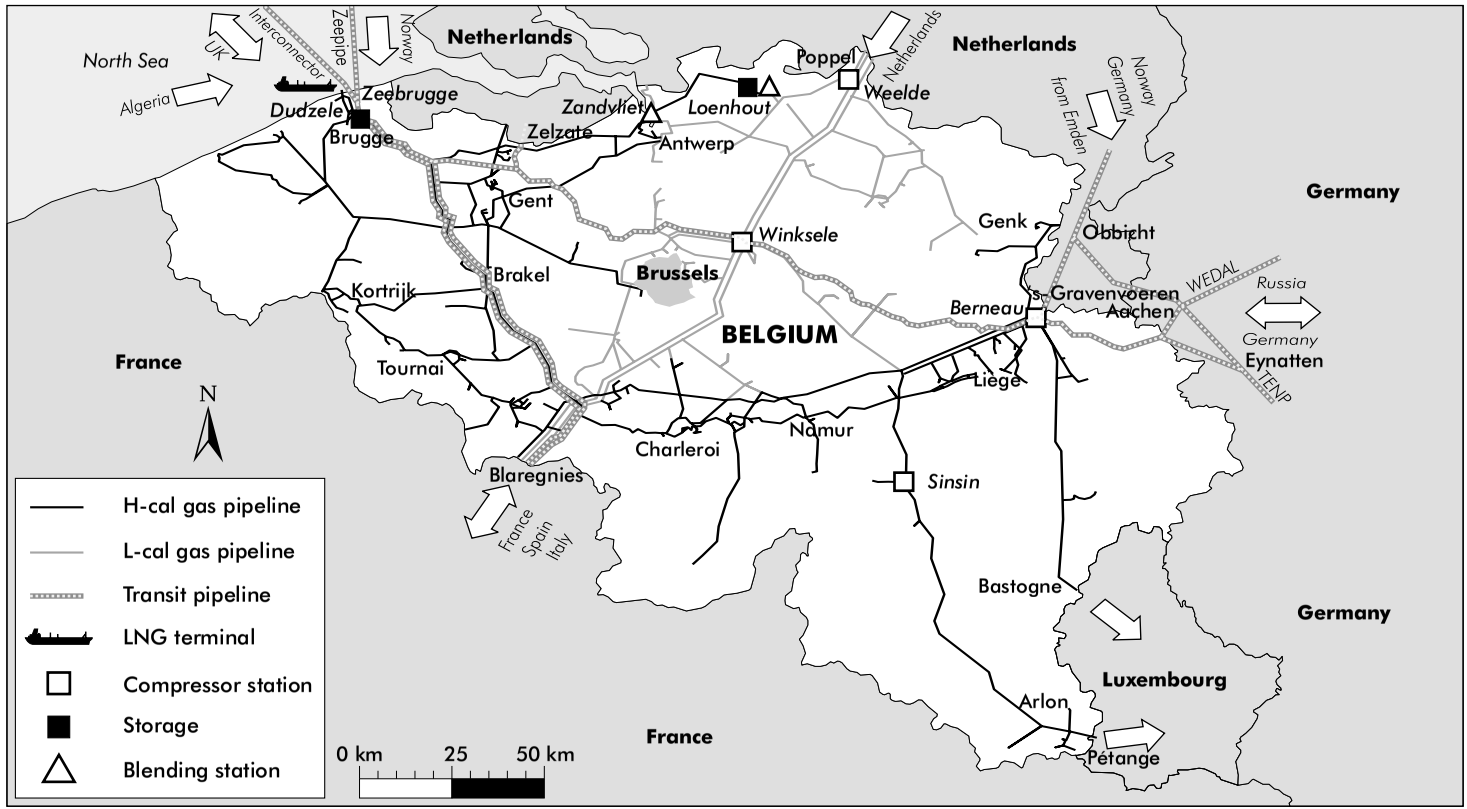
Belgium has no indigenous gas production, and therefore relies on trade to supply all of its domestic requirements. Its strategic location between the sources of European gas to its north and west, and their primary markets south and east of Belgium, make the country pivotal for the trade of gas in Europe and the regional liberalisation process. Figure 24 is a map of the gas network.

Belgium imports nearly all its gas for domestic consumption from four countries: the Netherlands, Norway, Algeria and the UK (see Figure 25). The presence of a liquefied natural gas (LNG) regasification terminal in Zeebrugge allows Belgium to accept cargoes from an expanding list of LNG-producing countries in addition to Algeria, and greatly contributes to its insurance against supply interruptions.

11. High-calorie gas is used in the majority of Belgium, and is the same quality as internationally traded gas. Low-calorie gas in Belgium is sourced from one field in Holland, and therefore is not replaceable directly with imports from other sources.

Figure 24

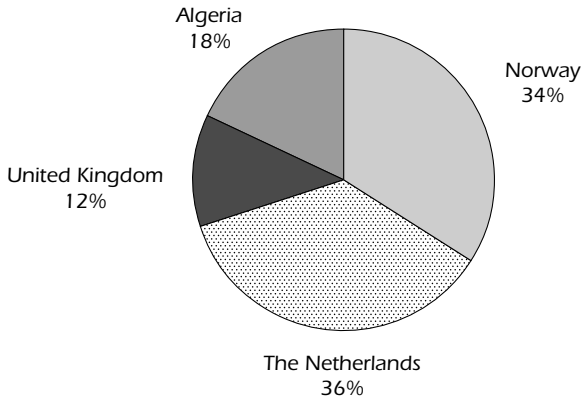
Map of Natural Gas Transportation Network, 2004



Source: Country submission.

Figure 25

Belgian Natural Gas Supply by Source, 2003



Source: Country submission.

The presence of the LNG terminal and associated storage, along with major pipeline interconnections (see Table 30) allows Zeebrugge to act as the main trading hub for continental gas, while its connection to the UK allows market liquidity to be shared with the UK's National Balancing Point (NBP), the country's major trading point. Although Belgium is seemingly very well connected to its neighbours, much of the capacity is contracted and therefore not available to the market, meaning that much of the strategic advantage of the hub is lost.

Table 30

International Connections to the Belgian Natural Gas Network

Connection to	*Belgian border*	*Quality*	*Connections to pipelines*
Norway	Zeebrugge	H	1
UK	Zeebrugge	H	1
Algeria, etc.	Zeebrugge	H	1
Norway/Germany	s'Gravenvoeren	H	1
Russia/Germany	Eynatten	H+H	2
Germany	Obblicht	H	1
Netherlands	Poppel	L	1
Netherlands	Zelzate	H+H	2
France/Spain/Italy	Blaregnies	H+H+L	3
Netherlands	Zandvliet	H+L	2
Luxembourg	Bras	H	1
Luxembourg	Pétange	H	1

H = high-calorie gas ; L = low-calorie gas.

Source: Country submission.

The gas and electricity regulator is making efforts to force the integration of the network between lines that were originally intended exclusively for transit gas through Belgium and lines that were built to serve domestic customers. This meshing will further enhance Belgian security of supply and increase the liquidity of the domestic gas market.

MARKET LIBERALISATION

The Belgian gas law of 29 April 1999 amended previous legislation from 1965 and fully incorporated the first European Directive on Gas Storage, Transportation, Distribution and Sales. In July 2000, the federal government agreed to speed up market opening for industrial clients and distribution companies beyond the rate required in the European directive.

This early adoption of the first EU gas directive, and its development in Belgium meant that the pace of liberalisation was initially quick. However, Belgium initially opted for negotiated third-party access (TPA) to transportation services, a process which did not realise a market in capacity and which has since been changed for regulated TPA. This delay, in addition to the decision to adopt legal but not ownership unbundling, has left the vast majority of Belgian electricity and gas assets under the control of the French Suez Group and has meant that the development of competition has slowed. The translation of the EU's second gas directive into Belgian legislation by the 1 June 2005 law could again kick-start the process, but it appears that although legal separation has been accomplished, the lack of ownership unbundling may be the stumbling block to more complete liberalisation.

The CREG, the federal regulator, monitors the natural gas market and has powers to approve transportation and distribution tariffs and other regulated assets. It also has a general advisory role on liberalisation issues. Recently, some powers held by the CREG have been removed by the 1 June 2005 law; some have been transferred to the federal government. These removed powers include the preparation of the ten-year natural gas supply and network development plan, the ability to collect information from market participants without justification and the ability to monitor aspects of compliance with corporate governance, such as the independence of the system operator from related undertakings. The division of responsibilities between the regional and federal regulators is shown in Table 31.

Owing to the federal structure of Belgium, it is the responsibility of the regions to decide on their rate of local market opening, meaning that progress was faster in some regions than in others. Overall, 92% of the Belgian market is able to choose its own supplier. The respective sizes of the regional gas markets in 2004 are shown in Table 32.

Table 31

Natural Gas Market Roles and Responsibilities of the Federal and Regional Regulators

Federal *CREG*	*Flanders* *VREG*	*Wallonia* *CWaPE*	*Brussels-Capital* *part of government, IBGE/BIM*
• Control TPA to natural gas transmission network • Control execution of plans regarding development of the natural gas transmission network and continuity of supply • Ensure that public service obligations are fulfilled by suppliers and the network operator • Work with the competition authority • Verify the absence of cross-subsidies between categories of clients[1] • Approve conditions of TPA into transmission networks • Ensure that companies not granting TPA do so for valid reasons • Approve the tariffs charged for using the transmission and distribution network	• Distribution of natural gas • Appoint DNOs • Grant delivery licenses to suppliers • Technical regulations for the management and expansion of the natural gas distribution network • Provide mediation regarding disputes • Ensure compliance with legal and statutory functions • Advise the Flemish government on operation of the Flemish energy market • Ensure that public service obligations are fulfilled	• Distribution of natural gas • Technical regulations for the management and expansion of the natural gas distribution network • Ensure compliance with legal and statutory functions • Advise the Walloon government on operation of the Walloon energy market • Ensure that public service obligations are fulfilled • Control the eligibility of clients for the competitive market	• Distribution of natural gas • Ensure compliance with legal and statutory functions

1. It is expected that this power will be removed from the CREG basis on a 27 July 2005 law.

Source: CREG, VREG, CWaPE and IBGE/BIM.

Table 32

Natural Gas Consumption by Region, 2004

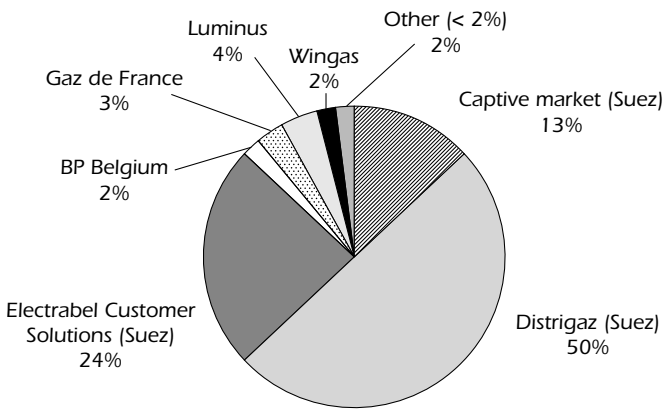
	Flanders	*Wallonia*	*Brussels-Capital*	*Belgium (total)*
Natural gas consumption (GWh)	126 360	49 891	11 080	187 330
Natural gas consumption (Mtoe)	10.87	4.29	0.95	16.11
Share of total market	67.5%	26.6%	5.9%	100.0%

Source: Country submission.

Despite liberalisation, the market is dominated by the incumbent supplier, Distrigas, and other Suez-owned companies. Figure 26 shows gas supply shares in Belgium.

Figure 26

Belgian Natural Gas Supply by Company, 2003



Source: Country submission.

FLANDERS

Flanders represents nearly 70% of the Belgian gas market, and approximately 58% of the population.

Since July 2003 the gas market has been open to all users who are on the distribution grid, and there are currently 12 registered suppliers of gas in addition to the incumbent[12] group. As with many other European regions, the degree of switching by customers has been low, with 87.8% of the gas market (by energy supplied) still controlled by the incumbent through its subsidiaries (Electrabel Customer Solutions and Distrigas NV); only two other companies (Gaz de France and Luminus) hold any significant market share. By June 2005, over 10% of natural gas access points had signed contracts with new suppliers, up from 1.5% of those that had done so by January 2004.

Flanders has a regional regulator, the VREG, for its gas and electricity markets. The VREG is responsible for the efficient organisation of the Flemish gas market, as well as providing recommendations to the Flemish government on

12. The dominant energy supplier in Belgium is the Suez Group, which controls, via affiliates, several gas providers in Belgium, the largest being Electrabel Customer Solutions (ECS) and Distrigas NV.

the optimisation and organisation of the market and the provision of licences to gas suppliers. It is also responsible for the technical regulation of access to the gas distribution network and its management and extension. The regulator also hears disputes and enforces a code of conduct among suppliers.

WALLONIA

Wallonia represents 27% of the Belgian gas market, and approximately 31% of the population.

The Walloon gas market opening has not progressed as quickly as in Flanders. Overall, large users and business customers have been able to choose suppliers since July 2004. Households are not yet able to choose suppliers. Currently, about 35% of the gas market in Wallonia is free to choose suppliers, and approximately 84% of all customers are still supplied by the incumbent, either because they have not switched or because they are not yet eligible. Other market actors include ALG-Négoce (controlled by Gaz de France), BP, Luminus and Gaz de France directly. The completion of market opening is expected by January 2007. By the first half of 2004, 24% of industrial gas demand was supplied by new suppliers.

The Walloon area also has a regulator, the CWaPE, which is responsible for the local network and competition within the region. Its responsibilities include the regulation, control and transparency of the Walloon market, and the prevention of market abuse. The CWaPE has a similar role to that of the VREG in the reporting of data and the provision of information and opinion to parliament and also organises the function of arbitration for disagreements relating to distribution network access.

BRUSSELS-CAPITAL

The Brussels area represents the remaining 6% of the Belgian market for gas, and approximately 10% of the population. Comprising largely of a city-state, the majority of gas use in the region is for space heating, although there is also an automobile assembly plant.

The Brussels gas market has lagged behind the other regions because of to several factors, including the much lower proportion of large industrial buyers who in other regions have been pushing for the opportunity to buy gas from the cheapest source. This regional market is approximately two years behind the degree of market opening of the Flemish gas market. An April 2004 law allows for the reorganisation of the gas market. Here also there are policy changes in development with regard to the second European gas directive.

Owing to the geographical size of Brussels region, there is only one *intercommunale*, SIBELGA, supplying gas to end-users, though there are 12 registered suppliers. The market is dominated by the incumbent supplier, which has 99.85% of the market in terms of energy consumed. Other market actors include Luminus, Nuon and Gaz de France.

The Brussels region does not have nor intend to appoint a separate regulator; the Brussels government is the regulator. The functions provided by the regional regulators in Flanders and Wallonia are also contained within the government of Brussels region, including the provision of a mediation procedure and appeals panel and oversight of regional market abuse.

INDUSTRY STRUCTURE

SUPPLIERS

Within Belgium, the provision of utility services is tied to the community by a series of cross-ownerships and social obligations. In the past, local inter-municipal companies (*intercommunales* owned by the different regional communes) supplied clients with gas and electricity, and in an increasing number of cases, telephone, water and internet services. Because these *intercommunales* are in some part owned by the local municipalities, the national gas and electricity providers or both, a part of the profits from the end-user provision of gas provided funds for the communities. Most *intercommunales* are owned partly by Electrabel, part of the Suez Group, and are known as *intercommunales mixtes*.

Luminus

Since liberalisation, *intercommunales* have been prohibited from supplying gas to end-users who are free to choose their suppliers, and now act as distribution network operators (DNOs). Distribution network operation is a far less profitable enterprise than actually selling the product, especially in a regulated environment[13]. In order to substitute for the lost revenue, the six independent *intercommunales* formed a consortium, Publilum allowing them to participate in a new supply company with the UK's Centrica[14]. This new company, Luminus, is the default supplier of gas to 190 000 customers (in addition to 600 000 electricity customers), and the revenue stream prior to liberalisation is now provided through dividend payments.

13. In 2003 *intercommunales mixtes* received EUR 22 483 425 less in income as compared with 2004. In 2004 they received EUR 100 421 575 less in income as compared with 2002, according to the CREG's 2003 and 2004 annual reports.
14. Publilum and Centrica each own 50% of the joint venture, which is set to be merged with SPE (51% controlled by Centrica and GDF) and ALG-Négoce (controlled by GDF) to become a more significant competitor to the Suez Group interests.

Electrabel Customer Solutions

The remaining 13 *intercommunales mixtes* are owned in part by Electrabel and the municipalities. Electrabel Customer Solutions (ECS) is primarily a subsidiary of Electrabel, but is also to a lesser degree a subsidiary of the municipalities.

Services

All services related to the gas distribution systems in the *intercommunales mixtes* are provided by three companies: Netmanagement, Indexis and Gedis. Netmanagement (a subsidiary of Electrabel) provides connection services to clients when they are connected to a new supplier or repair services in the case of faulty service. Gedis, a data centre that operates in the Flemish market only, is owned by the region's municipalities, while Electrabel holds shares in Netmanagement and Indexis, the metering company for Belgium.

One major legacy issue of these companies is that the computer systems of Gedis and Indexis are still linked to that of Electrabel through Netmanagement. The ownership of Netmanagement and the legacy IT integration between Gedis, Indexis and Electrabel have led to charges of unfair advantages on the part of the former vertically integrated company. Since its inception, Luminus has invested in separate IT systems from those of Gedis and Indexis for the pure *intercommunales*.

SYSTEM OPERATION

Fluxys

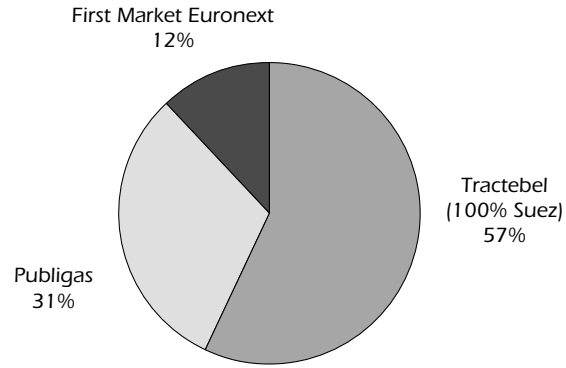
The transportation grid operator, Fluxys, was legally and operationally separated from Distrigas in 2001 in accordance with the EU gas directive. As shown in Figure 27, the Suez Group directly controls a majority stake (57.25%), in addition to about one half (5.21%) of the 11.5% currently listed on the Belgian stock exchange (Euronext Brussels). The municipalities own the remaining 31.25% through the Publigas vehicle, while the federal government retains a preferential golden share. In June 2005, Belgium passed a law introducing a four-year tariff period in order to improve tariff predictability for customers, provide regulatory stability and provide Fluxys with incentives for more efficient grid management. Before implementation, a royal decree must be issued.

Distrigas

Distrigas is the historical gas supplier on the transmission grid. The 13 *intercommunales mixtes* are dependent on Distrigas for their natural gas supply. In exchange, the municipalities hold an ownership interest in Distrigas

Figure 27

Fluxys Ownership

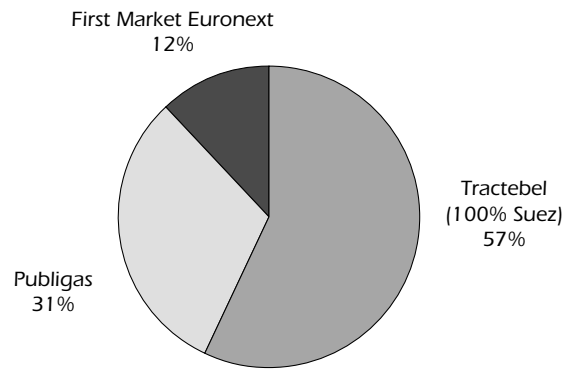


Source: Company Annual Reports.

through Publigas, a consortium analogous to Publilum. Given the ownership structure as shown in Figure 28, it is clear that the local shareholders benefit from the continued financial health of Distrigas via its near-monopoly on their customers in the same way that the Publilum consortium benefits from Luminus's market share. In 2004, Publigas received dividends amounting to EUR 33.4 million from Distrigas.

Figure 28

Distrigas Ownership



Source: Company Annual Reports.

In the current structure of Distrigas, the Suez Group has a controlling stake in Distrigas (57.25% directly, plus 5.21% in Euronext shares), and the government retains one golden share designed to allow it veto power if the objectives of federal energy policy may be compromised by the actions of the company. This golden share was the subject of EC treaty infringement proceedings. In June 2002, the European Court of Justice found in favour of Belgium's desire to retain this method of limiting the actions of Distrigas.

RATES OF RETURN FOR THE REGULATED NETWORK

The CREG sets a weighted average cost of capital (WACC) on a yearly basis, representing a maximum return on Fluxys investments in regulated activities. This WACC is then multiplied by an asset value (known as the "RAB") to arrive at the profit before tax that Fluxys is allowed to earn. The value of assets assessed to earn this WACC is based on a replacement value of the asset portfolio adjusted for investments or divestments and working capital. In addition to this return on existing assets, Fluxys is also allowed to pass through the costs of operational expenditure incurred while maintaining the network.

The WACC achieved by a company is very sensitive to its capital structure, the level of long-term interest rates and the corporate tax rate. Profit targets related to operation of a gas network generally assume a highly "geared" capital structure, or one that has a high debt-to-equity ratio, in response to the low-risk nature of the business. Indeed, the CREG assumes a company structure of two-thirds debt in setting its profit target (7.1% before tax in 2004, according to Fluxys). A company that makes interest payments out of pre-tax income lowers its taxable income. This means that a company such as Fluxys, which holds no debt, achieves poorer results after tax because highly geared companies benefit from a larger tax shield because of debt repayment. Nonetheless, the CREG is using an industry-accepted target for a regulated market. Belgian customers are currently paying for gas distribution at levels similar to those paid by customers in comparable markets.

H-GAS AND L-GAS

Of the two qualities of gas in Belgium, H-gas (high-calorie) supplies most of the demand, but L-gas (low-calorie) supplies certain regions including Antwerp, Limburg, Flemish Brabant, Walloon Brabant and Hainaut, as well as Brussels exclusively. The total demand for L-gas in Belgium makes up 26% of the demand for natural gas, and is transported from the Dutch Slochteren field on a network that is physically separate from the H-gas network. The total gas production from the field is sold to Distrigas on a long-term contract (by Gasunie of the Netherlands). As a result, there is no competition within

regions solely supplied with L-gas. Competition will only be possible if one of the following criteria is met:

- The exclusive supply contract between Distrigas and Gasunie is modified.
- The H-gas grid is progressively extended to L-gas customers.
- All companies are given equal access to facilities that blend H-gas onto the L-gas grid.

The policy implemented by the CREG in order to solve this competition issue is to extend the H-gas grid to L-gas customers.

Switching from L-gas to H-gas requires a case-by-case approach. When a distribution grid switches gas qualities, a check of every burner is required, but no replacement of appliances. Distrigas has a large take-or-pay contract running to 2016 for L-gas.

The consequence of these issues is that the progressive conversion of L-gas customers on to the H-gas network is a long process, and the programme, in order to make the Belgian market more homogeneous and to promote competition, is likely to proceed very slowly.

SAFETY

On 30 July 2004, at an industrial park near Ath, about 50 kilometres south-west of Brussels, a high-pressure H-gas pipeline linking Zeebrugge to Blaregnies exploded, as a result of damage incurred during construction work unrelated to the pipeline.[15] The explosion resulted in 24 deaths and over 120 injuries. The majority of the deaths were emergency services workers sent to the site to investigate earlier reports of a gas leak.

This incident has led to a general concern that, although in this case the pipeline was damaged by a third party, the regulation of gas transport might lead to lower-cost, lower-safety pipelines being laid in Belgium. In fact, the system used by CREG to calculate tariffs that Fluxys is allowed to charge its customers is based on costs, and therefore does not encourage the network operator to "cut corners" on maintenance or investment – its procurement costs are passed straight through to the consumer.

More recently, on 23 November 2004, Fluxys found manufacturing faults in a new pipeline that was being built between Zomergem and Zelzate. The pipeline was replaced before it entered into service.

15. A judicial decision regarding the responsibility for the accident has not yet been issued.

DESCRIPTION OF THE NETWORK

The gas network in Belgium has been primarily influenced by several key factors. First, it has been well interconnected to its neighbours, particularly since the discovery of North Sea gas led to connections with Norway, and subsequently the UK. Secondly, the gas industry has been influenced by its proximity to the Netherlands' gas fields, which can ramp up or down production very quickly and effectively act as "swing" supply. This has led to the lack of a strong incentive to develop seasonal gas storage, which would have performed the same role. This tendency has been enhanced by the paucity of suitable geological formations, although former coal mines have been used as gas storage sites. The third feature which has shaped the gas network in Belgium is the presence of an LNG regasification and storage facility that opened in 1987 at the port of Zeebrugge in the north-west of the country, and which, by 2007, will have doubled its capacity from 4.5 bcm to 9 bcm per year. This facility has substantially increased the security of Belgium's gas supply by allowing it access to the nascent, but rapidly developing Atlantic LNG market, although take away capacity inland has remained in the hands of the incumbent.

International pipelines

The major two-way high-pressure pipeline systems connecting Belgium to its neighbours run from west to east, linking the UK with Germany via the VTN-RTR pipeline, from east to south, linking the North Sea and UK to France and from north to south, linking the Netherlands with France. These pipelines, although well integrated and connected to the overall national grid, are referred to as "transit" pipelines because of this original function of transiting gas across Belgium, and there are arguments that this exempts the pipelines from the EU third-party access rules applicable to domestic networks. Currently the transit contracts are all held by Distrigas on a long-term basis, meaning that it controls the bridge between the largest markets for gas in Europe and their closest sources.

Storage

There are now three sites in which gas is stored in Belgium, one of which (an aquifer in Loenhout) is used to augment seasonal swing in purchase contracts from the Netherlands. Two coal mines (Anderlues and Péronnes) are also used to supply seasonal storage, but have not been in service since 2000. Péronnes has since been identified as a suitable test site for possible carbon sequestration.

Short-term storage is available at Zeebrugge, and also by transporting LNG by truck to a storage site in Dudzele, which is used as a peak-shaving facility.

Hour-to-hour flexibility is also obtained by modifying the withdrawal rates from LNG tankers at Zeebrugge, in addition to the standard use of line-pack, which is the use of pipeline capacity itself as storage.

According to the CREG, Fluxys and Fluxys LNG are among the operators applying the lowest rates for transport, storage and terminal operation in the EU.

NETWORK MANAGEMENT

"Transit" network

The "transit" capacity is supported by the three large pipeline systems described as international pipelines and operated by Fluxys. Access to these pipelines is available exclusively as a third party through Distrigas affiliates, which controls the network access through long-term contracts.

Domestic network

The domestic gas network is administered and run by Fluxys, the transportation arm of the former monopoly, Distrigas, from which it was legally separated in 2001, though the two companies still have exactly the same shareholder structure.

Short-term capacity and balancing

In the system of "enhanced entry/exit" adopted in Belgium, the domestic network has been split into four balancing points (BAPs). One of these zones (BAP L-Cal) represents the L-gas customers in the central and northern parts of the country, while the others surround the major interconnection points of s'Gravenvoeren (BAP GRA), Blaregnies (BAP BLA) and Zeebrugge (BAP ZBG). Within each zone, a shipper must match nominations and deliveries prior to delivery with hourly constraints within a certain tolerance. Otherwise, the shipper has to pay balancing charges. If the shipper is not merely importing for delivery to the same region, but is importing for transportation to a different BAP, then the shipper must ensure balancing at each of the interfaces, or risk multiple penalties in each zone. In the fourth European Commission benchmarking report, the commission states that the value of these penalties is approximately 140% to 180% of the price of gas, the second-highest multiple of any EU country.

Long-term capacity

Capacity information is supplied by Fluxys, which is the supplier to the primary market. There is no secondary market yet in Belgium, and interruptible capacity is not included in the following discussion as it is of very little value in such a volatile market.

The amount of available capacity on the Belgian gas network depends on the transit flow rates as well as domestic supply and demand. Although Fluxys uses a simulation model to predict future capacity, the results are only indicative. Once capacity has been allocated to a shipper on one entry zone, the amount of capacity can change on other entry zones. That the model employed by Fluxys is effectively a "black box" exacerbates the problem, since market participants cannot study the model to generate independent expectations of actual available capacity.

To book capacity from the Zeebrugge LNG terminal into Belgium, Fluxys publishes available capacities on its website. Though some capacity appears available, it is in fact all booked on long-term contracts owned by Distrigas. Unloading capacity at the LNG terminal is fully committed until 2006 by Distrigas, and then from 2007 onwards it is fully booked by Exxon/QP, Distrigas and Tractebel LNG (also Suez), although short-term or spot slots for cargoes may become available on an irregular basis.

Though capacity is available to deliver gas from higher-priced regions into Belgium, this is of almost no value to market participants. Fluxys projects that the amount of available capacity on pipelines delivering gas from lower-priced regions into Belgium as a percentage of total capacity will fall each year from 5% in 2005 to 3% in 2008. There is no available capacity (current or planned) on the entire L-gas network.

INVESTMENT

Current investment in the Belgian international gas infrastructure is targeted on three key sites in order to increase import capacity and improve the compatibility of the domestic network with that of neighbouring countries. Fluxys is currently performing work on the following projects, which have been prioritised for it by the CREG:

- Capacity enhancement at Zeebrugge LNG reception terminal (planned operation in 2007), and on which it is allowed to earn a higher WACC.
- Improving the operability of the blending facility in Zeebrugge for import/export gas (study phase).
- Expanding and enhancing the capacity of the VTN-RTR pipeline in the east-to-west direction (study phase).

Other projects with similar strategic aims have been identified for future investment within the CREG's ten-year plan, such as bridging the missing link between Lommel and Loenhout.

In addition, a programme of domestic work has been recommended by the CREG in order to increase the storage capacity at Loenhout, and also the

degree of meshing of the domestic transportation network with pipelines originally designed for transit in order to achieve greater internal network security. The CREG has set a condition that the gas network should be expanded in every case where it is necessary to meet reasonable market demand. Network development to meet inland consumption should not require long-term commitments from shippers.

PRICING AND SUBSIDIES

PRICES

Wholesale prices are determined through the Zeebrugge hub, the nexus of North Sea gas flows into Belgium and beyond. In an attempt to increase the liquidity at the Zeebrugge hub, the hub operator, Huberator, has recently launched a screen-based exchange for the Zeebrugge market in partnership with APX (the Amsterdam Power Exchange). Liquidity is likely to suffer from the lack of third-party access (TPA) to the hub, which is located on a pipeline fully booked by transit shippers and subject to narrow gas specifications. Liquidity is also likely to suffer from the market design, which has split Belgium into four balancing zones, only one of which includes Zeebrugge.

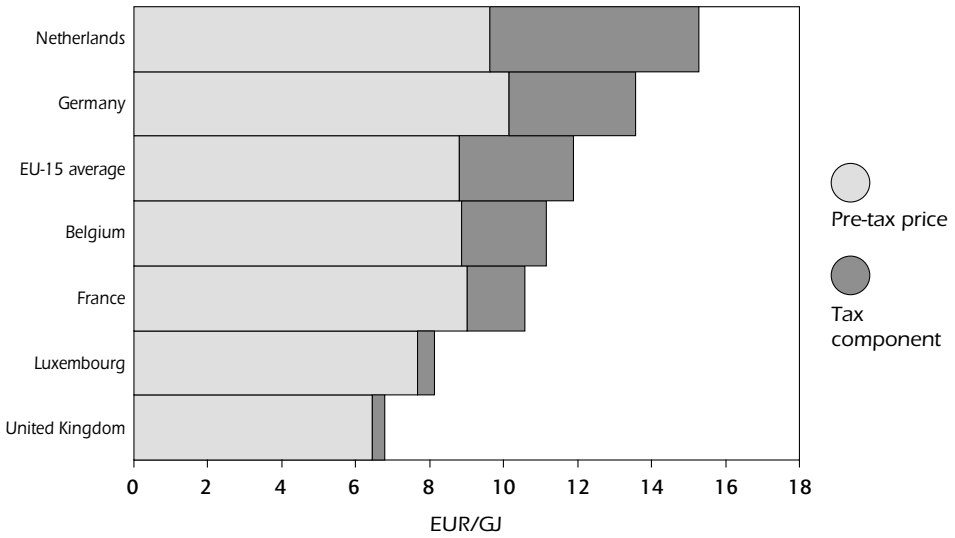
Domestic prices of gas are almost equivalent to the EU-15 average, whereas industrial prices are lower than Belgium's neighbours (see Figure 29 and Figure 30; Figures 31 and 32 compare seasonal household and industrial natural gas prices with those in neighbouring countries). This is partially due to the slightly favourable tax regime in Belgium for large industrial users, caused in part by the need to keep prices low owing to reliance on heavy industry.

SUBSIDIES

Belgium has developed a system of energy taxes mostly imposed as public service obligations. Of the funds that have been actively dispensing money, there is a social energy fund, set up in 2003, which enables Belgian public social assistance centres to distribute energy-related assistance to disadvantaged customers. Maximum prices for disadvantaged customers have been in place since December 2003 and are financed by the Fund for Protected Customers. There is also a new fund that has been set up for the compensation of the loss of revenues for the municipalities since the liberalisation of the gas and electricity markets. It is unclear how these two funds will be dispensed. More details concerning these taxes are provided in Chapter 3 on general energy policy.

Figure 29

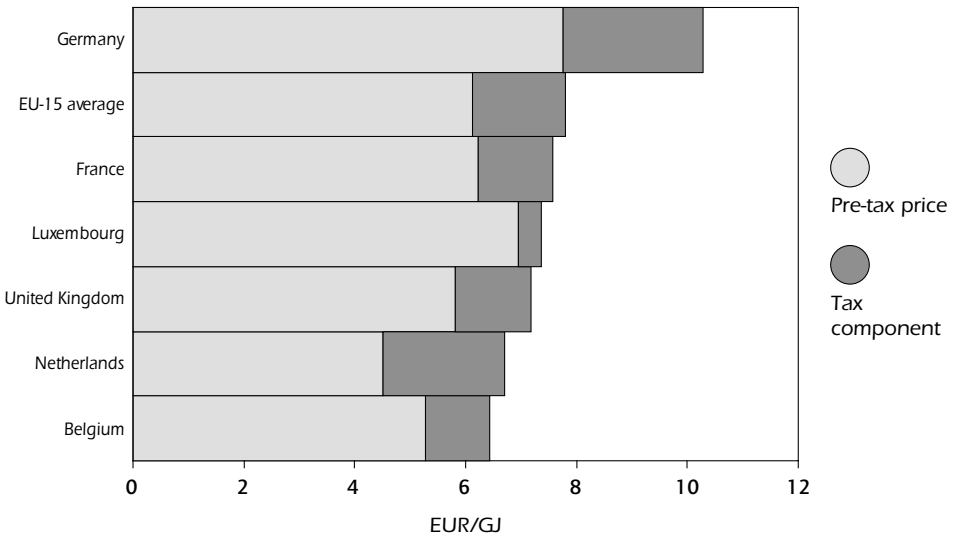
Domestic Natural Gas Prices in Belgium and in Neighbouring Countries, 2005



Note: Half-yearly prices.
Source: EUROSTAT.

Figure 30

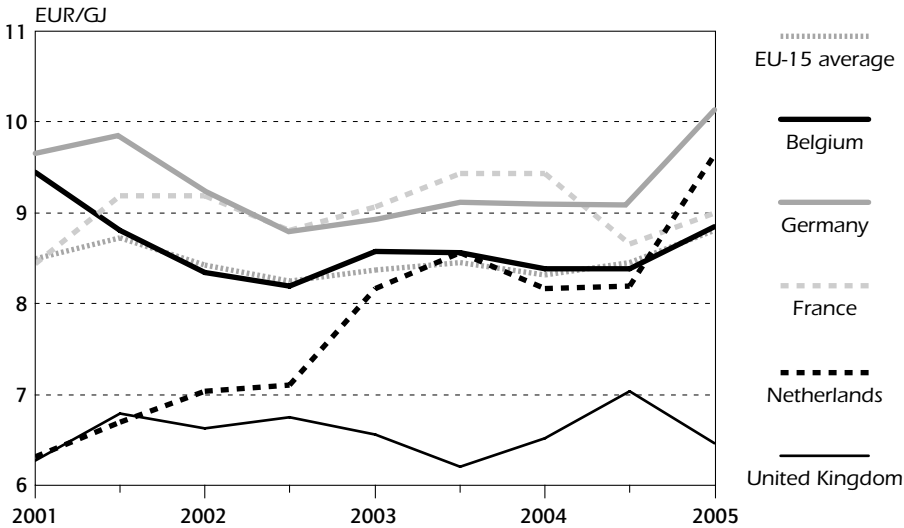
Industrial Natural Gas Prices in Belgium and in Neighbouring Countries, 2005



Note: Half-yearly prices.
Source: EUROSTAT.

Figure 31

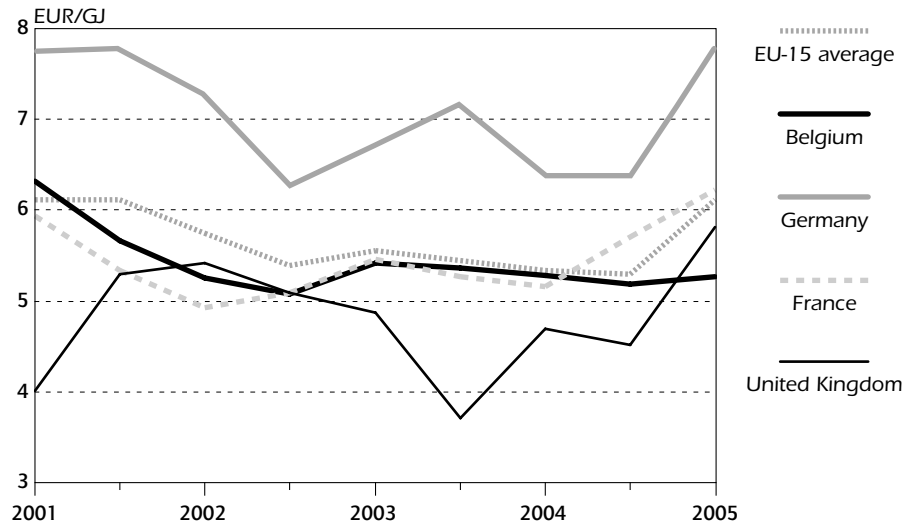
Seasonal Household Natural Gas Prices in Belgium and in Neighbouring Countries, 2001 to 2005



Note: Half-yearly prices.
Source: EUROSTAT.

Figure 32

Seasonal Industrial Natural Gas Prices in Belgium and in Neighbouring Countries, 2001 to 2005



Note: Half-yearly prices.
Source: EUROSTAT.

CRITIQUE

Since the last in-depth review, Belgium has made progress towards more complete market liberalisation. All of Flanders, which constitutes 70% of total natural gas demand, and larger users in Wallonia, are now free to choose their own supplier from the competitive market. In addition, the country is working to standardise the gas network in order to build a more liquid and competitive market. This is good news, as the L-gas market is currently supplied by one long-term contract, inhibiting any competitive market development. New suppliers have entered the Belgian natural gas market and the country is increasing its network interconnection infrastructure at its borders, while the Zeebrugge hub has become the most established trading point in continental Europe.

Belgium's domestic gas demand is expected to rise by 2.9% annually over the next ten years to absorb most of the projected increase in power demand along with a steady stream of new domestic gas customers. Incremental gas demand will then accelerate to more than 5% per year as it also starts to replace nuclear power from 2015 to 2025. The impact of this dramatic rise in domestic consumption must be quantified, particularly in terms of its effect on the network. It would also be advisable for Belgium to consider factoring projected transit flows into a comprehensive plan.

In light of the increasingly important role that gas will play in Belgium's energy future, a key issue is that nearly all capacity at entry points to the country is reserved on long-term contracts, so these points are therefore contractually (but perhaps not physically) congested. The Suez Group continues to control nearly all entry capacity to the country, particularly through old transit contracts. Storage capacity is allocated each year according to priority rights that give a competitive disadvantage to new entrants. All capacity that provides access to the hub in Zeebrugge is controlled by Suez under existing long-term transit contracts, exempted from the third-party access rule. In addition to this, the incumbent has ownership interests in the transmission system operator (Fluxys), a majority of the DNOs (*intercommunales mixtes*), with operational control of the services company and the Belgian electronic customer database. This omnipresence makes it difficult for other players to have access to the market and gives Suez the ability to leverage its market power.

To make greater progress towards a competitive energy market within Belgium, the energy market structure should be modified so that asset owners are given incentives to offer effective TPA. This means that the interests of the *intercommunales* and the supply companies should be de-coupled through effective unbundling, Fluxys should be completely independent of gas suppliers and consumers, a secondary capacity market should be implemented and regulators should be given more power to enforce compliance within the

market. If legal separation does not provide effective competition, then stronger measures – including ownership unbundling – should be considered. For a competitive market to develop, regulators must monitor the market and ensure that no conflicts of interest are allowed to remain between suppliers and other actors, including municipalities, either through ownership interests, preferred customer status or shared assets. The regulator should be free to collect information on these interests without having to justify why it is required, so that proper investigations into market practices can be undertaken.

Belgium's gas consumption growth and its role as a pivotal gas transit country places strategic importance on the degree of available border capacity linking Belgium to its neighbours, as well as on maintaining and improving the quality of the gas network within the country. Currently, there is a lack of competition in the supply market, owing in large part to the lack of transportation capacity access. While it is encouraging that 16 companies have received transportation licences for gas in Belgium, only 4 were active at the end of 2004. Belgium should consider ways to enhance security of supply by facilitating investment in and access to new border capacity via the use of transparent market-based mechanisms.

The recent parliamentary decision to reduce the role of the regulator means that the ongoing efforts to liberalise the market may be reduced. The federal regulator currently has a relatively strong role, and should be commended for enabling the degree of market opening that has been seen. However, in order to achieve a more liberalised market, the national regulator should be given greater powers to ensure fair and non-discriminatory exchange of information for all market actors. Information flows between unbundled market elements is critical to successful market operation. It is essential for Belgium to increase the power of the regulator in order to combat abuses of market power, especially in areas of corporate governance where the CREG has had its influence removed.

As discussed earlier, the cost of balancing services is a concern in Belgium, where balancing penalties approach 140%–160% of the value of gas. It is the responsibility of network users to balance their gas flows. However, imbalances are unavoidable, since volumes are nominated the day before delivery, and consumption can deviate from expectations. These imbalances are manageable by supply companies either through a portfolio of flexible supplies at relatively low marginal cost (as in the case of Suez) or by incurring balancing penalties that are the second-highest in the EU. This presents a substantial business risk, comparatively higher for smaller volumes, and is a significant barrier for new entrants to the market. Belgium should consider increasing the amount of flexibility available to new entrants by holding virtual storage auctions (with regulated reserve rates), and ensuring that

balancing services supplied in Belgium are competitively priced when compared with international benchmarks.

Making access to the hub more transparent and, as a result, increasing gas volumes on the traded market is essential to increasing the liquidity at the Zeebrugge hub, which would generate gas pricing that reflects fundamentals. Currently, oil-indexed prices dominate within Belgium, providing no useful pricing signals about the supply and demand of gas. A consequence of the lack of price signals is that gas is pulled to the UK in the winter when it is in high demand in both the UK and Belgium, and pushed back to Belgium in the summer when it is in low demand in both markets. Furthermore, Belgium does not see pricing signals that would identify the need for new investment in capacity and other infrastructure. This puts considerable strain on the Fluxys system and compromises security of the domestic supply network. Belgium should consider measures to increase the volume of gas traded at the Zeebrugge hub, including the provision of more information to market players. The interaction of the Zeebrugge hub with the Belgian entry-exit system should be reviewed in order to increase liquidity on the hub, given other IEA countries have found that hub liquidity decreases as the domestic market is spit into more zones.

Currently, there is no competition within regions solely supplied with L-gas. To enhance competition, the CREG is trying to extend the H-gas grid to L-gas customers. However, this requires new investment in pipelines and adoption of policies to implement switching by the distribution companies, neither of which is enforceable by CREG. Furthermore, moving to the higher gas quality requires that customers have their burners inspected by professionals because of the different characteristics of the gas. As a result, progressive conversion of L-gas customers to the H-gas network is a long process, which will make the development of a more homogeneous and competitive Belgian market very slow. The government should consider providing TPA to blending facilities, which would allow competing H-gas suppliers to service L-gas customers, thereby increasing competition.

The current relationship between policy-makers, regulators and the network operator appears to work effectively, but there could be better consultation with experts on the technical feasibility of some aspects of the physical infrastructure and market design. For instance, the increase in gas-fired power demand foreseen over the next 10 to 20 years seems feasible from a policy perspective, but might not be technically possible without targeted investments in both the gas and electricity networks.

The elimination of the distinction between transit of international gas and transport of national gas would be beneficial for better integration with other European gas networks, and the ongoing meshing of the network should help to achieve this. Belgium is not the only country in the EU to argue for this

distinction, but the EC (on principle) does not recognise transit as being separate from transport within the Common Market. From the point of view of the Common Market, both of these activities are transportation within Europe, and therefore subject to the same regulated TPA principles.

Although there are arguments that the network operator does not get a fair rate of return on its infrastructure investments, the WACC measure applied by the regulator appears reasonable when compared with international best practices, and is consistent with a low-risk enterprise such as pipeline management. The return allowable is flexible by authorising different rates for different investment classes, such as pipeline, storage and regasification terminals.

RECOMMENDATIONS

The government of Belgium should:

- *Decrease as much as possible the existing structural barriers to entry to encourage new actors to enter the gas market, by promoting effective TPA to the gas network.*
- *Introduce mechanisms to reduce market concentration by, among other things, ensuring that Fluxys is completely separated from any upstream or downstream operator.*
- *Give relevant regulators and authorities the necessary means to prevent anti-competitive behaviour and intervene when necessary.*
- *Ensure stable regulations, including regulated tariffs, for transport operation and development.*
- *Consider ways to enhance security of supply by increasing market-based access to planned and existing capacity in order to encourage competition.*
- *Consider measures to decrease the strain on the domestic gas transportation system by supporting an actively traded market, through increasing volumes of domestic gas traded at the Zeebrugge hub.*
- *Eliminate the technical distinction between gas "transit" and "transportation" so that other participants can gain access to Belgium's considerable transit capacity. Belgium will thereby maintain its position as an attractive transit country.*
- *Monitor the ongoing integration of the transit system with the domestic supply system.*

CAPACITY, PRODUCTION, DEMAND AND TRADE

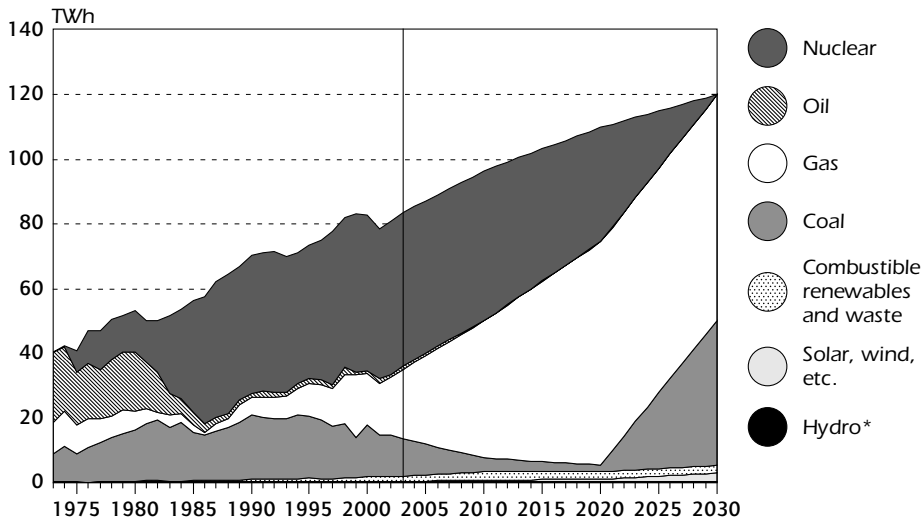
LONG-TERM SUPPLY AND CONSUMPTION TRENDS

In the last thirty years, the most prominent trends in Belgium's electricity generation profile have been the tremendous growth in electricity production and the concurrent growth in nuclear electricity (see Figure 33). Between 1974 and 2004, total generation has more than doubled, growing at an average annual rate of 2.4%. Whereas in 1974 nuclear power provided almost none of Belgium's electricity, it now accounts for the lion's share – over 55%.

More recently, over the past ten years the most prominent trend has been the growth in the use of natural gas for electricity generation, largely displacing coal. Gas-fired generation has tripled in a decade; its share of total generation has grown from 12% in 1994 to nearly 30% in 2004. In contrast, electricity generated from coal has fallen by nearly 50% over the same period. Coal-fired generation made up 27% of total generation in 1994 and made up only 12% in 2004.

Figure 33

Electricity Generation by Source, 1973 to 2030



* negligible.

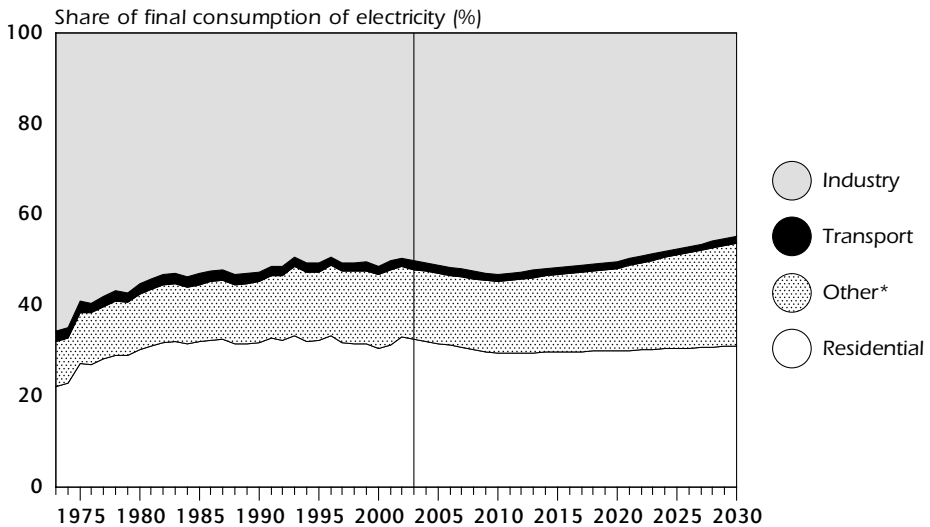
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

Long-term projections indicate that as nuclear power is phased out over the next decades, gas-fired generation will replace most of the lost generation until 2020. After 2020, it is expected that, along with gas, coal-fired generation will also fire a large share of overall generation.

Looking at consumption by sector, shown in Figure 34, the most significant changes occurred between 1974 and 1984. In 1974, residential consumption accounted for 23% of total consumption, growing to over 30% in 1984, and holding steady at above 30% for the next two decades. In contrast, industrial consumption accounted for 65% of total consumption in 1974, dropping to 54% in 1984. Over the following two decades it dropped slightly, to just over half of total consumption.

Figure 34

Final Consumption of Electricity by Sector, 1973 to 2030



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2005, and country submission.

RECENT FIGURES

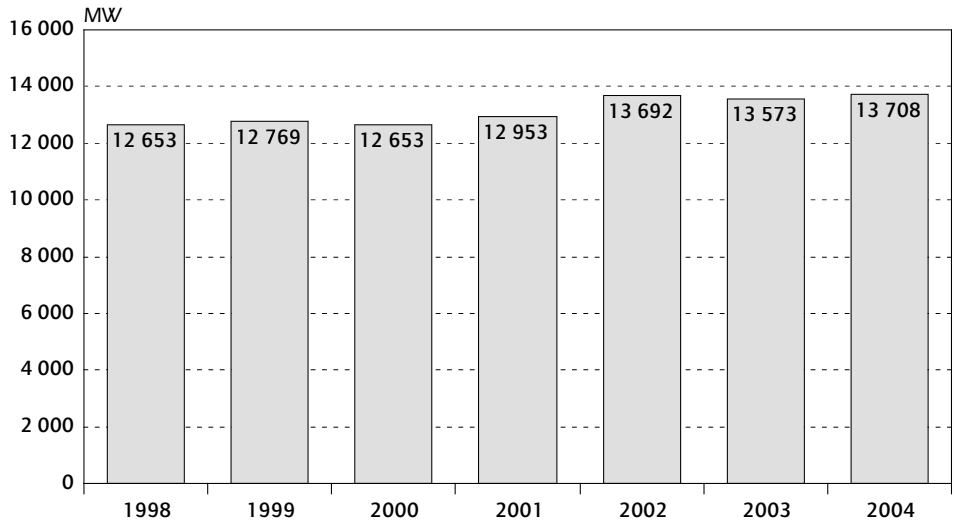
In 2004, total generation capacity in Belgium was 15 700 MW, a 2% increase over 2003. Nuclear accounts for 37% of this installed capacity. Coal, natural gas and pumped storage hydro make up the majority of remaining capacity.

Renewables – principally wind and biomass – provide a very limited share of the installed capacity base.

Peak demand in Belgium increased by 1.0% between 2003 and 2004; it has grown by 8.3% since 1998, an average annual rate of 1.3% (see Figure 35). Peak demand was 13 708 MW in 2004.

Figure 35

Peak Electricity Demand, 1998 to 2004



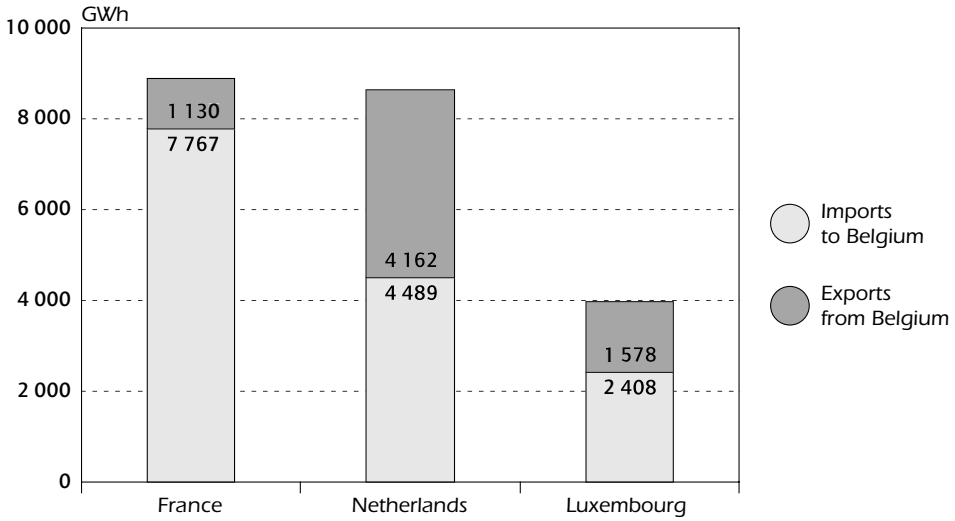
Source: Elia.

Total generation has grown by 2% between 1998 and 2003, rising from 82 000 GWh to 83 400. While nuclear generation's share of total generation has held steady at about 55% over the last five years, natural gas-fired generation has risen by 44%. Over the same period, coal-fired generation has fallen by over 30% and oil-fired generation by over 60%. Generation from solar and wind has risen eightfold in five years, but still provides less than 1% of total generation.

Cross-border exchanges are a significant part of overall electricity transmission in Belgium, accounting for 21 500 GWh in 2004. This represents 24.6% of Belgian electricity demand, significantly higher than the EU average. Figure 36 shows imports and exports for 2004.

Figure 36

Cross-border Electricity Exchange with France, the Netherlands and Luxembourg, 2004



Source: Elia.

MARKET REFORM

MARKET LIBERALISATION

In April 1999 Belgium transposed the first EU directive into Belgian law, which informs the process of liberalisation of the country's electricity market. The law established conditions for third-party access to the transmission network. In 1999 the commission for the Regulation of electricity (CRE) was converted into the federal Gas and Electricity Regulatory Commission (CREG).

The CREG, the federal regulator, monitors the electricity market and has the power to approve transmission and distribution tariffs and other regulated assets. It also has a general advisory role on liberalisation issues. Recently, some powers held by the CREG were removed by a 1 June 2005 law; this law transferred some power to the government. Powers removed include responsibility for the preparation of the ten-year development plan, powers to collect information from market participants without justification and powers to monitor compliance with corporate governance.

Though the federal government is monitoring liberalisation and has some powers, much electricity market authority rests with the regional governments, which have the authority to regulate distribution and local transmission networks at and below 70 kilovolts (kV). The regional governments set up their

own regulatory institutions. Flanders established the VREG (*Vlaamse Reguleringsinstantie voor de Elektriciteits- en Gasmarkt*). Wallonia established the CWaPE (*Commission wallonne pour l'énergie*). Brussels-Capital established the *Service de l'Energie*. Like CREG, VREG and CWaPE are autonomous entities from the government. The Brussels-Capital regulator is part of the government ministry.

All four regulatory bodies carry out regulatory tasks in the liberalised part of the electricity and gas markets, including advising government authorities about the electricity market and monitoring the markets to ensure implementation of the law and compliance with regulations. The roles of the regional regulators are detailed in Table 33.

Table 33

Electricity Market Roles and Responsibilities of the Federal and Regional Regulators

Federal *CREG*	***Flanders*** *VREG*	***Wallonia*** *CWaPE*	***Brussels-Capital*** *part of government, IBGE/BIM*
• Advise federal government • Regulate transmission above 70 kV • Monitor the wholesale electricity market • Monitor the federal green certificate market • Give advice on the appointment of the transmission system grid operator • Work with the competition authority • Verify the absence of cross-subsidies between categories of clients[1] • Approve tariffs for using the transmission and distribution network • Arbitrate disputes	• Advise Flemish government • Regulate transmission and distribution up to 70 kV • Issue retail supply licenses • Monitor the regional electricity market • Monitor the Flemish green certificate and CHP markets • Appoint distribution system grid operators • Provide dispute mediation	• Advise Walloon government • Regulate transmission and distribution up to 70 kV • Issue retail supply licenses • Monitor the regional electricity market • Monitor the Walloon green certificate and CHP market • Appoint distribution system grid operators • Arbitrate grid access disputes	• Regulate transmission and distribution up to 70 kV • Issue retail supply licenses • Monitor the regional electricity market • Monitors the Brussels-Capital green certificate and CHP market • Appoint distribution system grid operators • Arbitrate grid access disputes

1. It is expected that this power will be removed from the CREG on the basis of a 27 July 2005 law.

Source: Country submission.

On 1 June 2005, Belgium passed energy laws that fully transpose the EU's second Directive on Gas and Electricity Market Opening. Currently, the opening of electricity markets in Belgium is at different stages and occurring along different timetables in different regions (see Table 34). Based on total electricity supplied to end-use customers (in GWh), 91% of the retail market is currently able to choose suppliers. In this report, the retail market refers to all final sales of electricity to all end-use customers, including residential, commercial and industrial customers.

The Flemish electricity sector has been fully liberalised since 2003, meaning that all retail customers are free to choose their own suppliers. In Wallonia, all high-voltage customers (above grid connection 1 kV) are eligible, which means that 55% of the market (in terms of total consumption) is currently able to choose suppliers. In Brussels-Capital, all customers with consumption of more than 10 GWh have been free to choose their supplier since January 2003. Commercial customers have been eligible to choose suppliers since July 2004. In total, 75% of Brussels-Capital electricity is consumed by customers eligible to choose their own suppliers. At the federal level, all clients connected to the transmission grid have been eligible to choose suppliers since July 2004.

Table 34

Progress of Electricity Market Opening in Belgium

(as of October 2005)

	Federal	*Flanders*	*Wallonia*	*Brussels-Capital*
High-voltage customers	**Free**	**Free**	**Free**	**Free**
Low-voltage business customers	Not applicable	**Free**	**Free** (on demand)	**Free**
Low-voltage households	Not applicable	**Free**	January 2007	Between January and July 2007

Source: Country submission.

Wallonia will open its electricity market for all customers in January 2007. Brussels-Capital has not yet decided the exact date, but it will open its electricity market for all customers some time in 2007. The CREG estimates that out of all eligible industrial customers in Belgium, 35% have switched suppliers since market opening, and 8% switched in 2003. Among small commercial or residential customers, 19% of eligible customers in Flanders have switched (data are not available for all of Belgium).

MARKET HARMONISATION

The differences between the rules, regulations and regulatory institutions of the three regional markets and the federal electricity market make market

participation more complex. These differences require that market participants use processes, systems and strategies that work in all regions where they participate, or that they develop and use unique systems for each market. The differences between green and CHP certificate markets were discussed in the chapters on energy efficiency and renewable energy. In addition, the differences in how rational-use-of-energy public service obligations – legal obligations to lower consumption – are implemented also limit market harmonisation, as discussed in the chapter 5 on energy efficiency. In Wallonia these obligations are placed on retail suppliers. In Flanders the distribution grid operators must meet this obligation. Another electricity market difference between the three regions is that all retail suppliers must apply for and receive a license from the relevant regulator in the market. Suppliers also need a license for the transmission network from federal authorities.

INDUSTRY STRUCTURE

GENERATION

Generation ownership

While the retail market has been deregulated, opening it up to new suppliers, Electrabel remains the dominant supplier. Suez had owned 50.1% of Electrabel since 1999. In November 2005, Suez increased its stake to over 97% of the company. In 2003, Electrabel owned about 85% of Belgium's installed base of about 15 000 MW. A breakdown of Electrabel's generation facilities are provided in Figure 37.

SPE, a public electricity co-operative, owned 8% of generation as of 2003. SPE and Electrabel once operated a joint industrial venture, but this agreement, which was established in 1995, was terminated in 2003 by mutual agreement of the two companies. Nearly 90% of SPE's capacity is gas turbines. The remainder is fuelled by diesel.

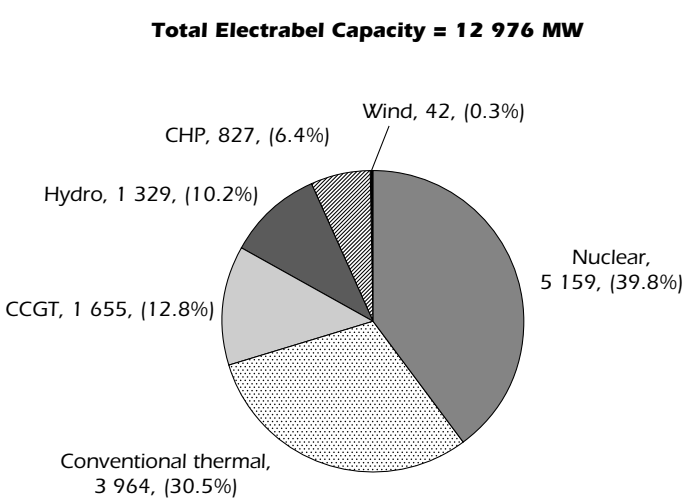
Other generators – including Electricité de France (EDF) most prominently – owned 7% of installed capacity in 2003. Of peak capacity, which is made up of pumped storage, open-cycle gas turbines (OCGT) and turbojet facilities, Electrabel owned 96% in 2003 and SPE owned the remaining 4%.

VPPs

In order to effectively reduce the share of electricity capacity owned by Electrabel, the company has agreed to offer up to 1 200 MW of its capacity annually through virtual power plant (VPP) auctions to other market participants. VPPs – which have also been used in France, the Netherlands and Denmark as part of an agreement in connection with a merger or acquisition – represent rights to nominate electricity output for the following

Figure 37

Electrabel's Generation Capacity by Source, 2004



Source: Electrabel, annual report 2004.

day onto the transmission grid at a predefined price. They are a type of option, which is a standard financial instrument that gives the owner of the option the right, but not the obligation, to buy or sell the underlying product. VPPs allow suppliers to procure electricity generation, without owning the underlying assets.

Prices from the auction are transparent, but buyers' identities are not released to the public. The auctions are administered by an independent entity, Endex, the European Energy Derivatives Exchange. Electrabel sets the predetermined strike prices. They also set the reserve prices, or minimum auction prices.

The results of the auctions are shown in Table 35. In total, Electrabel has offered 2 290 MW of capacity through VPP auctions, one-third of which is peak capacity. More than 80%, or 1 885 MW, were successfully sold. By October 2005, contracts for 1 000 MW of these 1 885 MW had already expired. The Belgian government reviews the results of the auctions to ensure that the interests of the Belgian market are met through this auctioning system.

New capacity

As a result of a recent legislative change, the authority to tender for additional capacity –should it be found that there is insufficient capacity and the market is not building new capacity – has been removed from the CREG and given to the federal government.

Table 35

Results of Electrabel VPP Auctions

		Total offered (MW)	*Unique bidders*	*Unique buyers*	*Total sold (MW)*
1	9 December 2003	**Total: 250** *Baseload: 167* *Peak: 83*	18	7	230
2	25 February 2004	**Total: 270** *Baseload: 180* *Peak: 90*	14	N/A	265
3	26 May 2004	**Total: 255** *Baseload: 170* *Peak: 85*	15	9	240
4	3 September 2004	**Total: 415** *Baseload: 277* *Peak: 138*	15	7	365
5	18 November 2004	**Total: 450** *Baseload: 300* *Peak: 150*	16	9	275
6	16 February 2005	**Total: 400** *Baseload: 267* *Peak: 133*	13	10	330
7	12 May 2005	**Total: 250** *Baseload: 167* *Peak: 83*	15	6	180

Source: Endex.

TRANSMISSION

Structure and responsibilities of the grid operator

In September 2002, the federal government appointed Elia as the grid operator for the transmission system.

In June 2005, Elia was publicly listed on the Euronext stock exchange and sold a large stake in the company to private investors. Before the sale, Electrabel had a 64% share in Elia, SPE had 6% and Publi-T – a consortium of fully public municipalities – had the remaining 30%. The sale reduced the combined shares of Electrabel and SPE to 30%. The sale was postponed from an original September 2004 date, in part because shareholders thought market conditions were unsuitable.

Half of Elia's board is made up of independent members that must be approved by the CREG. The first independent board members were selected by an independent hiring agency. When original board members need to be replaced, the existing independent board members propose new candidates. No government members are on the board.

Elia's legal responsibilities are to:

- Provide access to the grid for third parties.
- Operate and maintain the grid.
- Manage improvements and extensions of the grid, including interconnections, so as to provide transmission capacity needs for its customers.
- Manage electricity flows so as to reach equilibrium between supply and demand of electricity (taking exports and imports into account).
- Ensure, with the available means, the security, reliability and efficiency of the Belgian power system (including the availability of ancillary services).

Elia does not buy or sell electricity itself, except for ancillary services, compensation of losses on the grid at the regional level (70 kV and below) and balancing services.

Through a contract with Luxembourg, some of that country's transmission system is operated by Elia, and is effectively considered part of the Belgian electricity network.

Description of the physical network

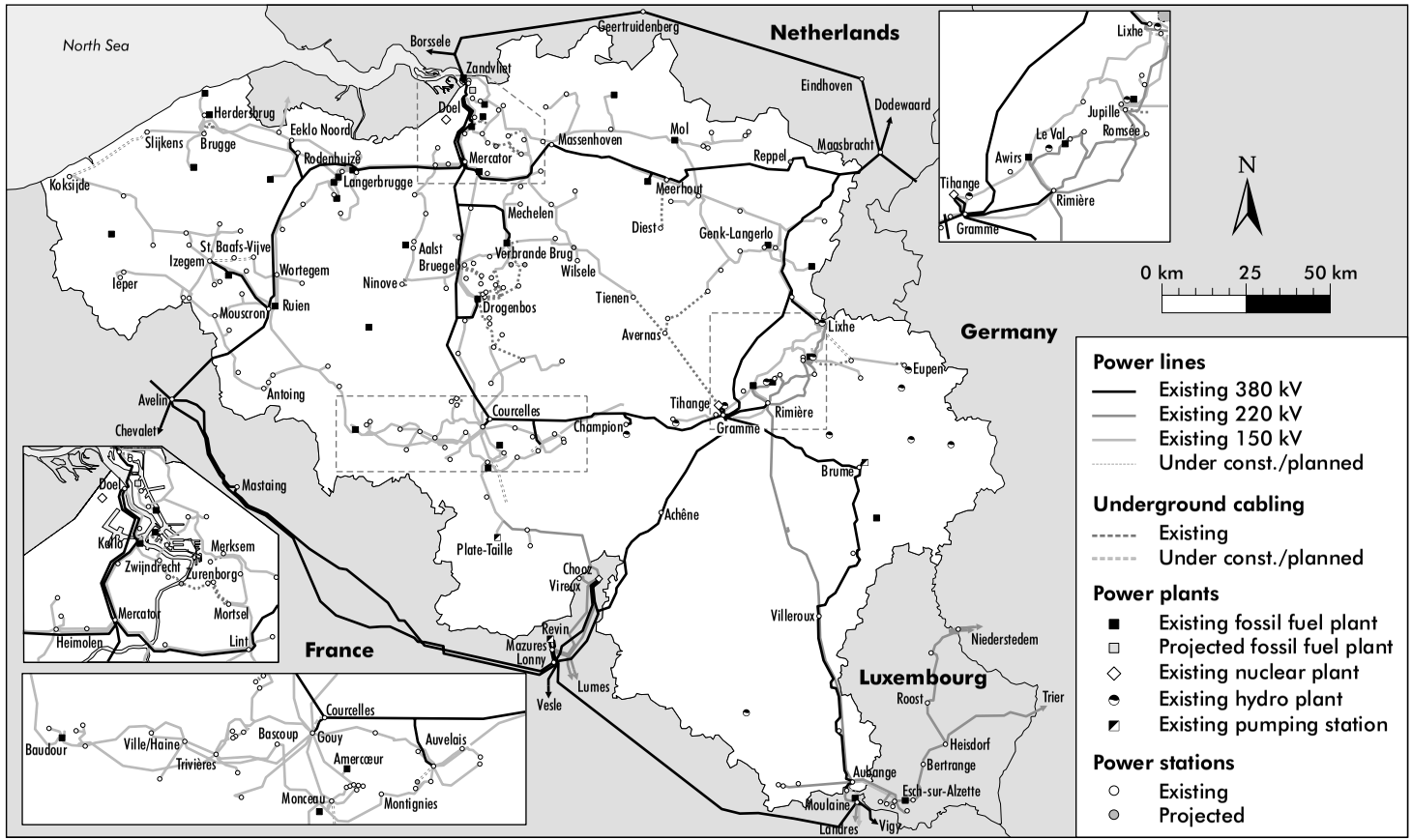
The key difference between Elia and other transmission system operators is that Elia operates a network that goes to a much lower voltage, notably down to 30 kV (the grids of 30–70 kV are under regional jurisdiction). Elia also manages the highest voltages, up to 380 kV. Most network operators do not deliver power so close to final consumption and, as a result, Elia has over 130 customers, a high number for such a small geographical network. Belgium's transmission network is shown in Figure 38. Table 36 provides a summary of lengths of the transmission grid.

Access and tariff policy

Another unique attribute of Belgium's electricity network is that because of its geographical characteristics, there is very little congestion within the Belgian grid. As a result, transmission is charged at a postage-stamp rate on a euro per kilowatt basis (*i.e.* charges do not vary according to transmission distance or congestion).

Figure 38

Map of Belgium's Transmission Network



Source: Elia.

Table 36

Length of Elia's Transmission Grid (km)

Voltage	*Overhead lines*	*Underground cables*	*Total*
380 kV	890	0	890
220 kV	297	0	297
150 kV	2 014	331	2 345
70 kV	2 439	189	2 628
36 kV	8	1 868	1 876
30 kV	26	214	240
Total	**5 674**	**2 602**	**8 276**

Note: Data as of 1 January 2005.

Source: Elia.

A 29 April 1999 law regulates access to the electricity transmission grids and requires that all transmission and distribution tariffs be approved by the CREG on an annual basis. The law also requires that tariffs related to connection to and use of the grid be based on reasonable costs to the grid operator, plus a reasonable return on capital investment. Under this "cost-plus" mechanism, the CREG has the ability to reject certain costs if they are considered unreasonable.

In June 2005, Belgium passed a law introducing a four-year tariff period in order to improve tariff predictability for customers, ensure regulatory stability and provide Elia with incentives for more efficient grid management. Before implementation, a royal decree must be issued.

Elia procures balancing energy to meet real-time electricity demand and charges these costs according to regulated imbalance tariffs. Billing of imbalances is hampered by missing and inaccurate metering data from the distribution network operators (DNOs). Changes are under consideration that would implement a more market-based and cost-reflective system.

Grid access is available on a non-discriminatory basis. Despite the difference between regional regulations, Elia has created a single grid access contract that is used in all three regions, improving simplicity and transparency.

Elia's nomination system handles all types of energy flows:

- Load and generation at specific access points.
- Cross-border transmission nominations.
- Day-ahead hub nominations (not related to specific access points).
- Intra-day hub nominations.

To lower barriers to entry, flow nominations or schedules can either be handled through Elia's password-protected nominations website or by using an XML submission format.

Cross-border allocation of transmission and market integration

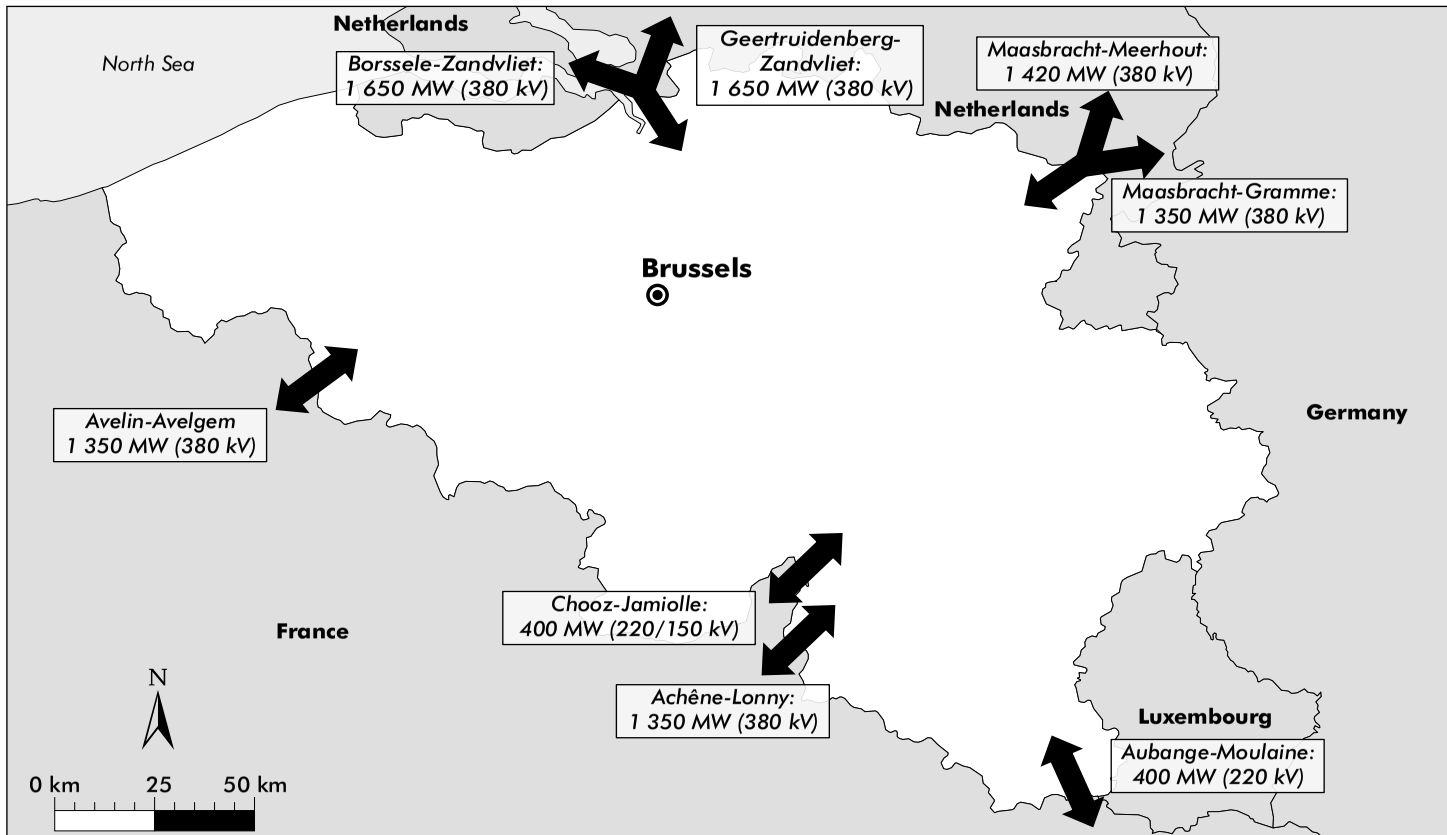
Elia manages cross-border transmission at four points along the southern border with France and at two points along the northern border with the Netherlands (see Figure 39). Transmission capacity along the northern border is allocated through auctions. Capacity is available for various time horizons: day, month or year. Yearly or monthly capacity is issued on a "use it or lose it" basis, which means that any capacity not used must be offered to others, either by transferring the capacity rights to another party or by offering the capacity on a secondary market, which is the day-ahead market. Allocation along the southern border with France is not market-based, but rather allocated according to historical first-come-first-served lists. It is also issued on a "use it or lose it" basis. In 2001, Elia and RTE, the French transmission system operator, proposed a market-based allocation method for the Belgium-France border, but this was rejected by both countries' regulators, primarily owing to a short delay and a lack of transparency in how the method worked.

In 2003, both the second EU Directive on Electricity and a further regulation on cross-border exchanges in electricity directed member countries to implement fair, cost-effective and transparent rules on the allocation of available cross-border capacity. In light of this, the European Regulatory Mini-Forum for Central Western Europe concluded in December 2004 that market-based allocation mechanisms can be only implicit and explicit auctions. As a result, the regulators of Belgium and France developed a proposal to implement daily, monthly and annual capacity auctions for the southern border. Elia and RTE are now in the process of preparing a request for formal approval by the CREG and France's electricity regulator, *la Commission de régulation de l'électricité*. If the regulators approve the request, which is expected, daily, monthly and annual capacity at the southern border will be allocated through auctions starting at the beginning of 2006. Monthly and annual capacity will be allocated through explicit auctions – direct auctions – of capacity by the TSO. Implicit auctions on Belpex, the newly created regional electricity exchange, will be used to allocate daily capacity, which means that capacity is implicitly priced according to the price difference of electricity on either side of the border. (More information on Belpex is provided later in this chapter.) In addition, if the proposal is approved, daily capacity at the northern border with the Netherlands would also move to implicit auctions on Belpex.

Additional cross-border capacity may become available following a decision of the European Court of Justice, which may release some capacity currently tied up in long-term contracts.

Figure 39

Map of Belgium's Cross-Border Transmission Points and Capacity



Note: The capacities noted above are thermal line ratings and do not necessarily represent actual transmission capacities for cross-border transactions. On the Jamiolle-Chooz line, capacity is limited to 290 MW by a 220/150 kV transformer. Capacity on the Borssele-Zandvliet line is limited to 450 MW by a transformer in Borssele.

Source: Elia.

To further improve co-ordination and operation of the electricity markets of Belgium, France and the Netherlands, the three countries' regulators issued a joint consultation document in July 2005 on the integration of their wholesale markets. Through this collaboration the regulators aim to improve liquidity, security of supply and price stability for the three countries.

Infrastructure additions, improvements and investment

Elia has an obligation to connect all clients, but does not bear the full cost of new network connections. New load or generation must pay the cost of building a line to the general network themselves. Elia pays for necessary grid improvement and socialises these costs to all grid clients.

Elia must establish a federal investment plan and three regional investment plans in which it describes major infrastructure projects. These investment plans must be approved by the relevant governments upon advice from the regulator, except in Flanders, where no regulator approval is necessary.

Elia has planned a number of major grid investment projects for its borders, which are shown in Figure 40. In 2005 a second circuit 380 kV line between Avelin and Avelgem will add about 700 MW of cross-border transmission capacity. In 2006, a proposed project will reinforce the 220 kV Chooz–Monceau line and Monceau phase shifter, increasing capacity by about 800 MW. After 2006, further 380 kV high-voltage connections have been proposed, which will add about 1 000 MW of cross-border capacity in total. These later improvements are part of a recent memorandum of understanding between France and Belgium. In total, these projects would increase the present cross-border capacity from 2 200 to 4 700 MW.

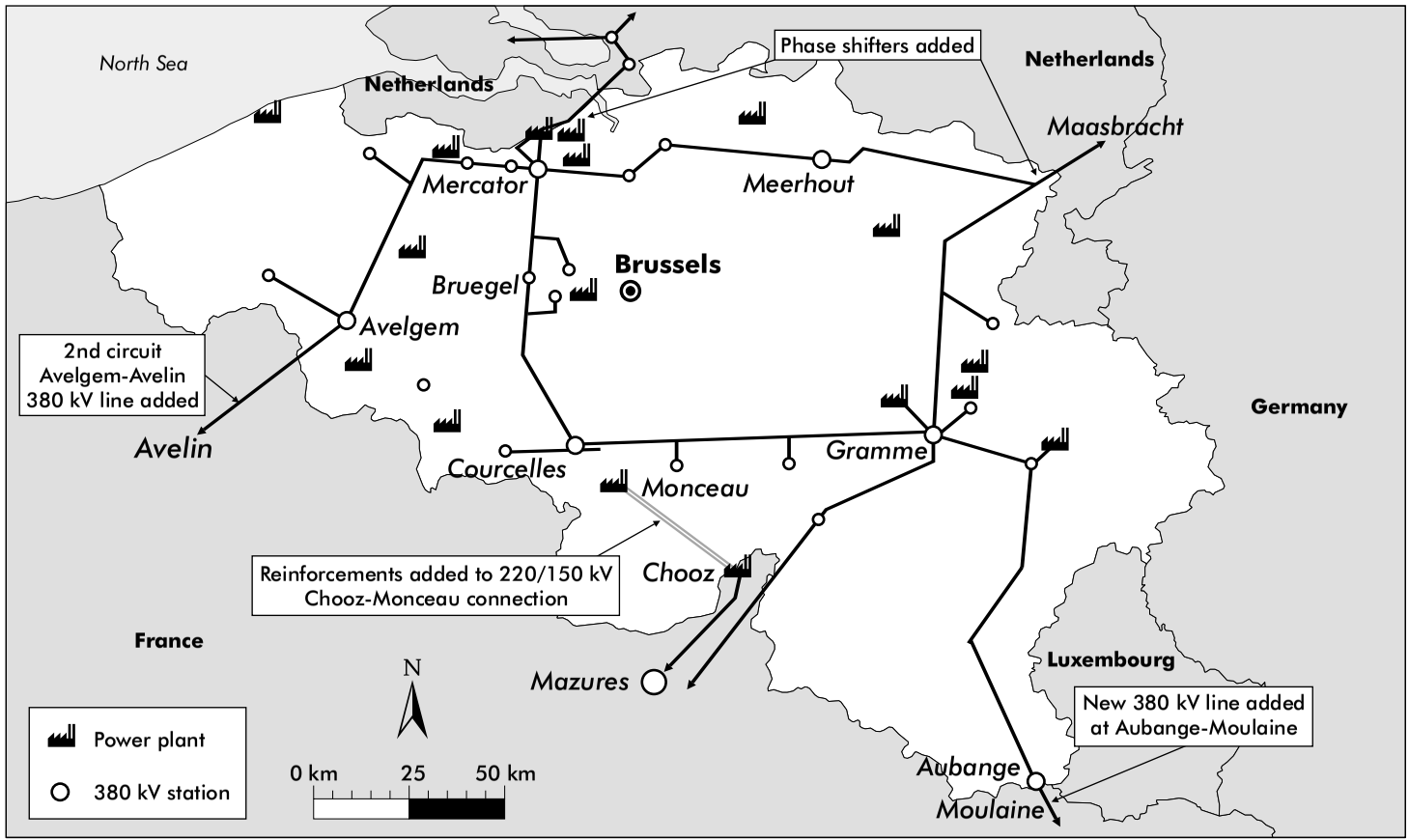
DISTRIBUTION

Distribution (70 kV and below) is the responsibility of the regional governments. As a result, distribution operators are designated and regulated at the regional level. The Walloon and Brussels regions differentiate between the local/regional transmission grid (70–30 kV) and the distribution grid (below 30 kV). The Flemish region does not make this differentiation. In general, Elia operates the grid from 380 kV to 30 kV.

Historically, municipalities have chosen to organise and manage distribution activities for end-use customers using a number of different structures. Some municipalities do this alone, through autonomous municipal utilities. Others join together and form pure inter-municipal companies, called *intercommunales*. Some municipalities have chosen to work with Electrabel, forming *intercommunales mixtes*. Regional regulations require that the capital

Figure 40

Map of Major Planned Cross-border Grid Improvement Projects



Source: Elia.

of the distribution grid manager must be held in majority by the municipalities and provinces, a regulation that also applies to *intercommunales mixtes*.

Previously, purchases and sales of electricity were handled by distribution companies, but as the electricity market has been liberalised, regional governments and regulators have required greater separation of function. At present, except for the remaining captive customers in Wallonia and Brussels-Capital, sales of electricity must be handled by entities that are legally separated from the grid operators.

In Flanders, where the retail market is fully liberalised, distribution grid managers are responsible for operation, maintenance and the development of the grid, including providing access to the grid on a fair and non-discriminatory basis, and are not allowed to procure electricity or supply retail customers. In the Flemish region, distribution grid managers are appointed by the VREG.

In Wallonia and Brussels-Capital, where the retail market has not yet been fully liberalised, grid managers also continue to supply captive customers. They are not allowed to supply customers eligible to choose their own suppliers. In Wallonia, grid operators are appointed by the government. The same applies in Brussels-Capital, but the region does not have a distinct regulatory body.

In 2004, Flanders had 17 distribution grid operators (electricity and/or natural gas), of which six are pure *intercommunales* and nine are *intercommunales mixtes*. Wallonia had 14 distribution grid operators (9 pure *intercommunales* and 3 *intercommunales mixtes*, plus one additional entity). Brussels-Capital had one distribution grid operator. It should be noted that some distribution grid operators work in more than one region.

In addition to regulating transmission tariffs, the CREG also approves distribution tariffs. As discussed in the transmission section, a new law to move from annual tariff approval to a four-year cycle is under consideration. If implemented, it would improve tariff predictability for DNOs, ensure greater regulatory certainty and potentially provide incentives for more efficient distribution.

RETAIL SUPPLIERS

In order to be authorised to supply eligible retail customers, suppliers must receive a supply permit from the regional government, except in Flanders where the permit is granted by the VREG, the regulator. In 2004, there were 6 suppliers permitted at the federal level, 17 in Flanders, 14 in Wallonia (including 4 green suppliers) and 9 in Brussels-Capital. Data in Flanders indicate that some new suppliers have steadily gained market share over time, based on the percentage of access points (see Table 37).

Table 37

Market Share of Retail Suppliers in Flanders, January to June 2004

(% share of number of access points

	Jan. 04	*Feb. 04*	*Mar. 04*	*Apr. 04*	*May 04*	*June 04*	*Absolute change (Jan. to June 2004)*	*Percentage change (Jan. to June 2004)*
Electrabel and ECS	75.84	75.02	74.46	74.01	73.41	72.99	–2.85	–3.8%
Luminus	20.97	20.6	20.32	19.96	19.75	19.57	–1.4	–6.7
Nuon Belgium	1.66	2.74	3.45	4.17	4.72	5.21	3.55	213.9
Essent Belgium	0.6	0.69	0.74	0.81	0.9	1.01	0.41	68.3
City Power	0.7	0.72	0.74	0.75	0.79	0.82	0.12	17.1
EBEM	0.15	0.15	0.15	0.15	0.15	0.15	0	0.0
Ecopower	0.07	0.08	0.12	0.13	0.13	0.13	0.06	85.7
DSO	0	0	0	0	0.12	0.12	0.12	N/A
SPE	0.01	0.01	0.01	0.01	0.01	0.01	0	0.0

Source: *Structure and Functioning of the Electricity Market in Belgium in a European Perspective*, London Economics, based on data from the VREG, October 2004.

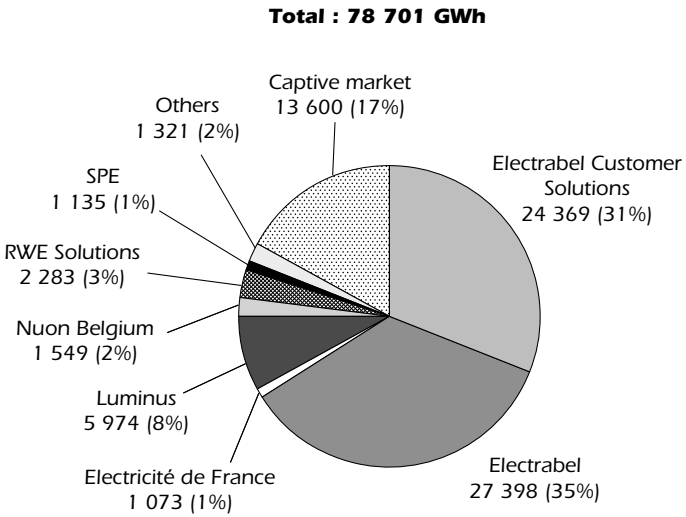
Despite the relatively large number of permitted retail suppliers in the Belgian market and the steadily increasing market shares in Flanders, Electrabel still dominates the retail market. In 2004, through Electrabel and Electrabel Customer Solutions, Electrabel supplied two-thirds of Belgium's electricity market, as shown in Figure 41. Including the captive market, which is supplied by Electrabel, this share rises to over 80% of the market.

In Flanders, the market is dominated by two large suppliers: Electrabel and Luminus. In 2004, in terms of GWh of electricity supplied to customers, Electrabel Customer Solutions and Electrabel combined had a 76% retail market share and Luminus had a 12% market share. When looking at access points or customers, Electrabel's combined market share drops to 70% and the market share of Luminus rises to 19%. By the beginning of 2005, 11% of Flemish access points had signed a contract with a new supplier, actively switching from the default provider. In addition, 50% of customers have negotiated new contracts with existing retail suppliers.

In 2003, Wallonia had four main retail suppliers of the eligible market, which totalled 10.9 terawatt-hours (TWh). Electrabel supplied 93% of the retail market (including 4% supplied by Electrabel Customer Solutions), EDF Benelux supplied 5% and ALE Trading supplied 2%.

Figure 41

Market Share of Retail Electricity Suppliers in Belgium, 2004



Source: Country submission.

Barriers to entry for retail suppliers

One key difficulty faced by new retail suppliers is access to customer data. In Belgium, all electricity market operation services for the mixed DNOs in Flanders are provided by three companies: Netmanagement, Indexis and Gedis. Netmanagement (a subsidiary of Electrabel) operates some services on behalf of the DNOs, such as providing connection services to new clients or repairing faulty service. Gedis, a company that prepares decisions on confidential and strategic matters for the mixed DNOs in Flanders, is owned by these mixed DNOs. All Belgian *intercommunales mixtes* hold shares in Indexis, the metering company for Belgium. One major legacy issue of these companies is that the computer systems of Gedis and Indexis are still linked to that of Electrabel through Netmanagement. The ownership of Netmanagement and the legacy IT integration between Gedis, Indexis and Electrabel have led to charges of unfair advantages on the part of the former vertically integrated company.

As a result, Electrabel has access to approximately 80% of Flemish customer metering and billing data, because of their historical databases and their relationship with the mixed DNOs. This situation harms new retail suppliers because they cannot see historical energy usage and use this information to estimate how much electricity to schedule for their customers or what rates to offer potential customers. This puts them at a competitive disadvantage

to Electrabel. The mixed DNOs are in the process of unbundling their customer database and making it accessible to all suppliers. Past unbundling deadlines have been missed; the mixed DNOs estimate that unbundling will be completed in the autumn of 2005.

All electricity market operations, services and decisions of the independent DNOs are provided by their own personnel. Since its inception, Luminus has invested in separate IT systems from those of the DNOs.

Another potential barrier to entry relates to new distribution grid connections. Some new retail suppliers have argued that new residential connections for Electrabel are usually completed within the day, whereas it can take up to a few weeks to complete new residential connections of other suppliers.

POWER EXCHANGE

In September 2004, Elia announced that it was forming a Belgian power exchange in co-operation with APX, the Amsterdam Power Exchange, TenneT, the Dutch TSO, Powernext, the French exchange, and RTE, the French TSO. It is expected to commence operation in early 2006.

Belpex will be coupled with the exchanges of France and the Netherlands. The interconnections' daily capacity between the countries will be allocated by the exchanges through implicit auction. This mechanism must still be approved by the regulators of the concerned countries.

On Belpex, market participants will be able to buy and sell electricity for next-day delivery. Power generators will be able to offer excess volume on the exchange and suppliers will be able to purchase electricity. Belpex operations should increase liquidity in the Belgian electricity market. The first phase will include only short-term products. Later efforts will include adding products such as futures and options.

PRICING

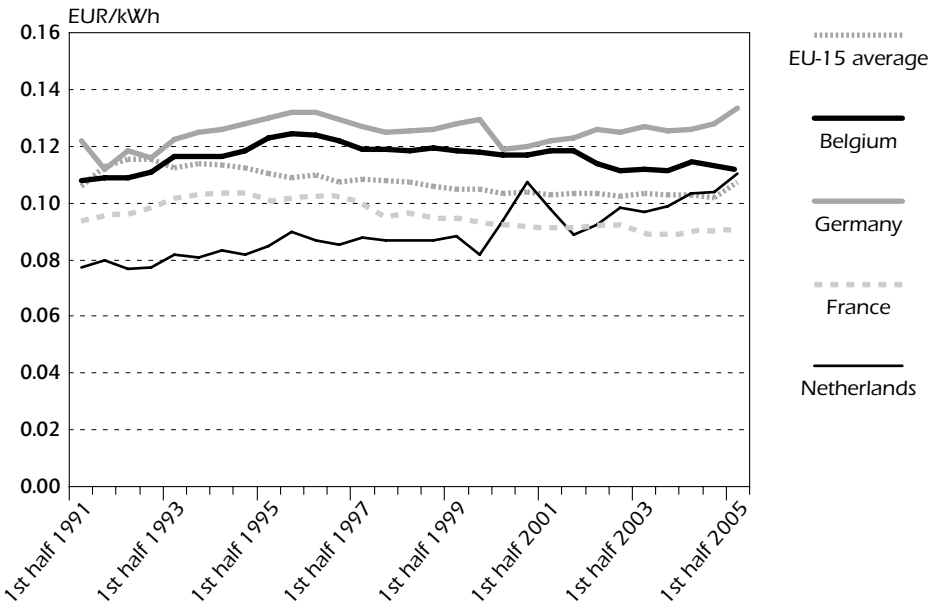
PRICES

As the electricity market in Belgium has been liberalised, data on electricity prices – both wholesale prices and retail prices to end-users – are less available and comprehensive, in part because these prices are generally not regulated or fixed. Nonetheless, some available price data give an indication of the relative cost of electricity in Belgium, both in comparison to other regions or countries and to previous time periods. Because Flanders' retail market has been liberalised the longest, much of the data on individual retail suppliers are from that region.

Data compiled on Eurostat, which is part of the statistical office of the European Community, show that Belgium's domestic electricity prices are slightly above those of the EU-15. However, the difference has narrowed over time, falling from a high of nearly 15% over the last decade to less than 4% in 2005 (see Figure 42). As compared with other nearby countries, Belgium's domestic electricity prices are higher than in France, lower than in Germany and nearly identical to those in the Netherlands.

Figure 42

Domestic Electricity Prices in Belgium and in Neighbouring Countries, 1991 to 2005

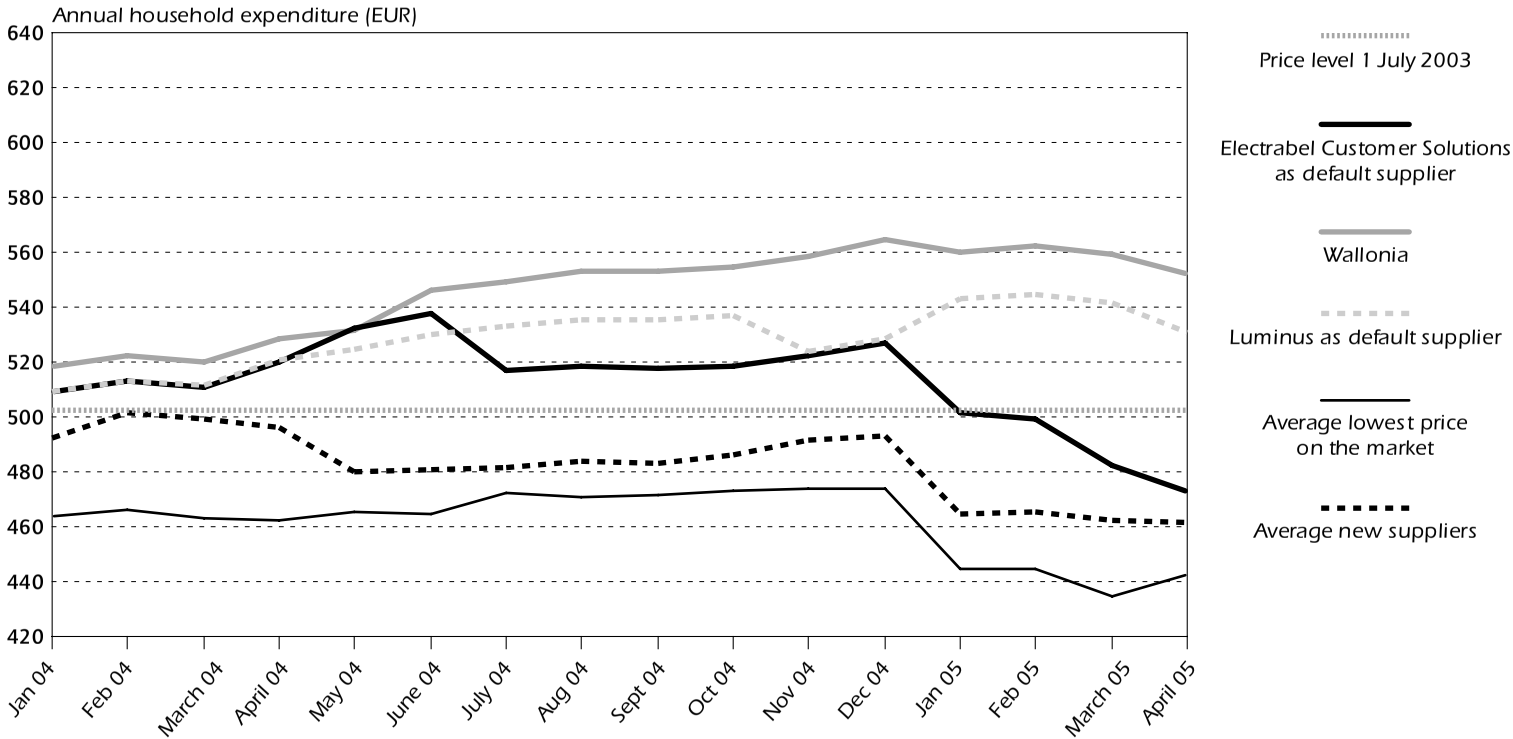


Note: Based on household consumption rates for a family with an annual consumption of 2 200 kWh during the day and 1 300 kWh during the night. Prices exclude taxes. Belgian data for the second half of 2004 are missing; they have been estimated in the chart.
Source: EUROSTAT.

In Flanders, the opening of the market has provided new electricity retail supply options, some of which are available at retail prices that are lower than both the July 2003 price and prices offered by Electrabel (see Figure 43). In addition, the lowest prices offered on the market have fallen since January 2004. When the VREG conducted a survey and asked customers that had switched suppliers about prices since switching, the overall impression was that prices had stayed the same or fallen somewhat. The VREG is working to better quantify the effect on prices since competition.

Figure 43

Electricity Price Comparisons in Flanders, January 2004 to April 2005



Note: Based on household consumption rates for a family with an annual consumption of 2 200 kWh during the day and 1 300 kWh during the night.

Source: Country submission (VREG).

Flanders also looked at the relative prices of a large group of retail suppliers, including suppliers of green electricity, based on average prices reported to the VREG. The average annual prices for a family consuming 3 500 kWh per year are reported in Table 38. The range of prices indicates that green electricity suppliers – who receive additional financial revenues from the sale of green certificates – offer rates competitive with those of standard electricity suppliers.

Table 38

Annual Residential Electricity Costs in Flanders, April 2005

Retail electricity supplier	*Average annual cost (based on residential consumption of 3 500 kWh/year)*
City Power Belgium Green*	EUR 415
Nuon Flex	EUR 428
Essent Standard	EUR 439
Luminus Direct	EUR 442
Ecopower*	EUR 444
Nuon Comfort	EUR 446
Luminus Asset	EUR 452
Nuon Nature*	EUR 471
Electrabel Elek 35	EUR 474
Essent Green*	EUR 474
Standard supplier	EUR 480
Electrabel Green*	EUR 494

Note: A * denotes a "green" energy supplier.

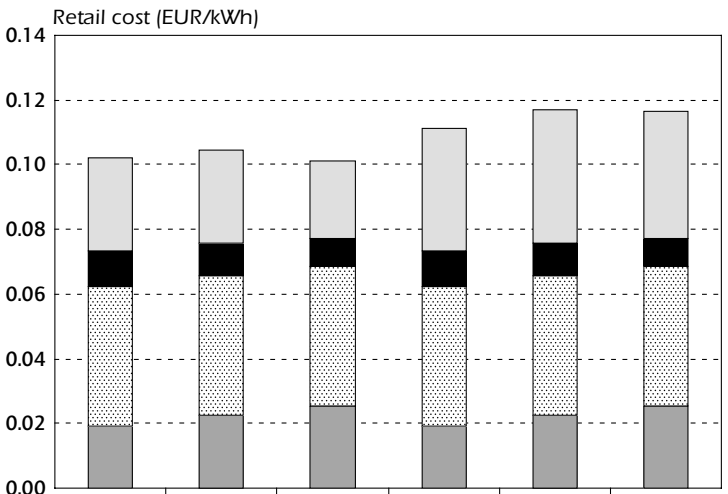
Source: Country submission.

In another comparison, the Belgian regulator, the CREG, compared four major price components for a small business in Flanders and a small business in Wallonia from 2003 to 2005. The results, shown in Figure 44, indicate that in both regions users have experienced a price decline between 2004 and 2005, but also show that distribution costs in Wallonia are higher than in Flanders (65% higher in 2005). The data also show that Elia's transmission costs have declined by over 20% since 2003. Nonetheless, higher fuel costs have generally offset these transmission price decreases.

Looking at transmission costs alone, Belgium's proposed 2005 transmission grid charges rank as the sixth-lowest of 23 surveyed systems, which include rates from 13 distinct countries, based on comparisons conducted by Elia. When looking at combined transmission and distribution costs, a benchmarking study by the EU shows that Belgium's rates rank relatively high.

Figure 44

Electricity Price Components in Flanders and Wallonia, 2003 to 2005



	Flanders			Walloon		
(EUR)	0.0286	0.0286	0.0238	0.0377	0.0409	0.0392
(EUR)	0.0112	0.0101	0.0088	0.0112	0.0101	0.0088
(EUR)	0.0434	0.0434	0.0434	0.0434	0.0434	0.0434
(EUR)	0.0189	0.0225	0.0252	0.0189	0.0225	0.0252

Source: Country submission.

Of 22 surveyed countries, Belgium's medium-voltage transmission charges of EUR 14/MWh were the sixth-highest, and higher than the neighbouring countries of France, Germany, Denmark and the Netherlands. However, when Belgium is compared to other EU countries using a more comparable medium-voltage client profile, these transmission charges of EUR 7.7/MWh rank as the fourth-lowest. On the other hand, at EUR 50/MWh, low-voltage charges were the fourth-highest, higher than in France, Denmark and the Netherlands.

SUBSIDIES

As described in the chapters on general energy policy and energy efficiency, Belgium provides a number of electricity subsidies. Most notably, Flanders legislation requires that electricity suppliers provide free to each household 100 kWh of electricity, plus an additional 100 kWh of free electricity for each member of the household. This is provided to all, not just low-income, households. The costs to suppliers of this free electricity are compensated by

the distribution system operator, which incorporates these costs into overall distribution tariffs for all other electricity supplied to households. As these tariffs are in line with consumption, it effectively provides a subsidy from households with high electricity consumption to ones with low consumption and also a small subsidy from small households to larger ones. Brussels-Capital provides electricity at a subsidised rate to low-income residents.

PUBLIC SERVICE OBLIGATIONS

A governmental regulation of 10 April 2003 set up public service obligations relating to issues of security, environment and social policy.

Environmental obligations

Suppliers must furnish an annual bill that gives expanded information on consumption and primary energy, including annual consumption and consumption changes over the previous three years, as well as average consumption by customer class.

Suppliers must also deliver, together with the annual bill, any documents relating to so-called rational-use-of-energy polices issued by the federal government. Moreover, they must grant subsidies, specified by the government, relating to renewables or rational use of energy, including:

- Grants for low-consumption electric household appliances.
- Grants for insulation.
- Grants for special heating systems.
- Grants for energy audits.

These grants are refunded through the Energy Fund. This fund is financed by regional taxes on electricity and gas.

Social obligations

For customers with existing electricity bill debts, a prepayment metering system is installed to help them manage their electricity consumption.

Federal public service obligations are described in the Chapter 3 on general energy policy.

CRITIQUE

Since the last in-depth review, Belgium has made significant changes to its electricity market. Most notably, at present more than 90% of consumption is

supplied through a liberalised retail market, improving efficiency and, as preliminary results show, lowering prices for end-use customers. In addition, the transmission grid is now managed by Elia, a company that is tasked with providing transparent and non-discriminatory access to the transmission grid. These efforts have resulted in significant entry of new suppliers to the retail market, providing customers with competitive choices of electricity suppliers. An increasing number of customers have signed new contracts with new or old suppliers. Despite these efforts, Belgium should continue to work to develop a competitive electricity market that benefits Belgian consumers. To accomplish this, Belgium should work to reduce the dominant role of Electrabel and better integrate its markets – not only the regional ones together, but also the Belgian market with its neighbouring markets of France and the Netherlands – with the goal of making Belgium part of a competitive European market.

In order to move towards a more comprehensive and integrated Belgian market, the regional and federal governments and regulators should ensure that electricity markets in all regions are opened without unnecessary delays. In addition, since liquidity and efficiency of markets are improved by larger numbers of market participants, the regional and federal authorities should work together to ensure that market rules and regulations are harmonised. Differences between the three regional electricity markets and the federal one prevent market participants from readily participating in all three markets, which reduces the number of participants in any one market. Instead, different rules, regulations and regulatory institutions require that market participants use processes, systems and strategies that work in all regions in which they participate, that they develop and use unique systems for each market or that they participate in fewer markets. In particular, differences in green and CHP markets, differences in public service obligation requirements and the need to obtain different supplier licences in different regions create higher business costs on market participants, which lead to reduced efficiency and higher prices for end-use customers. Given the relatively small size of the Belgian market and even smaller size of the regional markets, Belgium should reduce this regulatory burden. Australia, which also has a federalist governing structure, and the Nordic market, which is working together to integrate different countries, are good examples of progress towards market harmonisation and greater efficiency. Given Belgium's commitments to integrating its market with both France and the Netherlands, as well as with the larger EU, the country should ensure that its own regional markets work together.

Despite Belgium's progress towards opening its market, the market power of the incumbent hampers the development of true competition. Electrabel's ownership of 85% of Belgium's capacity reduces competition in the market, discouraging new entry and preventing the market penetration of other competitors. Furthermore, because of nuclear facilities that have been largely

depreciated, Electrabel is very competitive and new entrants may find it more difficult to compete with the dominant incumbent.

Integration of Belgium's electricity market with that of other countries can diminish the market power of dominant players by enlarging the effective size of the market. An essential step towards a larger, integrated European market is co-operation with neighbouring countries. Elia's planned grid investments – which would increase the present cross-border capacity from 2 200 to 4 700 MW – are key to expanding the relevant market size and reducing the market power of Electrabel. This is a positive development that should be accelerated. Just as critical as physical market integration is integration of market operations. It is critical that the Belgian regulator and Elia continue to work closely with the TSOs of neighbouring countries to co-ordinate market operations. In this context, it is promising that in July 2005 the regulators of Belgium, France and the Netherlands issued a joint consultation document to facilitate regional market integration between the wholesale electricity markets of the three countries. Belgium should continue to build on this effort, by both expanding the goal of the agreement from one that maximises efficient cross-border trade to one that seeks to establish a single common market, and by extending the agreement to more European countries. Spain and Portugal, for example, have signed a memorandum of understanding to create a unified Iberian market, while the Nordic market has been operating as a single market for several years.

The creation of Belpex, a Belgian power exchange that will be coupled with exchanges in France and the Netherlands, will be a powerful institution for providing transparent access to and pricing of wholesale electricity. This will help improve the liquidity and efficiency of the market and provide a neutral platform for the further development of financial products, such as derivatives, that can provide insurance to all market participants and improve the robustness and stability of the market. Government and regulatory authorities should ensure that Belpex becomes operational as soon as possible and that all necessary measures are taken so that the exchange can work seamlessly with the French exchange, Powernext, and the Dutch exchange, APX.

The appointment of Elia as the transmission system operator has greatly improved non-discriminatory access to the grid. In addition, cross-border transmission along the northern border with the Netherlands is allocated using market-based mechanisms. However, interconnection capacity along the southern border with France is allocated according to historical priority lists and is not market-based. Furthermore, a large share of capacity is reserved for historical contracts. Not only is this allocation method counter to the market-based approach Belgium committed to through the EU directive, but this hampers new actors from entering the electricity market in Belgium and will delay development of an integrated regional European electricity market. In this light, the memorandum of understanding, signed in March 2005 with

France and the Netherlands on cross-border trade and the plans to introduce market-based mechanisms for transmission capacity allocation at its southern border are commendable developments. This mechanism should be implemented without delay. Elia should also continue efforts to evolve towards a more market-based and cost-reflective real-time balancing mechanism.

VPP auctions are one method the government is using to effectively reduce Electrabel's market share. The introduction of the VPP is a good step towards improved competition as it decreases the structural barriers to entry into the Belgian electricity market. Auctioning of VPP capacity should be regulated and conducted in a transparent and fair manner, and open to all interested parties.

However, the value of VPP auctions should not be overstated. Though they provide access to Electrabel's supply, they are very imperfect proxies for actual ownership or divestiture. First, they are only options – if they are not exercised Electrabel retains control of the capacity and its larger dominant share. Second, these options only give access to supply on a day-ahead basis. VPP owners would not have access to the supply in the real-time market, when control of supply might be more powerful for countering the dominant player's market power. An additional problem with the VPP auctions as conducted in Belgium is that Electrabel has the primary role in setting both the predetermined strike price and the minimum auction price, giving it the opportunity to set both prices high enough to discourage their sale. Regardless of these prices, however, since VPPs cover a small portion of Electrabel's dominant position, the sale of the VPPs simply returns monopoly rents, or profit, back to Electrabel in the form of VPP sales revenue as opposed to revenue from retail customers. Given the many flaws with VPP auctions, modifications to VPP auctions, including giving the responsibility of setting the predetermined strike prices and minimum reserve prices to the CREG and adding the ability to nominate power in the real-time market, should be considered. If these efforts do not effectively reduce Electrabel's market dominance and create sufficient competition, stronger measures – including divestiture – should be envisaged.

Currently, the CREG approves transmission and distribution tariffs annually based on proposals from network operators. New legislation will introduce a multi-year methodology, decreasing uncertainty of regulation and giving appropriate signals to the market. Belgian authorities should ensure that this change is implemented as quickly as possible. In addition, postage-stamp rates do not give Elia any incentive to lower its costs, and data from the EU show that Belgian transmission tariffs are relatively high compared to other neighbouring countries.

Electricity distribution is legally unbundled from other activities, but Electrabel still manages some operations and customer databases of the *intercommunales mixtes*. Because of this, retail electricity suppliers have faced

significant difficulties obtaining metering and other customer data from the distribution network operators during customer enrolment, switching and billing. To counter this, efforts to unbundle customer databases from Electrabel's control should be completed as quickly as possible so that no single participant has a very significant competitive advantage. Regulators should also review existing new customer connection times to ensure that all suppliers' customers are treated equally.

Despite significant progress towards non-discriminatory electricity market access, some obstacles remain. For example, distribution network operators are able to set potentially discriminatory network access rules, there is currently a lack of neutral access to customer databases and there is potential discrimination with respect to new customer network connections. Therefore, it is important that regulators and authorities at federal and regional levels have the necessary means to intervene on any anti-competitive behaviour of the network operators or other actors that could hamper development and functioning of a competitive market. In addition, a strong political will to have a well-functioning electricity market is required.

RECOMMENDATIONS

The government of Belgium should:

- *Harmonise regulations and obligations for retail suppliers in different regions.*
- *Continue to work with the neighbouring countries of France and the Netherlands to increase interconnection capacity and better integrate all electricity markets, with the goal of creating a more integrated European electricity market.*
- *Decrease the existing structural barriers to entry to encourage new actors to enter the electricity market.*
- *Monitor the liquidity and functioning of the forthcoming Belgian electricity exchange, Belpex, and ensure that any preconditions for a common market with neighbouring countries are met.*
- *Replace the current first-come first-served allocation of interconnection capacity with market-based mechanisms at the southern border.*
- *Ensure that mechanisms to reduce market concentration, such as VPP auctions, are regulated and conducted in a transparent and fair manner, and open to all interested parties. If VPP auctions continue to be used,*

consider modifying them so that their outcomes are consistent with an efficient, competitive market.

- *Ensure multi-year and stable regulations, including regulated tariffs, for network operation and development.*
- *Ensure effective unbundling in distribution – including information technology systems – and that distribution network operators remain completely neutral toward all market participants.*

GENERAL OVERVIEW AND POLICY

Belgium has seven operating nuclear power plants – all pressurised water reactors – that have a total generating capacity of about 5 801 MW_e net (see Table 39). This represents a net capacity increase of about 89 MW_e since 2000 as a result of capacity upgrades achieved during that period.

In 2003, these plants produced 44.8 TWh, about 55.7% of the country's electricity generation, and represent a significant part of Belgium's efforts to reduce air pollution (NO_X and SO_2) and avoid carbon emissions. The overall performance of Belgian plants is generally world class, having an average availability of 88.5% over the three years from 2001 to 2003.

Table 39

Summary of the Nuclear Power Plants in Belgium

Plant	*Capacity (MW_e net)*	*Date connected to the grid*	*Owner*
Doel 1	392	August 1974	Electrabel: 100%
Doel 2	433	August 1975	Electrabel: 100%
Doel 3	1 006	June 1982	Electrabel: 96% SPE: 4%
Doel 4	985	April 1985	Electrabel: 96% SPE: 4%
Tihange 1	962	March 1975	Electrabel: 50% Semobis (EDF): 50%
Tihange 2	1 008	October 1982	Electrabel: 96% SPE: 4%
Tihange 3	1 015	June 1985	Electrabel: 96% SPE: 4%

Source: Country submission.

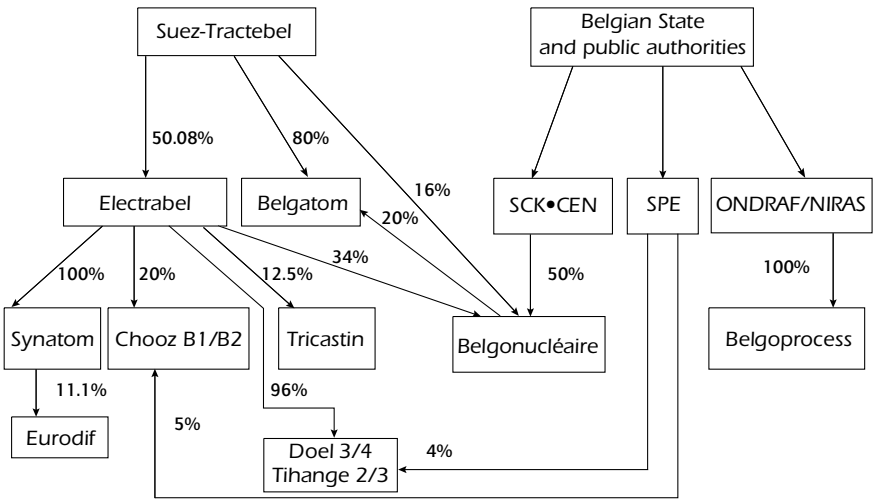
INDUSTRY STRUCTURE AND KEY INSTITUTIONS

Belgium is characterised by a complex ownership web among the actors in the nuclear sector (see Figure 45). Belgian utilities also have a 25% share in the output of the Chooz B plants in France. In addition, Electrabel has a share of

the Tricastin power plants in France, which are used to supply the uranium enrichment plants of Eurodif. Electrabel is the operator of all commercial reactors in Belgium.

Figure 45

Ownership of Belgian Nuclear Industry



Source: Country submission.

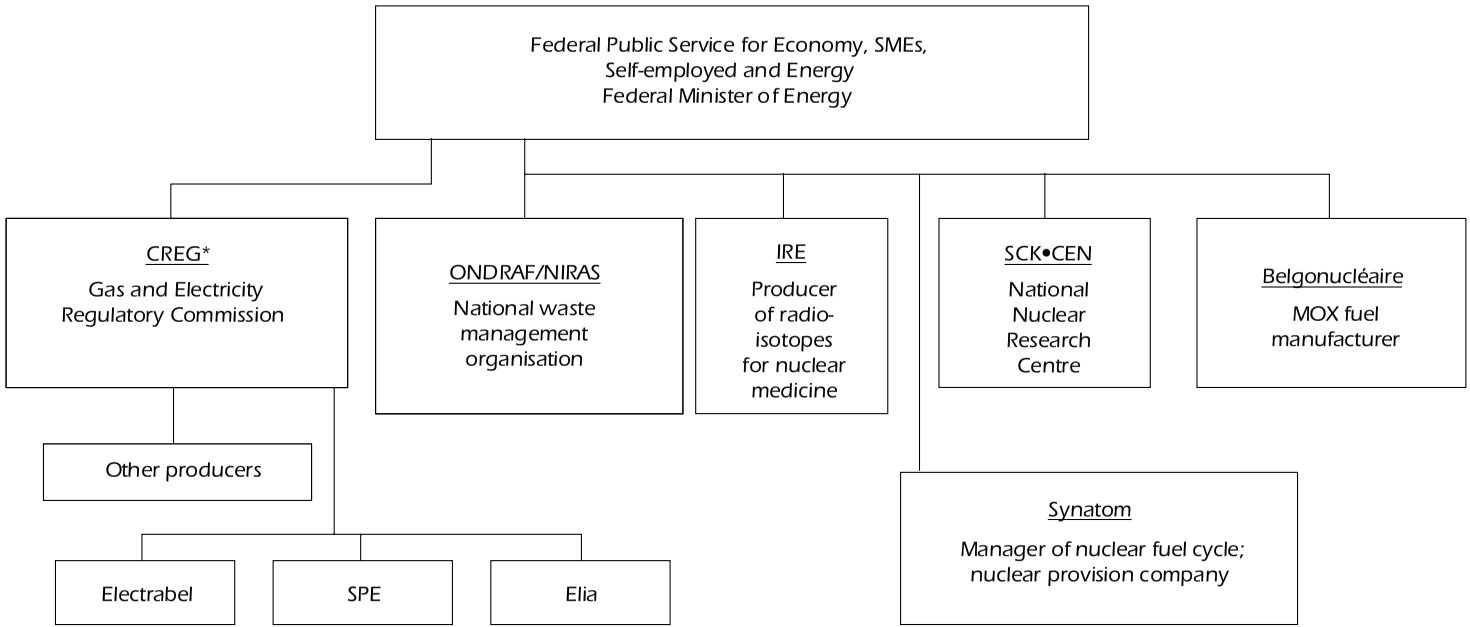
The responsibility for nuclear policy within the Belgian government rests with the Public Service for Economy, SME, Self-employed and Energy. An organisational diagram including the nuclear policy institutions in the Belgian regulatory structure is illustrated in Figure 46.

In January 2003, the National Assembly passed a law codifying the national policy of Belgium to phase out nuclear energy for commercial electricity production. The law specified a prohibition on the construction of new nuclear power plants and a limit on the operational period of existing plants to 40 years. The phase-out can only be overridden by new legislation or by a government decision based on a recommendation from the federal Gas and Electricity Regulatory Commission (CREG) that Belgium's energy supply is threatened by the closure of the plant(s), a situation considered to be a *force majeure*.

The current plans will lead to the closure of three plants by 2015 (1.75 GW_e net combined) with the remaining four plants (4.0 GW_e net combined) closed by 2025 (see Figure 47).

Figure 46

Federal Nuclear Policy Institutions

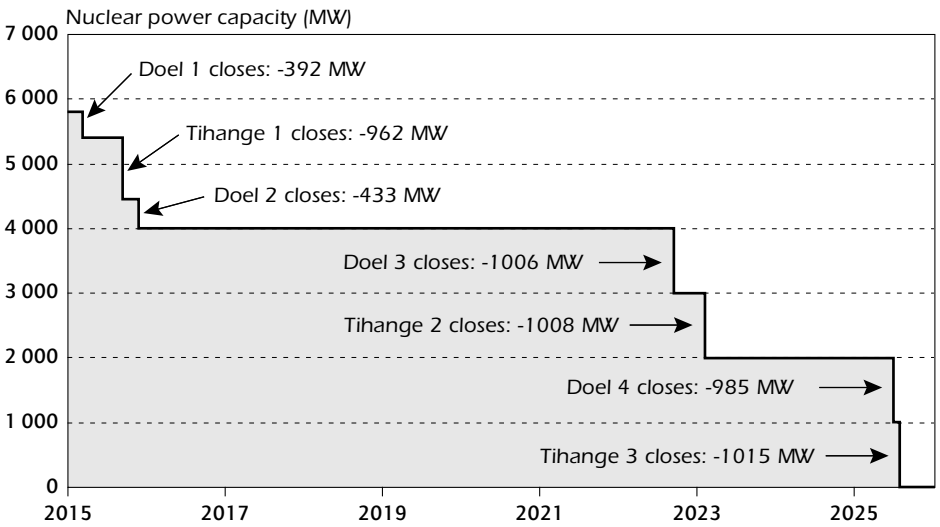


* for the liberalised part of the market.

Source: Country submission.

Figure 47

Schedule for the Phase-out of Nuclear Energy in Belgium



Source: Country submission.

NUCLEAR FUEL CYCLE

Belgium has a highly developed nuclear industry, which is considered world class in many areas of the nuclear fuel cycle. Synatom (owned 100% by Electrabel except one preferential share owned by the federal government) is the entity in Belgium that is responsible for all aspects of the fuel cycle, from procuring uranium to managing the spent nuclear fuel after its discharge from the reactor, *e.g.* procurement, conversion, enrichment, fuel fabrication and reprocessing. Synatom retains ownership of the nuclear materials at all times until the material is disposed of.

Belgium has no natural uranium that can be mined economically. In the past, there was limited production of about 40 tonnes a year from imported phosphates. This production has been terminated owing to economic reasons, though rising uranium prices could result in this production being restarted in the future. Synatom secures the uranium supplies through medium- and long-term contracts with uranium exporters in Australia, Canada, Russia and central and southern Africa.

Synatom has an interest in the French Eurodif plant, which is a major supplier of enrichment services. Additional enrichment services are met by long-term contracts with Techsnabexport (Tenex) in Russia.

A uranium fuel fabrication plant with a production capacity of 400 tU per year (more than enough to meet the country's needs) is located at Dessel; it is operated by a subsidiary of the French company FBFC (*Société Franco-Belge de Fabrication de Combustibles*). Additionally, a mixed oxide fuel (MOX) fabrication plant is also located at Dessel, operated by Belgonucléaire, and has a capacity of 35 tonnes per year.

The use of MOX is authorised, but limited to the quantities obtained from the reprocessed spent fuel from Belgian reactors already at the Areva reprocessing plant at La Hague, France. The return of the vitrified high-level waste to Belgium is authorised and began in April 2000. In 2003, a total of 6 shipments out of 15 had been completed with the last shipment expected to be completed by 2010.

All other services to support plant operations are either indigenous or obtained commercially from established suppliers in a number of diversified countries.

NUCLEAR SAFETY REGULATION

The safety of the nuclear installations in Belgium is governed by the law of 15 April 1994 with regard to the protection of the population and the environment against the dangers from ionising radiations. This law entrusts the supervision of nuclear safety to the Federal Nuclear Control Agency (AFCN – *Agence fédérale de Contrôle nucléaire/Federaal Agentschap voor Nucleaire Controle*). On 1 September 2001, the AFCN formally took full responsibility for the surveillance of all Belgian nuclear activities. It is an independent federal agency answering to the Ministry of Interior that exercises regulatory authority over nuclear operations. Its budget is paid for by the users and operators (see Figure 48).

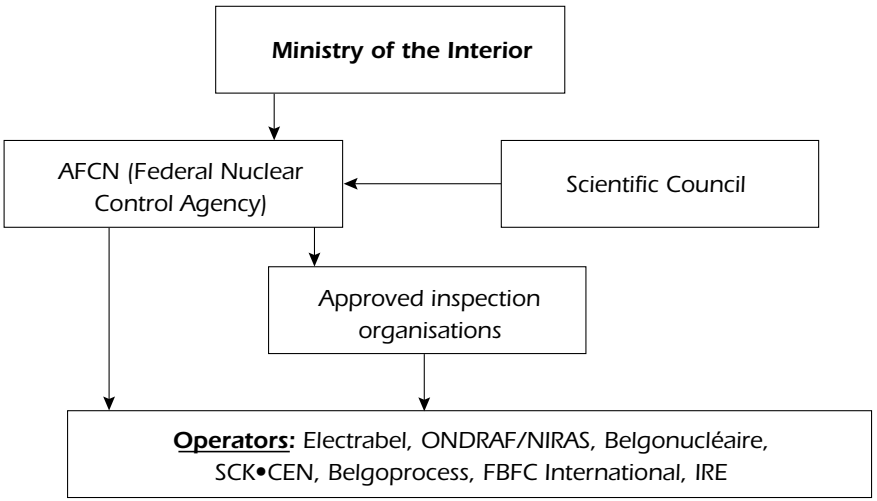
The surveillance of nuclear activities in Belgium is achieved primarily through the operators, who are responsible for meeting the requirements of their licenses. In addition, independent, non-profit technical support organisations called "approved inspection organisations", such as AVN (*Association Vinçotte Nucléaire/Associatie Vincotte Nucleair*), carry out on-site inspections and examine licence requests and safety reports of the operators, submitted to the AFCN. A scientific council is in place to give advice to AFCN on its control policy and on each licence demand for important nuclear facilities.

PLANT DECOMMISSIONING AND RADIOACTIVE WASTE MANAGEMENT

On 11 April 2003, a law was promulgated that established the roles, responsibilities and processes that will govern the decommissioning of existing nuclear power plants, the management of the spent nuclear fuel and

Figure 48

Nuclear Safety Regulation



Source: Country submission.

the financing of both these operations. The law establishes that Synatom will be the entity responsible for the dismantling of the power reactors and that it will also be responsible for managing the spent nuclear fuel. Synatom must cover the costs of these operations, and must now develop a programme to ensure this future funding. The Belgian government's controlling share in Synatom gives it the right to overrule any decision taken by Synatom. The law also created a supervisory committee composed of high-level representatives from the government, the banking world, the CREG, the Radioactive Waste Management Organisation (RWMO) and nuclear safety authorities. RWMO and nuclear safety representatives serve in a consultative role.

To ensure future funding for decommissioning, Synatom has developed the following:

- To finance the decommissioning of power reactors, beginning at the end of 2002, each trimester a payment must be transferred to Synatom by nuclear electricity producers (Electrabel, SPE) so that after 40 years of operation full decommissioning costs are covered.

- Financing for the management of spent nuclear fuel must be increased each year in proportion to the amount of spent nuclear fuel produced during the year. This financing increase is covered by payments from electricity producers to Synatom.

Funding for decommissioning and management of spent fuel is derived from income on electricity sales. Synatom is authorised to lend up to 75% of funds earmarked for plant decommissioning and spent fuel management to electricity producers. In order to do this, loan conditions must be met and detailed in conventions between Synatom and the electricity producer, to be approved by the supervising committee. The other 25% of funds must be invested in assets outside the nuclear operator with sufficient diversification to minimise risks.

The National Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF/NIRAS – *Organisme national des déchets radioactifs et des matières fissiles enrichies/Nationale instelling voor radioactief en verrijkte splijtstoffen*) is an autonomous public body, under the Public Service for Economy, SMEs, self-employed and Energy, legally responsible for the transportation, management and disposal of all radioactive waste in Belgium. Its responsibilities include the interim waste storage outside waste producer facilities and final disposal of all conditioned radioactive waste.

Currently, all radioactive waste in Belgium is stored pending the availability of facilities for its permanent disposal. Plans exist for the development of these, although the disposal of medium-level (non-heat generating) waste is not planned to start until 2035 and high-level (heat generating) waste not until 2050. Irradiated nuclear fuel is currently stored at the sites of the nuclear power plants following a government decision taken in 1998 to introduce a moratorium on nuclear fuel reprocessing.

When waste producers do not have their own appropriate facilities, processing and conditioning are performed in facilities operated by Belgoprocess, a subsidiary of ONDRAF/NIRAS, and located in Mol-Dessel.

Intermediate storage of the returned vitrified waste resulting from reprocessing of nuclear fuel takes place in the storage facilities operated by Belgoprocess in Dessel. The intermediate storage of spent fuel takes place on the sites of the nuclear power plants. Sufficient capacity exists to store the lifetime arisings of the Tihange plant locally and the capability to do so exists at the Doel plant by systematically extending a modular building there to meet operational needs.

The programme for disposal of low-level and short-lived waste aims at obtaining a governmental decision on the technical disposal solution (near-surface or geological disposal) as soon as possible. In partnerships between ONDRAF/NIRAS and the local population, activities are concentrated at the three locations in Belgium that have agreed to consider siting a low-level and short-lived waste repository, *i.e.* Dessel, Mol and Fleurus-Farciennes. The general assembly of the Dessel partnership (Dessel being the municipality on whose territory the nuclear operators Belgoprocess, Belgonucléaire and FBFC International are located) approved unanimously on 23 September 2004 its

final report on the possibility to locate an integrated disposal project in Dessel. It was then transferred to the municipal council, which approved the final report unanimously on 27 January 2005 and decided to transmit it to the competent federal authorities. With this decision, the municipality of Dessel is the first to announce officially its conditional willingness to discuss the possibility to host a low-level and short-lived radioactive waste repository on its territory. On 27 January 2005, the general assembly of Mol approved with a majority of votes a final report on the possibility to locate an integrated low-level and short-lived radioactive waste repository in Mol. The final report was approved by a large majority by the municipal council of Mol on 25 April 2005. As a result, the municipality of Mol announced its conditional willingness to discuss the possibility of hosting a low-level and short-lived radioactive waste repository on its territory. The local partnership at Fleurus-Farciennes is completing its activities and is expected to present its final report for approval to its general assembly in late summer or autumn, while the examination of the partnership's final report by the two municipal councils involved is planned before the end of 2005.

Research and development work is continuing for the geological disposal of high-level and long-lived waste, in particular in the underground laboratory in Mol.

HUMAN RESOURCE MANAGEMENT

The policy to phase out nuclear energy may impact the recruiting and retention of qualified personnel and increase the difficulty in replacing an ageing workforce. The National Nuclear Research Centre (SCK•CEN – *Studiecentrum voor Kernenergie/Centre d'Etude de l'Energie Nucléaire*), has taken several steps to counter these issues, including:

- Collaborating with five Belgian universities to create the Belgian Nuclear Higher Education Network (BNEN). This network aims at transferring nuclear knowledge and expertise to young scientists through selective and advanced courses on nuclear engineering. For many years the SCK•CEN has had a special programme for PhD students in co-operation with the Belgian universities and offers grants on an international basis to post-doctoral students who want to come and work for two years in one of its labs.
- Participating in the European Nuclear Engineering Network (ENEN). Under the co-ordination of SCK•CEN, this network produced a handbook for a global strategy on a European Master of Science in Nuclear Engineering.
- Adopting a practical knowledge management approach, consisting of, among other things, building databases, assembling nuclear and technical information, implementing quality assurance procedures, conducting training and writing publications.

- The centre also organises, at regular intervals, many advanced courses and seminars, as well as practical training, examples of which are "Radiation Protection" and "Off-site Emergency Planning and Responses to Nuclear Accidents".

CRITIQUE

In 2003 Belgium issued a law to phase out nuclear power between 2015 and 2025. The law specified a prohibition on the construction of new nuclear power plants and a limit on the operational period of existing plants to 40 years. The phase-out can be overridden under conditions of a *force majeure*. The current plans will lead to the closure of three plants in 2015 (1.75 GW_e net combined) with the remaining four plants (4.0 GW_e net combined) closed by 2025. As discussed in Chapter 3 on general energy policy, the phase-out of nuclear power could have a significant adverse impact in terms of energy supply security, climate change mitigation and economic growth. Its impact, including the economic costs of the various options for replacing nuclear power, should be thoroughly analysed. To ensure an informed public, the results of this analysis should be disseminated as widely as possible to energy actors and the general public, as discussed in Chapter 3.

Given the possibility that shut-down of the nuclear power plants could be reversed in the event of a *force majeure*, it would be prudent to ensure that no actions are neglected and no steps are taken that would preclude the possibility of continued operation until the shut-down is definitive. For example, some actions will need to be conducted well in advance of the shut-down date, such as the preparation and approval of a safety evaluation report to preserve the option of continued operation beyond the plants 40-year operating period.

The 2003 law assigning responsibility to Synatom for managing financial provisions relating to dismantling power reactors, as well as managing spent fuel, is a positive step as it creates a clear structure with defined roles and responsibility for decommissioning and spent fuel management.

The policy to phase out nuclear energy may impact the recruiting and retention of qualified personnel and increase the difficulty in replacing an ageing workforce. The SCK•CEN has taken many steps to counter these issues, but the phase-out policy requires careful management to avoid being left with insufficient resources. Even with the phase-out, qualified staff will be needed to conduct and oversee the closure and decommissioning of the commercial reactors, the development, start-up and operation of waste disposal facilities and the continued operation of isotope production and other nuclear activities. A review of best practices of other nations facing similar ageing workforce issues would also be prudent.

other nuclear activities. A review of best practices of other nations facing similar ageing work force issues would also be prudent.

RECOMMENDATIONS

The government of Belgium should:

- *Make preparations to preserve the ability to operate nuclear power plants after 2015 in the event of a* force majeure*, consistent with the law on the nuclear phase-out.*
- *Continue the education and other measures that ensure the availability of qualified personnel to staff the nuclear sector – including decommissioning and nuclear waste management activities – and relevant regulatory bodies.*

TECHNOLOGY, RESEARCH AND DEVELOPMENT

GENERAL OVERVIEW, ORGANISATION AND FUNDING

In Belgium, the administration of nuclear-related R&D (fusion and fission) is the exclusive responsibility of the federal government while administration of non-nuclear-related R&D activities is the main responsibility of the regional governments. This reflects the division of responsibilities on energy and research policies between the federal and regional governments. The federal government also pursues non-R&D policy research programmes under its second Scientific Support Plan for Sustainable Development (PADD II – *Plan d'appui scientifique à une politique de développement durable/Plan voor wetenschappelijke ondersteuning van een beleid gericht op duurzame ontwikkeling*), in which energy is one of the important components, as well as under the modelling activities of the Federal Planning Bureau. However, these non-technical energy-oriented studies are economic assessments with relatively modest budgets. This is also the case for the co-ordinating activities of CONCERE/ENOVER relating to some technological programmes, including the implementing agreements.

In Flanders, energy R&D policy is the responsibility of the Minister for Economics, Science and Innovation and is executed by the Science and Technology Administration (AWI – *Vlaamse administratie Wetenschap en Innovatie*). Two intermediary organisations are primarily responsible for the allocation and distribution of energy-related R&D funds:

- The Flemish Institute for the Promotion of Innovation by Science and Technology (IWT-Flanders – *Instituut voor de Aanmoediging van Innovatie door Wetenschap en Technologie in Vlaanderen*) implements policy related to industry and distributes funds among businesses and research institutes.
- The Fund for Scientific Research in Flanders (FWO-Flanders – *Fonds voor Wetenschappelijk Onderzoek -Vlaanderen*) implements policy with regard to basic research at the universities.

In addition, some resources within the Flemish Government Administration for Energy (ANRE – *Afdeling Natuurlijke Rijkdommen en Energie*) and the Environment Administration are available for energy policy supporting research. Two research institutions, VITO and IMEC, receive large shares of government funding. VITO, the Flemish Institute for Technological Research, is a specialised research centre with a semi-private status under the auspices of

the Flemish government. It carries out market-oriented technological research, develops products and processes and provides specialised services in the field of energy, the environment and advanced materials. The energy research activities of the IMEC, the Interuniversity MicroElectronics Centre, concentrate on solar PV cells.

In Wallonia there is one common administrator for energy R&D policy, the Walloon Minister having energy within his portfolio. Under this ministry is the General Directorate for Technology, Research and Energy. In addition, some specific energy-oriented research programmes have been in place for a few years. Wallonia also sets up centres of excellence, mainly to promote innovation strategies, where energy is one of many research areas.

Responsibility for science, technology and innovation in Brussels-Capital lies with the Minister-President. At the administrative level, the research and innovation office (SRI-DOI – *Service de la Recherche et de l'Innovation/Dienst Onderzoek en Innovatie*) of the Ministry of the Region of Brussels-Capital takes responsibility for the implementation of R&D policy. Its main mission is to administer funds to support basic industrial research and prototype development in regional companies. Technopol Brussel-Bruxelles is a non-profit organisation financed by the regional government to support technology transfer and innovation development with the co-operation of all science, technology and economic and public actors in the region. It plays a central role in R&D policy setting.

GENERAL SPENDING LEVELS

In 2003, Belgium's total energy R&D budget was EUR 76.7 million, out of which EUR 43.2 million were spent at the federal level for nuclear energy R&D, including fusion and fission. The remaining EUR 10.1 million and EUR 23.4 million were spent on non-nuclear energy R&D by the Walloon and Flemish governments respectively.

Of the EUR 23.4 million spent in Flanders, EUR 13.8 million was spent on IWT-Flanders (generic programmes for innovation), EUR 2.1 million on basic research, EUR 0.8 million on environmental projects and EUR 0.3 million on demonstrations. VITO spent EUR 4.2 million focusing on policy-supporting research areas (rational use of energy, including benchmarking, transport and environment, product and process assessment, renewable energy and geo-energy) and energy technology research (innovative decentralised systems, including hydrofluorocarbons, micro turbines, combined heat and power generation. IMEC spent EUR 2.2 million focusing on solar PV.

Of the EUR 10.1 million spent in Wallonia, EUR 5.5 million were spent on conservation (EUR 3.8 million of that was spent on industry), EUR 2.6 million on renewables (including EUR 1.4 million on solar thermal, EUR 0.6 million on

biomass and EUR 0.4 million on solar PV). EUR 0.4 million was spent on fossil fuels and EUR 0.6 million on hydrogen production. Funding of renewables R&D represents a significant increase over previous years. Through the recent mechanism of recoverable grants to the industries, energy R&D may increase in the coming years.

More detailed funding information is found in later sections in this chapter.

CO-ORDINATION EFFORTS

Co-ordination of energy R&D efforts at the various government levels is done through four key efforts: the Steering Committee of the Federal Programmes, the International Co-operation Commission (CIS – *Commission "Coopération internationale"/Commissie "Internationale Samenwerking"*), CONCERE/ENOVER and the Industrial Biotechnology Platform. The Steering Committee of the Federal Programmes provides advice on the development and selection of research proposals and projects to ensure they are consistent with R&D policy goals. The CIS is a permanent commission of the Belgian Interministerial Conference for Science Policy. It deals with international issues regarding science policy that are of interest to the federal government, the regions and the communities. The Industrial Biotechnology Platform brings together communities, regions and the federal State with the goal of defining a long-term strategy for biotechnology research and avoiding a fragmented research agenda.

Though CONCERE/ENOVER is a forum to discuss cross-regional and federal policy matters, including energy, it rarely focuses on energy R&D projects. In addition, the energy R&D policy body of Flanders is not a member of CONCERE/ENOVER.

At the international level, Belgium is a party to 11 IEA Implementing Agreements (IAs) focusing on energy efficiency, renewables and modelling (through the Energy Technology Systems Analysis Programme, ETSAP).

R&D PROGRAMMES

FEDERAL LEVEL

Nuclear

Research and development activities related to nuclear energy are a federal government responsibility. Most national research is carried out at the National Nuclear Research Centre, SCK•CEN, located in Mol.

The research topics SCK•CEN is allowed to work on are fixed by royal decree. In the field of nuclear science and technology, they are the following (in order of priority):

- Safety of nuclear reactors and nuclear fuel.
- Radiation protection.
- Safe conditioning and disposal of radioactive waste and dismantling.
- Physical and book-keeping control techniques, as well as chemical analysis techniques, of fissile materials and other sensitive materials.
- Resistance of nuclear infrastructures against various aggressions.

No federal work is authorised to be performed on advanced fission systems. However, the research centre has an active project called MYRRHA that is examining accelerator-driven systems for permutation and transmutation of fission product waste as part of a European co-operative project.

SCK•CEN collaborates actively with Belgian universities and has a programme for attracting young scientists from both Belgium and abroad.

The Tractebel group, which comprises Tractebel Energy Engineering (a nuclear engineering company), Laborelec (a research laboratory set up by the electricity utilities), Electrabel, Belgatom and AIB-Vinçotte Nuclear (AVN), an approved inspections agency, also carries out research activities primarily aimed at finding solutions to specific problems arising from the operation of nuclear power plants. Tractebel is involved in several privately funded R&D efforts for the development of advanced nuclear energy systems.

In real terms, direct government support to SCK•CEN has decreased steadily since 1995. Further, possible losses of income to SCK•CEN from Belgonucléaire could result in additional budgetary pressures. By 2015, Belgium's sole research reactor will probably close. A replacement capability has not yet been identified but any new capability would require substantial sustained funding from Belgium even if international funding is obtained.

Non-nuclear

The federal government's non-nuclear energy R&D efforts are generally grouped under the PADD II initiative. Energy and transport are grouped under Part I: Sustainable production and consumption patterns. Climate and atmosphere are grouped under Part II: global change, ecosystems and biodiversity. Under PADD II, energy topics include climate change, energy efficiency at the household level and alternative or renewable sources of energy. Five renewables projects are currently being financed:

- The solar roadmap project conducts in-depth analysis of policy, technology and market performance of solar energy.

- A project on the optimal offshore wind development in Belgium conducts technical and economic studies on offshore wind energy.
- A project on liquid biofuels in Belgium analyzes the ecological, economic and socio-economic sustainability of large-scale biomass routes in Belgium.
- A project on sustainable hydrogen looks at the feasibility of hydrogen penetration in Belgium, including databases, technology assessments, evaluation of legislation and modelling.
- An additional project on wind energy works to develop a consistent methodology for long-term and short-term wind data, roughness maps and other inputs for wind project modelling, in order to improve site selection.

About EUR 5 million are budgeted for energy projects under PADD II.

FLANDERS

In Flanders, energy management, renewable energy and energy saving and rational use of energy are key areas of R&D investment. A strong focus on photovoltaics is embedded within IMEC. Photovoltec, a spin-off from IMEC, now produces one of the most efficient PV cells in the world.

Over 60% of Flanders' energy research budget has been directed towards shorter-term research, with a tendency towards hydrogen and renewables funding. Photovoltaic research represents 81% of industrial energy research.

Table 40 gives energy R&D funding and subsidies by organisation for 1999 through 2003. It shows dramatic and steady increases in overall funding. In four years funding has nearly tripled; it rose by nearly 50% between 2002 and 2003.

Table 40

Energy R&D Funding and Subsidies in Flanders, 1999 to 2003

Units: million euros	*1999*	*2000*	*2001*	*2002*	*2003*	*Total*
IMEC	0.123	0.307	0.737	1.693	2.207	5.067
VITO	3.993	4.159	4.469	4.289	4.177	21.087
IWT-Flanders	1.618	3.185	3.758	6.307	13.756	28.624
BOF	1.055	0.902	1.505	1.680	1.613	6.755
FWO-Flanders	0.071	0.159	0.228	0.343	0.472	1.273
ANRE	1.191	1.409	0.743	0.962	0.342	4.646
TWOL	0.386	0.453	0.458	0.743	0.784	2.823
Total	**8.437**	**10.574**	**11.897**	**16.017**	**23.351**	**70.275**

Note: TWOL is a fund for applied scientific research into the environment (*Toegepast Wetenschappelijk Onderzoek Leefmilieu*). It is part of the Environment and Infrastructure Department. BOF is a special research fund *(Bijzonder Onderzoeksfonds*).

Source: Country submission.

Both *ex post* and *a priori* evaluation based on potential and economic value added are conducted on government-funded R&D efforts.

WALLONIA

Wallonia's energy research focuses on five major areas:

- Energy efficiency and end-use technologies, especially in buildings (solar heating, natural and artificial lighting).
- Combustion of fossil fuels, new technologies.
- Biomass (combustion, gasification, biomethanisation).
- Solar thermal and, recently, photovoltaics.
- Hydrogen and fuel cells.

Moreover, special research efforts are made on catalysts, in support of research in fields related to combustion, hydrogen production and proton exchange membrane (PEM) fuel cells.

Over time, the research centre focused on coal, but then shifted towards environmental research, including non-energy areas. In addition, many projects are focused on energy efficiency.

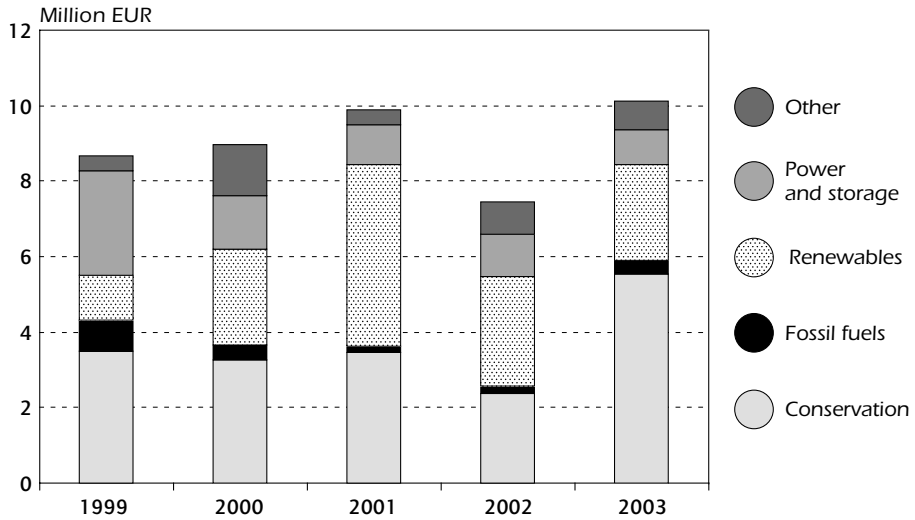
One spin-off of a government-funded project is Xylowatt, which builds biomass gasification facilities.

Total government spending on energy R&D is presented in Figure 49. It shows that total spending has varied somewhat between 1999 and 2003, but has generally stayed around EUR 8–10 million. Over that period, spending has grown from EUR 8.7 million to EUR 10.1 million, an increase of 13%.

Renewable energy R&D spending is broken down by research area in Figure 50. In particular, it shows dramatic variations in commitment budgets for research focused on renewable energy R&D. Hydro-related research has fallen from nearly a third of total renewables funding to 2% between 1999 and 2003. Wind energy research, which accounted for 1–4% in most years, accounted for 12% of total spending in 2002. Biomass research funding peaked in 2001 in both absolute and relative terms, when it received EUR 2.3 million, 47% of overall renewables funding. Solar funding has received relatively steady and growing support, from EUR 0.7 million to EUR 1.8 million between 1999 and 2003, corresponding to 58% and 72% of overall renewables funding. As these commitment budgets cover three years' worth of funding, to better understand actual funding trends over time, changes to funding levels should be considered on a rolling three-year basis.

Figure 49

Government Energy R&D Spending in Wallonia, 1999 to 2003

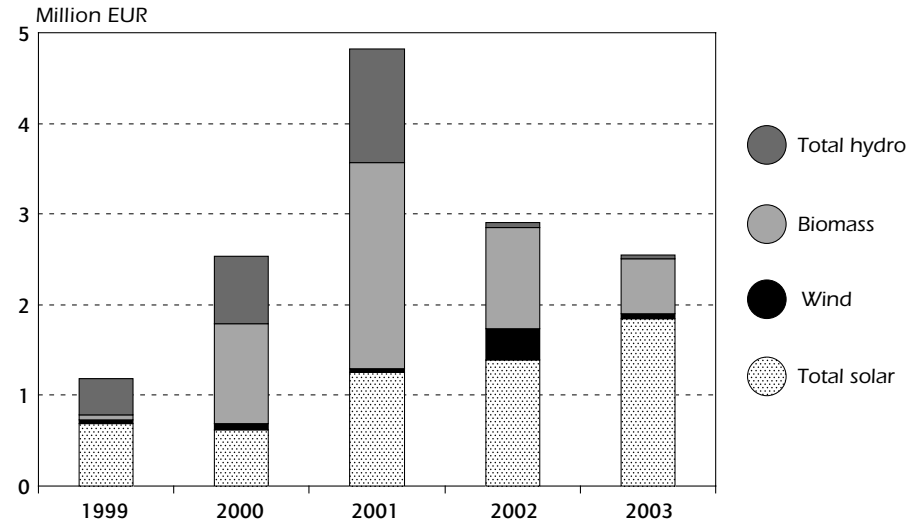


Note: The spending levels detailed above represent commitment budgets, not actual yearly expenses. The commitments cover a period of roughly three years.

Source: Country submission.

Figure 50

Government Renewable Energy R&D Spending in Wallonia, 1999 to 2003



Source: Country submission.

The Walloon region regularly launches calls for proposals on specific thematic priorities of research, named *Programmes Mobilisateurs*, the results of which are often of interest to existing companies or might lead to the creation of new enterprises. The priorities are set up in co-operation and discussion with involved actors of the Walloon R&D community.

Independent foreign experts evaluate all R&D proposals. Based on these evaluations, the General Directorate for Technology, Research and Energy in Wallonia selects the best projects for funding. Because of budget limitations, *ex post* evaluation is more limited. For basic industrial research, research teams must submit evaluation questionnaires once a year for the three years following the completion of a project in order to evaluate its results. For applied research projects, most grants are so-called recoverable grants; the ability of projects to repay the grant allows the government to evaluate their success.

BRUSSELS-CAPITAL

As a relatively small region, Brussels-Capital's research budget is very small. Instead, the region's research centres, universities and companies are active in broader EU energy and research programmes. These include the sixth Framework Programme on R&D and a non-technological programme, "Intelligent Energy for Europe", as well as Eureka, COST, Structural funds, Interreg and ERA-Net. In recent years Brussels-Capital's budgets formerly spent on energy R&D projects have shifted towards studies in support of energy policy.

CRITIQUE

Belgium's 2003 energy R&D budget of EUR 76.7 million is a large increase from EUR 54.6 million in 1999. This is a commendable development, particularly as many IEA countries are experiencing drops in public R&D budgets. At the regional level, growing emphasis on energy efficiency – and, to a lesser extent renewables R&D – well reflects the priorities of regional energy policies. Belgium's collaboration with the private sector and universities, as well as its participation in ten IEA implementing agreements will help maximise the benefits of its energy R&D budget.

Given Belgium's large and growing outlay of public funds, it is important that the country further develops methods to review energy R&D policies and spending, to ensure that they are in line with overall energy policies, and that projects are cost-effective. Evaluating the performance of ongoing and completed programmes can result in more efficient use of limited financial resources. While federal and regional governments seem to be

conducting some evaluation, they are encouraged to share their experience and expertise for *ex ante* and *ex post* evaluation.

It is increasingly important to involve the private sector in R&D activities to facilitate the process of technology deployment. Such co-operation seems to be active in nuclear technologies where SCK•CEN and the Tractebel group are involved. It is not evident to what extent the private sectors are involved in the non-nuclear R&D activities led by the regional governments.

Information exchange, co-ordination and co-operation on areas of common interest such as energy efficiency and renewable energies, could enhance synergies and maximise the benefit of limited financial energy R&D resources. To ensure this collaboration and exchange, Belgium should further strengthen collaborative efforts, perhaps by broadening the subjects discussed through CONCERE/ENOVER to include energy R&D funding and policy, or by establishing a separate mechanism or forum where energy R&D policy-makers of federal and regional governments can exchange information and enhance co-operation and co-ordination. In any case, the energy R&D policy-makers from the Flemish government, who are not a member of CONCERE/ENOVER, should be involved in such efforts.

There have been some difficulties in gathering adequate information on Belgian government spending on energy R&D between 2000 and 2002. This may be partly attributed to the split of responsibilities between the federal and the regional governments. Improved mechanisms for data collection of overall energy R&D funding and the allocation of that funding should be considered as part of the effort for better information exchange and co-ordination between the federal and regional governments.

Both at federal and regional levels, science and technology administrations often govern non-nuclear energy R&D initiatives. This will necessitate strong co-operation between energy administrations and science/technology administrations so that energy R&D policy is in line with federal and regional energy policy priorities.

Despite the decision to phase out nuclear, it seems sensible to sustain nuclear-related R&D with a view to ensuring reliable and safe operation of, and expertise on, nuclear power and waste disposal. Belgium should ensure that SCK•CEN's budget and staff are sufficient to maintain this expertise. In addition, should Belgium close its sole research reactor, this would leave it without a domestic irradiation capability – a capability needed in non-nuclear R&D sectors in addition to nuclear. Thus, Belgium could face substantial and rapid declines in R&D infrastructure and capability at a time when nuclear R&D needs remain, and its ability to innovate and compete in other important sectors could be seriously weakened. Belgium should carefully review any future decision to close this research reactor.

R&D sectors in addition to nuclear. Thus, Belgium could face substantial and rapid declines in R&D infrastructure and capability at a time when nuclear R&D needs remain, and its ability to innovate and compete in other important sectors could be seriously weakened. Belgium should carefully review any future decision to close this research reactor.

RECOMMENDATIONS

The government of Belgium should:

- *Enhance* ex ante *and* ex post *cost-benefit analysis of R&D activities.*
- *Enhance regional non-nuclear public-private partnership in energy R&D programmes.*
- *Enhance information exchange, co-operation, and co-ordination among regional governments in the areas of common interests, such as energy efficiency and renewables-related R&D.*
- *Develop improved processes for the collection of data on energy R&D funding and the allocation of that funding.*
- *Enhance co-ordination between the offices responsible for energy policy and science/technology policy to ensure the consistency between energy policy and energy R&D programmes.*
- *Maintain a minimum nuclear R&D capability; carefully evaluate programme requirements and funding of the SCK•CEN centre, as well as any decision to close the country's nuclear research reactor.*

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY

		1973	1990	2002	2003	2010	2020	2030
TOTAL PRODUCTION		**6.5**	**13.1**	**13.3**	**13.4**	**13.7**	**11.2**	**2.4**
Coal[1]		6.4	1.2	0.1	0.1	..	..	..
Oil		–	–	–	–	–	–	–
Gas		0.0	0.0	–	–	–	–	–
Comb. Renewables & Waste[2]		0.0	0.7	0.8	1.0	1.6	1.9	2.1
Nuclear		0.0	11.1	12.3	12.3	12.1	9.2	–
Hydro		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal		–	0.0	0.0	0.0	0.0	0.0	0.0
Solar/Wind/Other		–	0.0	0.0	0.0	0.1	0.1	0.3
TOTAL NET IMPORTS[3]		**39.8**	**36.0**	**42.5**	**45.7**	**47.8**	**51.9**	**59.0**
Coal[1]	Exports	0.8	1.1	1.4	0.7	..	..	..
	Imports	5.3	10.8	6.8	6.5	..	..	..
	Net Imports	4.6	9.7	5.4	5.8	4.2	3.1	10.0
Oil	Exports	15.1	19.2	23.3	23.8	..	..	..
	Imports	46.4	41.7	52.7	55.8	..	..	..
	Bunkers	3.1	4.1	6.9	6.9	5.8	6.2	6.7
	Net Imports	28.2	18.4	22.6	25.0	23.2	24.0	24.1
Gas	Exports	–	–	–	–	–	–	–
	Imports	7.1	8.2	13.6	14.2	20.0	24.4	24.6
	Net Imports	7.1	8.2	13.6	14.2	20.0	24.4	24.6
Electricity	Exports	0.2	0.7	0.8	0.7	..	..	..
	Imports	0.1	0.4	1.4	1.3	..	..	..
	Net Imports	–0.1	–0.3	0.7	0.6	0.4	0.4	0.4
TOTAL STOCK CHANGES			**–0.0**	**0.1**	**0.8**	**–0.0**	**–**	**–**
TOTAL SUPPLY (TPES)		**46.3**	**49.1**	**56.5**	**59.2**	**61.5**	**63.1**	**61.4**
Coal[1]		11.2	10.7	6.3	5.9	4.2	3.1	10.0
Oil		28.0	18.7	22.9	24.8	23.2	24.0	24.1
Gas		7.1	8.2	13.4	14.4	20.0	24.4	24.6
Comb. Renewables & Waste[2]		0.0	0.7	0.9	1.2	1.6	1.9	2.1
Nuclear		0.0	11.1	12.3	12.3	12.1	9.2	–
Hydro		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal		–	0.0	0.0	0.0	0.0	0.0	0.0
Solar/Wind/Other		–	0.0	0.0	0.0	0.1	0.1	0.3
Electricity Trade[4]		–0.1	–0.3	0.7	0.6	0.4	0.4	0.4
Shares (%)								
Coal		*24.1*	*21.7*	*11.2*	*10.0*	*6.8*	*5.0*	*16.2*
Oil		*60.5*	*38.2*	*40.5*	*41.8*	*37.7*	*38.0*	*39.1*
Gas		*15.4*	*16.6*	*23.7*	*24.3*	*32.6*	*38.6*	*40.1*
Comb. Renewables & Waste		*–*	*1.4*	*1.6*	*2.0*	*2.6*	*3.0*	*3.4*
Nuclear		*–*	*22.7*	*21.8*	*20.9*	*19.6*	*14.6*	*–*
Hydro		*–*	*–*	*0.1*	*–*	*0.1*	*0.1*	*0.1*
Geothermal		*–*	*–*	*–*	*–*	*–*	*–*	*–*
Solar/Wind/Other		*–*	*–*	*–*	*–*	*0.1*	*0.1*	*0.5*
Electricity Trade		*–0.1*	*–0.7*	*1.2*	*0.9*	*0.6*	*0.6*	*0.6*

0 is negligible, – is nil, .. is not available.

Unit: Mtoe

DEMAND

FINAL CONSUMPTION BY SECTOR

	1973	1990	2002	2003	2010	2020	2030
TFC	**34.6**	**33.2**	**40.9**	**42.7**	**45.4**	**47.8**	**49.1**
Coal[1]	5.7	3.5	1.8	1.8	1.7	1.4	1.2
Oil	21.0	17.3	21.2	22.6	21.6	22.4	22.4
Gas	4.6	6.8	10.4	10.5	12.7	13.2	13.6
Comb. Renewables & Waste[2]	–	0.3	0.4	0.4	0.7	0.9	1.0
Geothermal	–	0.0	0.0	0.0	0.0	0.0	0.0
Solar/Wind/Other	–	0.0	0.0	0.0	0.0	0.0	0.1
Electricity	2.9	5.0	6.7	6.9	7.7	8.8	9.6
Heat	0.3	0.2	0.5	0.5	0.9	1.1	1.2
Shares (%)							
Coal	*16.5*	*10.6*	*4.3*	*4.2*	*3.6*	*2.8*	*2.4*
Oil	*60.7*	*52.2*	*51.7*	*52.9*	*47.6*	*46.8*	*45.7*
Gas	*13.3*	*20.5*	*25.4*	*24.6*	*28.1*	*27.6*	*27.7*
Comb. Renewables & Waste	–	*1.0*	*0.9*	*1.1*	*1.6*	*1.9*	*2.1*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	*0.1*	*0.2*
Electricity	*8.5*	*15.0*	*16.5*	*16.1*	*17.1*	*18.4*	*19.5*
Heat	*0.9*	*0.7*	*1.2*	*1.2*	*2.0*	*2.4*	*2.5*
TOTAL INDUSTRY[5]	**16.8**	**13.6**	**17.2**	**17.0**	**20.7**	**21.5**	**21.2**
Coal[1]	3.5	3.0	1.6	1.6	1.6	1.3	1.2
Oil	7.9	4.3	6.4	6.0	7.1	7.5	7.5
Gas	3.2	3.3	5.3	5.2	6.8	6.9	6.8
Comb. Renewables & Waste[2]	–	0.1	0.2	0.3	0.2	0.2	0.2
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	1.9	2.6	3.3	3.4	4.1	4.4	4.3
Heat	0.3	0.2	0.4	0.4	0.9	1.1	1.1
Shares (%)							
Coal	*21.1*	*22.2*	*9.0*	*9.7*	*7.8*	*6.3*	*5.4*
Oil	*46.8*	*31.8*	*37.0*	*35.2*	*34.5*	*35.1*	*35.6*
Gas	*18.7*	*24.3*	*30.9*	*30.8*	*32.8*	*32.1*	*32.3*
Comb. Renewables & Waste	–	*1.0*	*1.2*	*1.5*	*0.9*	*1.0*	*1.1*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	–	–	–
Electricity	*11.5*	*19.3*	*19.4*	*20.2*	*19.9*	*20.6*	*20.3*
Heat	*1.9*	*1.4*	*2.4*	*2.6*	*4.1*	*4.9*	*5.4*
TRANSPORT[6]	**5.0**	**7.9**	**9.8**	**10.4**	**10.7**	**11.6**	**12.3**
TOTAL OTHER SECTORS[7]	**12.7**	**11.7**	**13.9**	**15.3**	**14.0**	**14.7**	**15.6**
Coal[1]	2.2	0.5	0.2	0.2	0.0	0.0	0.0
Oil	8.1	5.2	5.1	6.3	4.2	3.9	3.5
Gas	1.5	3.5	5.1	5.3	6.0	6.3	6.8
Comb. Renewables & Waste[2]	–	0.2	0.2	0.2	0.2	0.2	0.1
Geothermal	–	0.0	0.0	0.0	0.0	0.0	0.0
Solar/Wind/Other	–	0.0	0.0	0.0	0.0	0.0	0.1
Electricity	0.9	2.3	3.3	3.3	3.5	4.2	5.1
Heat	–	0.0	0.1	0.1	0.1	0.1	0.1
Shares (%)							
Coal	*17.0*	*4.5*	*1.5*	*1.0*	*0.2*	*0.1*	–
Oil	*64.2*	*44.5*	*36.8*	*41.3*	*30.4*	*26.6*	*22.2*
Gas	*11.4*	*30.0*	*36.6*	*34.5*	*42.6*	*42.7*	*43.2*
Comb. Renewables & Waste	–	*1.6*	*1.1*	*1.3*	*1.2*	*1.1*	*0.9*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	–	–	–	*0.1*	*0.2*	*0.4*
Electricity	*7.4*	*19.2*	*23.6*	*21.5*	*25.0*	*28.9*	*32.9*
Heat	–	*0.3*	*0.4*	*0.4*	*0.5*	*0.5*	*0.4*

Unit: Mtoe

DEMAND

ENERGY TRANSFORMATION AND LOSSES

	1973	1990	2002	2003	2010	2020	2030
ELECTRICITY GENERATION[8]							
INPUT (Mtoe)	**10.0**	**17.7**	**19.1**	**19.9**	**21.2**	**21.7**	**19.7**
OUTPUT (Mtoe)	**3.5**	**6.0**	**7.0**	**7.2**	**8.3**	**9.5**	**10.3**
(TWh gross)	40.6	70.3	80.9	83.6	96.5	110.0	120.0
Output Shares (%)							
Coal	*21.7*	*28.2*	*15.6*	*13.9*	*4.5*	*1.8*	*37.4*
Oil	*53.7*	*1.9*	*1.2*	*1.2*	*0.2*	*0.0*	*0.0*
Gas	*23.7*	*7.7*	*22.1*	*25.9*	*43.9*	*62.9*	*58.1*
Comb. Renewables & Waste	*0.3*	*1.0*	*2.1*	*1.9*	*2.5*	*2.3*	*2.0*
Nuclear	*0.2*	*60.8*	*58.5*	*56.7*	*47.9*	*32.2*	–
Hydro	*0.4*	*0.4*	*0.4*	*0.3*	*0.5*	*0.4*	*0.4*
Geothermal	–	–	–	–	–	–	–
Solar/Wind/Other	–	*0.0*	*0.1*	*0.1*	*0.5*	*0.5*	*2.1*
TOTAL LOSSES	**12.6**	**16.2**	**16.1**	**16.8**	**16.2**	**15.3**	**12.3**
of which:							
Electricity and Heat Generation[9]	6.2	11.4	11.6	12.2	11.9	11.0	8.1
Other Transformation	5.0	2.1	1.6	1.7	1.6	1.5	1.4
Own Use and Losses[10]	1.4	2.7	2.9	2.9	2.7	2.8	2.9
Statistical Differences	**0.05**	**-0.20**	**3.90**	**-2.03**	**..**	**..**	**..**

INDICATORS

	1973	1990	2002	2003	2010	2020	2030
GDP (billion 2000 USD)	125.70	184.36	232.14	235.06	283.45	337.81	397.09
Population (millions)	9.73	9.97	10.33	10.37	10.51	10.70	10.88
TPES/GDP[11]	0.37	0.27	0.24	0.25	0.22	0.19	0.15
Energy Production/TPES	0.14	0.27	0.23	0.23	0.22	0.18	0.04
Per Capita TPES[12]	4.76	4.93	5.47	5.70	5.85	5.90	5.65
Oil Supply/GDP[11]	0.22	0.10	0.10	0.11	0.08	0.07	0.06
TFC/GDP[11]	0.27	0.18	0.18	0.18	0.16	0.14	0.12
Per Capita TFC[12]	3.55	3.33	3.96	4.11	4.32	4.46	4.51
Energy-related CO_2 Emissions (Mt CO_2)[13]	133.6	108.5	112.5	120.1	123.0	131.0	158.5
CO_2 Emissions from Bunkers (Mt CO_2)	11.3	16.0	25.7	26.6	23.0	24.4	26.0

GROWTH RATES (% per year)

	73-79	79-90	90-02	02-03	03-10	10-20	20-30
TPES	1.0	-0.0	1.2	4.6	0.6	0.3	-0.3
Coal	0.3	-0.6	-4.3	-6.5	-4.8	-2.8	12.3
Oil	-1.5	-2.8	1.7	8.1	-0.9	0.3	0.0
Gas	4.5	-1.2	4.2	7.7	4.8	2.0	0.1
Comb. Renewables & Waste	41.7	22.8	2.3	26.5	4.5	1.8	0.9
Nuclear	130.2	12.8	0.9	0.0	-0.3	-2.6	-
Hydro	4.9	1.3	2.5	-32.3	10.0	-	-
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	17.6	42.9	27.2	3.6	14.0
TFC	0.5	-0.6	1.8	4.3	0.9	0.5	0.3
Electricity Consumption	4.2	2.6	2.5	1.6	1.8	1.3	0.8
Energy Production	2.7	5.0	0.1	1.5	0.3	-2.0	-14.3
Net Oil Imports	-0.8	-3.4	1.7	10.8	-1.1	0.3	0.0
GDP	2.4	2.2	1.9	1.3	2.7	1.8	1.6
Growth in the TPES/GDP Ratio	-1.3	-2.2	-0.7	3.3	-2.1	-1.5	-1.9
Growth in the TFC/GDP Ratio	-1.9	-2.8	-0.2	3.0	-1.8	-1.2	-1.3

Please note: Rounding may cause totals to differ from the sum of the elements.

FOOTNOTES TO ENERGY BALANCES AND KEY STATISTICAL DATA

1 Includes lignite.

2 Comprises solid biomass, biogas, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.

3 Total net imports include combustible renewables and waste.

4 Total supply of electricity represents net trade. A negative number indicates that exports are greater than imports.

5 Includes non-energy use.

6 Includes less than 1% non-oil fuels.

7 Includes residential, commercial, public service and agricultural sectors.

8 Inputs to electricity generation include inputs to electricity, CHP and heat plants. Output refers only to electricity generation.

9 Losses arising in the production of electricity and heat at main activity producer utilities (formerly known as public) and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 33% for nuclear and 100% for hydro.

10 Data on "losses" for forecast years often include large statistical differences covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.

11 Toe per thousand US dollars at 2000 prices and exchange rates.

12 Toe per person.

13 "Energy-related CO_2 emissions" have been estimated using the IPCC Tier I Sectoral Approach. In accordance with the IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 2003 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology.

INTERNATIONAL ENERGY AGENCY "SHARED GOALS"

The 26 member countries* of the International Energy Agency (IEA) seek to create the conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and the well-being of their people and of the environment. In formulating energy policies, the establishment of free and open markets is a fundamental point of departure, though energy security and environmental protection need to be given particular emphasis by governments. IEA countries recognise the significance of increasing global interdependence in energy. They therefore seek to promote the effective operation of international energy markets and encourage dialogue with all participants.

In order to secure their objectives they therefore aim to create a policy framework consistent with the following goals:

1. **Diversity, efficiency and flexibility within the energy sector** are basic conditions for longer-term energy security: the fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydro power, make a substantial contribution to the energy supply diversity of IEA countries as a group.

2. Energy systems should have **the ability to respond promptly and flexibly to energy emergencies.** In some cases this requires collective mechanisms and action: IEA countries co-operate through the Agency in responding jointly to oil supply emergencies.

3. **The environmentally sustainable provision and use of energy** is central to the achievement of these shared goals. Decision-makers should seek to minimise the adverse environmental impacts of energy activities, just as environmental decisions should take account of the energy consequences. Government interventions should where practicable have regard to the "Polluter Pays Principle".

4. **More environmentally acceptable energy sources** need to be encouraged and developed. Clean and efficient use of fossil fuels is essential. The development of economic non-fossil sources is also a priority. A number of IEA members wish to retain and improve the nuclear

* Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.

option for the future, at the highest available safety standards, because nuclear energy does not emit carbon dioxide. Renewable sources will also have an increasingly important contribution to make.

5. **Improved energy efficiency** can promote both environmental protection and energy security in a cost-effective manner. There are significant opportunities for greater energy efficiency at all stages of the energy cycle from production to consumption. Strong efforts by governments and all energy users are needed to realise these opportunities.

6. Continued **research, development and market deployment of new and improved energy technologies** make a critical contribution to achieving the objectives outlined above. Energy technology policies should complement broader energy policies. International co-operation in the development and dissemination of energy technologies, including industry participation and co-operation with non-member countries, should be encouraged.

7. **Undistorted energy prices** enable markets to work efficiently. Energy prices should not be held artificially below the costs of supply to promote social or industrial goals. To the extent necessary and practicable, the environmental costs of energy production and use should be reflected in prices.

8. **Free and open trade** and a secure framework for investment contribute to efficient energy markets and energy security. Distortions to energy trade and investment should be avoided.

9. **Co-operation among all energy market participants** helps to improve information and understanding, and encourage the development of efficient, environmentally acceptable and flexible energy systems and markets worldwide. These are needed to help promote the investment, trade and confidence necessary to achieve global energy security and environmental objectives.

(The Shared Goals were adopted by IEA Ministers at their 4 June 1993 meeting in Paris.)

GLOSSARY AND LIST OF ABBREVIATIONS

In this report, abbreviations are substituted for a number of terms used within the International Energy Agency. While these terms generally have been written out on first mention and abbreviated subsequently, this glossary provides a quick and central reference for many of the abbreviations used.

AAU	assigned amount unit (under the Kyoto Protocol)
AFCN	Federal Nuclear Control Agency
ANRE	Flemish Government Administration for Energy
APX	Amsterdam Power Exchange
BAP	natural gas network balancing point
bcm	billion cubic metres
bpd	barrels per day; 1 Mt/year is equivalent to about 20 000 bpd
BFP	Federal Planning Bureau
BNP	National Oil Board
BOFAS	Belgium's Fund for the Clean-up of Polluted Service Station Soil
CEPS	Central European Pipeline System
CIS	Belgium's International Co-operation Commission
CO_2	carbon dioxide
CHP	combined production of heat and power; sometimes when referring to industrial CHP, the term "co-generation" is used
CDM	clean development mechanism (under the Kyoto Protocol)
CONCERE/ENOVER	energy consultation group that includes representatives from regional and federal governments
CRE	Federal Commission for the Regulation of Electricity
CREG	Federal Gas and Electricity Regulatory Commission
CWaPE	Walloon Energy Regulatory Commission
DNO	distribution network operator

EC	European Commission
ECS	Electrabel Customer Solutions
EDF	Electricité de France
EEA	European Environment Agency
ETSAP	Energy Technology Systems Analysis Programme
EU	European Union
EU-ETS	European Union Emissions Trading Scheme
EUR	euro (€); on average in 2004 EUR 1 = USD 1.237
FAPETRO	fund for the analysis of Oil Products
FEDESCO	a federal energy services company that promotes energy efficiency
FWO-Flanders	Fund for Scientific Research in Flanders
g	gram
GDF	Gaz de France
GDP	gross domestic product
GHG	greenhouse gases
GW	gigawatt, or 1 watt x 10^9
GW_e	gigawatt of electric capacity
GWh	gigawatt-hour = 1 gigawatt x 1 hour
H-gas	High-calorie natural gas
HGP	higher gas price scenario of the BFP
IA	implementing agreement
IBGE/BIM	Brussels-Capital's Government Administration for Energy and the Environment; also the energy regulator
IEA	International Energy Agency
IEP	International Energy Program
IPCC	Intergovernmental Panel on Climate Change
IRR	internal rate of return
IMEC	Interuniversity MicroElectronics Centre
IT	information technology
IWT-Flanders	Flemish institute for the Promotion of Innovation by Science and Technology
JI	joint implementation (underd the Kyoto Protocol)

kg	kilogram, or 1 gram x 10^3
km	kilometre, or 1 metre x 10^3
km^2	square kilometre
ktoe	thousand tonnes of oil equivalent; see "toe"
kW	kilowatt, or 1 watt x 10^3
kW_e	kilowatt of electric capacity
kWh	kilowatt-hour = 1 kilowatt x 1 hour = 1 watt x 10^3 x 1 hour
kV	kilovolt, or 1 volt x 10^3
L-gas	low-calorie natural gas
LNG	liquefied natural gas
LPG	liquefied petroleum gas
m^2	square metre
MOX	mixed oxide fuel
Mt	million tonnes
$MtCO_2$	million tonnes of carbon dioxide
$MtCO_2$-eq	million tonnes of carbon dioxide equivalent; these values include other greenhouse gases converted to CO_2-equivalents on the basis of their global warming potential
Mtoe	million tonnes of oil equivalent; see "toe"
MW	megawatt, or 1 watt x 10^6
MW_e	megawatt of electric capacity
MWh	megawatt-hour = 1 megawatt x 1 hour
NATO	North Atlantic Treaty Organization
NIMBY	"not in my backyard"
NO_x	oxides of nitrogen
NUC1	one of two nuclear scenarios of the BFP
NUC2	one of two nuclear scenarios of the BFP
OECD	Organisation for Economic Co-operation and Development
ONDRAF/NIRAS	National Agency for Radioactive Waste and Enriched Fissile Materials
PADD II	Belgium's second Scientific Support Plan for Sustainable Development

PJ	petajoule, equivalent to about 280 GWh
PSO	public service obligation
PV	photovoltaic
R&D	research and development, especially in energy technology; may include the demonstration and dissemination phases as well
RWMO	Radioactive Waste Management Organisation
REF	reference scenario of the BFP
RES+CHP	renewable energy and CHP scenario of the BFP
RUE	rational use of energy
SCK•CEN	National Nuclear Research Centre
SME	small and medium-sized enterprise
SO_2	sulphur dioxide
SO_x	sulphur oxides
TFC	total final consumption of energy
toe	tonnes of oil equivalent, defined as 10^7 kcal
TPA	third-party access; in some regions the term "open access" is used in place of TPA
TPES	total primary energy supply
TSO	transmission system operator
TWh	terawatt-hour = 1 terawatt x 1 hour = 1 watt x 10^{12} x one hour
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
USD	US dollar ($); on average in 2004 USD 1 = EUR 0.808
VAT	value-added tax
VITO	Flemish Institute for Technological Research
VPP	virtual power plant
VREG	Flemish Electricity and Gas Regulator
WACC	weighted average cost of capital

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