EIB Energy Review

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ABBREVIATIONS

GHG	:	Greenhouse Gases Emissions
IEA	:	International Energy Agency
TEN	:	Trans European Networks
MED	:	Northern Africa and Near East Countries
ACP	:	Africa, Caribbean and Pacific
CCGT	:	Combined Cycle Gas Turbines
CHP	:	Combined Heat and Power
GDP	:	Gross Domestic Product
EEA	:	Environmental Energy Agency
LNG	:	Liquefied Natural Gas
GFCF	:	Gross Fixed Capital Formation
CCS	:	Carbon Dioxide Capture and Storage
CDM	:	Clean Development Mechanism
JI	:	Joint Implementation
AAU	:	Assigned Amount Units
ETS	:	European Emission Trading Scheme
ETP	:	European Technological Platform
WB	:	World Bank
EBRD	:	European Bank for Reconstruction and Development
ESCO	:	Energy Service Company
IFI	:	International Finance Institutions
ALA	:	Asia and Latin America
MENA	:	Middle East and North African countries

EXECUTIVE SUMMARY

Selective world and EU issues

The recent EU Commission Green paper "Energy"[1] identifies six priority areas:

- Completing the internal European electricity and gas markets
- Enhancing security of supply in the internal market, including emergency oil and gas stocks and prevention of disruptions
- Promoting a more sustainable, efficient and diverse energy mix
- Effective action to address climate change, mainly through energy efficiency, increasing the use of renewable energy sources, and carbon capture and geological storage
- Development and deployment of new energy technologies (Strategic European energy technology plan)
- Common external energy policy to enable Europe to play a more effective international role in tackling common problems with energy partners.

The proposed target areas for the energy operations of the EIB supports these objectives.

- The substantial rise of oil prices since end 2003, which initially was seen as a short-term phenomenon, was gradually perceived as a sign of the end of the period of low oil prices that had prevailed since the mid-1980s. The IEA, EU Commission and other international energy agencies have all increased their long-term oil price scenarios. This is explained by the general perception that the possibilities to develop non-OPEC production are less than expected in the past and by the lower elasticity of oil demand to price and to GDP than in the past. The recent EU Commission (DG TREN) baseline scenario assumes that oil import prices will reach 58 USD/bbl in 2030 (in 2005 USD). There are substantial uncertainties on the duration of the cycle of high prices. Many expect that prices will decline to 45-50 USD/bbl by 2010. One important factor in the definition of the oil price scenarios is the evolution of the investment in the upstream oil and gas industry in the Middle East and Northern African countries. As indicated in the IEA World energy outlook[2] report of 2005, a shortfall in investments in these countries in upstream oil would lead to high prices. More generally, it should be stressed that uncertainties in the formation of oil prices have increased, which supports a common view that prices can vary at any time within a large range. As a result, the robustness of any investment choice should undergo sensitivity tests. As illustrated in figure 3, the relative position of various energy sources in the power sector changes under the new energy scenarios.

- A larger, but still fragile, political consensus, on the need to slow the expansion of Greenhouse gas emissions is building up at world level, with a leading role by the EU. Climate change considerations are thus an important element in energy investment decision. The CO2 price has a significant impact for the project economic justification (under the assumptions considered in this report, the CO2 penalty is higher than the fuel cost in a coal power station and about half the fuel cost in a CCGT using natural gas).

- Global energy consumption growth is concentrated in developing countries. International organisations, including the EU Commission and IFIs, have a significant role to play in helping these countries make the transition to a lower carbon economy.

[1] EU Commission, Green Paper "A European Strategy for Sustainable, Competitive and Secure Energy" COM(2006) 105 final 8.3.2006
[2] IEA, World Energy Outlook 2005, November 2005

Main EU Energy Investment trends and the EIB role

- The Commission and also the IEA have recently put a special focus on energy efficiency. The potential of energy savings seems higher in some EU countries (particularly New Member States) than in others, taking into account differences in their energy intensity. The Bank can help to achieve a convergence of the energy intensity within the EU, by financing energy efficient investments, particularly in the more energy intensive countries.

- After making significant progress in large industry and electricity, the energy efficiency potential in the EU remains mainly in transport, buildings, CHP and SMEs in general. The Bank can directly support the expansion of CHP and cogeneration plants, as well as renovation of district heating. In the other sectors (buildings, transport and industry) the action of the Bank is often more indirect. It can finance energy efficiency investments/programmes, which in order to be effective, for some sectors, may need to include grants and provision of information. Additionally, the Bank can give an "energy efficiency quality stamp" to the projects it finances by ensuring that they use the most energy efficient technologies.

- Apart from renewables, indigenous EU energy production will decrease in coming years. However, there is still scope to develop a certain economic potential of conventional energy resources, particularly gas. The EU energy dependence on the outside will substantially increase in coming years. Safeguarding and increasing the security of energy supply is an important objective of the EU policy that the Bank can continue to support. This concerns in particular diversification of energy imports and appropriate energy transport infrastructures with neighbouring and energy producing countries.

- Gas expansion in the European markets should continue, considering its economic and environmental advantages. However, high and volatile gas prices may substantially limit the expansion of gas. The Bank should continue to play a major role in this development, particularly by financing the development of gas import infrastructures into the EU, including LNG facilities (they ensure import diversification and contribute to the development of gas-to-gas competition).

- Expansion of renewable energy has been substantial, but has concentrated in relatively few countries of the EU. To support this expansion, the Bank has significantly developed its renewable energy lending, which has been over 500 MEUR/a in the last few years in line with the objective foreseen for 2002-2006. It is recalled that a new target has been adopted aiming at allocating to renewable energy projects, on average by 2008-2010, up to 50% of total Bank lending in the EU for new electricity generation capacity only. Developing new renewable energy markets is a key priority of EU policy, and the Bank will develop a stronger role in this aspect.

- Following wind energy expansion (with increasing focus put in some countries on offshore wind farms, for various reasons including cost considerations and resistance from impacted populations), biomass, particularly biofuels, is expected to be the fastest renewable energy source in coming years. The Bank will be proactive in this area where the right combination between technological developments and raw material availability is essential. It could support the development of biomass potential of the EU, as well as other renewables, with good prospects of becoming competitive in a reasonable time frame.

- Under the new energy price scenarios, new coal power stations using imported coal become a competitive option to cover electricity demand in the EU, depending on the CO2 price. Technological developments (clean coal technologies and carbon capture and storage) can significantly improve the environmental performance of coal in power generation in the long run. Additionally, coal generated electricity gives protection against high oil or gas prices. For these reasons, the Bank should support the development of clean coal technologies in the EU power sector.

- The future role of nuclear energy in the EU energy mix is still very open. It will depend on political decisions and on technological developments. The main uncertainties on the development of new nuclear programs are notably related to the public acceptance, waste disposal solutions, as well as commissioning and decommissioning acceptance criteria. The debate has been re-launched in several EU countries and the Bank will keep apace with developments.

- The development of new energy technologies will contribute significantly to the achievement of the main EU objectives in the energy sector. Energy R&D will underpin the EU competitiveness, particularly as the EU has a world leading position in some areas, such as in renewable energy and energy efficiency. The Bank will expand its support of new energy technologies, developing specific financial instruments. Works associated with the proposals of the 7th R&D Framework Programme (FP 7) have identified different relevant areas and projects, including large ones (for instance ITER nuclear fusion project).

- There are still significant opportunities to better integrate the EU gas and electricity markets, which should significantly contribute to the development of the internal energy market and to enhancing security of energy supply. Financing of these infrastructures is a traditional activity of the EIB, which will be pursued in the future.

Energy policy issues concerning Partner and Neighbouring countries

- EU energy policy in relation to partner and neighbouring countries has two main aspects. In the case of neighbouring countries the aim is mainly to extend the benefits of the internal market to them and to ensure the imports of energy to the EU originating in or transiting through those countries. The Bank can contribute to these objectives mainly by financing projects aiming at better integrating the energy markets of neighbouring countries, among themselves and with the EU; as well as by financing new energy import routes to the EU, including LNG facilities.

- Concerning developing countries in general, the main objectives of the EU policy in relation to energy are to promote access to modern sources of energy to the population and to promote the development of sustainable energy solutions. The Bank can continue to play a significant role in financing of investments to cover energy demand, including the development of the participation of the private sector in energy activities. Specifically, it can also support the development of sustainable energy solutions.

- Ambitious targets have been set at EU and international level concerning reductions of CO2 emissions and the development of energy efficiency and renewable energy resources. The Bank's participation in several carbon funds and other clean development funds should allow a significant contribution to be made to this objective. The Bank will actively follow the ongoing discussions about the progress and encountered difficulties, and incorporate further developments into its own actions.

Proposed target areas and implementation issues

- Energy is high on the policy agenda of the Union. Within the strategy and objectives[3] for the EIB group approved by the Board of Governors, it is proposed to develop the energy operations of the Bank in five main complementary areas. This global perspective should permit the Bank to contribute in a more effective and consistent way to EU policy objectives. These areas are the following:

  Large energy projects in the EU, including TENs
  - Ensure that EIB financing is focused on highest priority projects in the EU, taking into account the priority areas identified in the Green paper "Energy" and the other

[3] Economic and Social cohesion, Innovation 2010 Initiative, Trans-European Networks, Environmental Protection and Improvement and support to Small and medium sized enterprises.

important Bank's objectives, particularly economic and social cohesion
- Support European interest and priority TENs projects, as well as TENs of common interest
- When required, contribute to addressing project issues and financial aspects, in order that they do not impede otherwise viable/priority projects.

Energy efficiency
- Financing of energy efficiency investments/programmes, particularly those concerning SMEs and the public sector
- Financing of CHP and cogeneration, as well as the upgrading of existing district heating systems
- Explore with promoters possibilities to develop the energy efficiency potential and give an "energy efficiency quality stamp" to the projects financed by the Bank

Renewable energy sources in the EU
- Achieving the existing targets concerning financing of renewable energy projects
- Development of less mature renewable energy markets in the EU
- Development of underdeveloped renewables (particularly biofuels) and new renewable energy technologies, with good long-term prospects

R&D in energy matters
- Increase EIB overall commitment to energy projects under i2i
- Develop risk sharing instruments for this type of projects under SFF and introduce RSFF
- Boost complementarily between FP7 and i2i and support the ETP and Research Infrastructures in energy

Cooperation with Partner and neighbouring countries
- Contribute to a better integration of the energy markets of neighbouring countries, among themselves and with the EU
- Promote the development of new energy import routes to the EU
- Increase access of the population of developing countries to modern sources of energy
- Support and encourage the participation of the private sector in energy activities
- Develop financing of sustainable energy solutions and in general supporting the development of a low carbon economy in developing countries.

Implementation will proceed with the objective of furthering value added. This may call in appropriate cases for a tailor-made introduction of new financial instruments or provision of advisory services (such as Jaspers for new EU Member States, Romania and Bulgaria or TA for MED countries). The type of instruments to be applied will vary from one case to another. For instance, the appropriate instrument to develop new renewable energy markets may be specific equity funds for this type of projects or risk sharing mechanisms with financial intermediaries. Similarly, risk-sharing instruments can play a substantial role in supporting R&D in the energy sector. By contrast, advisory services may be a key instrument to develop energy efficiency investments in the public sector in some countries, appropriately combined with grant instruments.

An enhanced cooperation with other institutions is a key element to achieving the objectives proposed. This concerns the EU Commission, mainly at policy level, as well as other IFIs and specifically the EBRD given its experience in countries of common operational interest.

EIB ENERGY REVIEW

1. INTRODUCTION

Following the energy crises of 1973 and 1980, energy became a Bank priority. However, the lessening of tension in the oil market since the mid 1980s led to a lower level of intervention of government in energy policy, which was also reflected in the Bank's action. Since the mid-1980s, the new direction of the EU energy policy has mainly been driven by considerations of environmental policy (particularly climate change), the establishment of the internal energy market and security of energy supply. The recent oil price increase, which has reached its third highest historical peak, has led to a higher prioritisation of energy issues in the EU policy agenda.

The object of this paper is to define orientations for the Bank's operations in the energy field, in order to reflect this reprioritisation of energy matters in the EU. The Bank has undertaken different initiatives concerning the energy sector (support to energy TENs, climate change policy, etc). This paper proposes a more global perspective aiming at increasing the relevance and effectiveness of the different initiatives of the Bank in relation to the EU objectives.

The first chapter presents the evolution of the EIB energy operations in the EU and in Partner and Neighbouring countries; particularly the contribution of the EIB to the main policy objectives of the EU.

In the second chapter, the world and EU energy outlook is reviewed. The aim is to analyse the key issues that will drive energy investment decisions and to identify obstacles to the development of the EU energy priorities. This chapter analyses the long-term energy price scenarios, the climate change policy and the evolution of the dependence on EU energy from the outside.

The third chapter presents the Bank's priorities in the different energy sectors and geographical areas. The definition of these priorities take into account the Bank's general priority objectives, the objectives of the mandates given to the Bank and the instruments available (senior loans, structured finance, technical assistance facilities, etc), as well as the Bank's approach to value added (the three pillars). The Bank's strategy in the energy sector is developed in five main areas:

- Large energy projects in the EU, including TENs
- Energy efficiency
- Renewable energy sources
- R&D in energy matters
- Cooperation with Partner and Neighbouring countries.

2. REVIEW OF THE PAST EIB ENERGY OPERATIONS

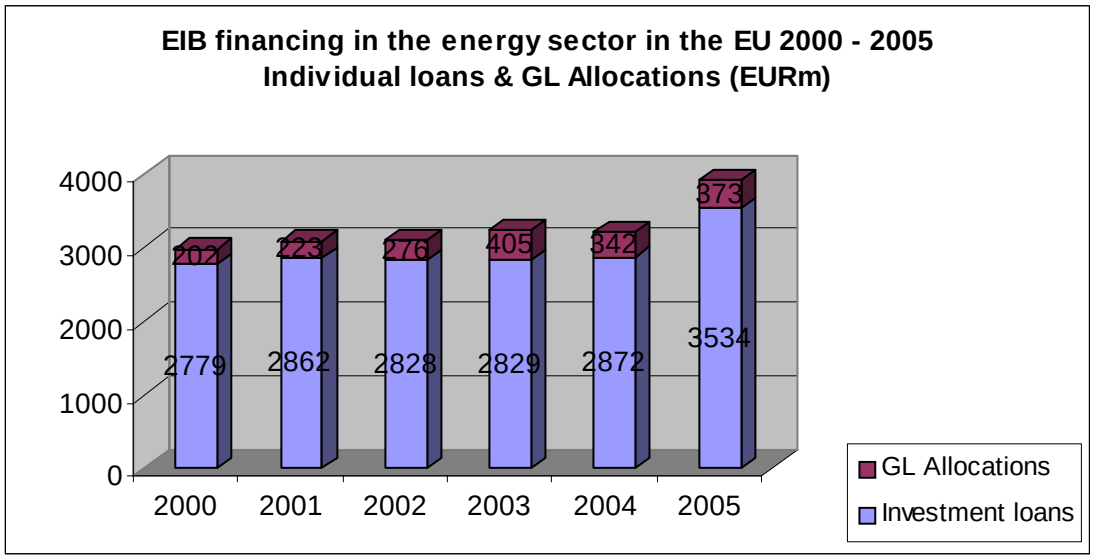
During the period 2000-2005, most of the EIB lending (signatures) to the energy sector through individual loans[4] has gone to finance projects in the EU (77% of the total-17.7 bn EUR), followed by the MED countries (12%-2.7 bn EUR), ACP countries (3%-666 MEUR) and Asia and Latin America (3%-650 MEUR).

Total EIB energy lending[5] in relation to total lending in the EU has gradually declined, from 23% in the 1980s, to 18% in 1990-95, 12% in 1996-2000 and 9% in 2000-2005. Energy lending has followed more or less the energy investment trends in the EU. The EIB has financed around 5% of the total investments by the energy sector in the EU. Annual Bank

[4] The sectoral distribution of financing to energy projects through GL outside the EU is not in the Bank's databases and for GL inside the EU the information on the sectoral distribution is not fully accurate.
[5] Including projects with energy objectives outside the energy sector.

lending for energy projects in the EU has been in the order of 3.3 bn EUR during 2000-2005 (see figure 1). Energy projects are normally very large and thus it is not surprising that the majority of the financing has consisted of individual loans (about 91% of the total in 2000-2005), while financing through global loans has represented only 9% of the total.

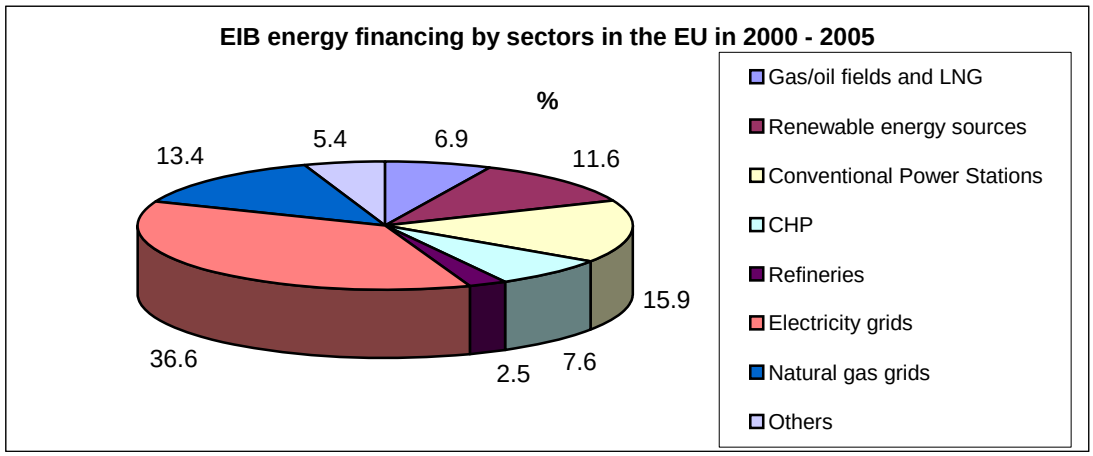
Figure 1



In 2000-2005, the largest part of EIB financing in the EU[6] (see figure 2) has gone to electricity transmission and distribution (36.6% of the total energy lending)[7]. Financing to power stations burning fossil fuels represents 23.5% of the total, mostly to finance CCGT burning gas and Combined Heat and Power stations (CHP). Gas grids (including gas storage) are 13.4% of the total financing. Finally, financing of renewable energy sources[8] amounts to 11.6% of the total (almost exclusively to produce electricity).

In relation to the 1990-2000 period, the part of financing going to electricity grids and renewable energy sources has increased in the period 2000-2005, while the share of gas/oil fields, gas grids and conventional power stations has decreased. The distribution by sectors of the financing through GL is rather different than for individual loans, principally because renewable energy sources and CHP represent a larger part of the total than for individual loans (about 37%).

Figure 2



[6] Including waste-to-energy projects.
[7] About half to electricity distribution and the other half to electricity transmission. Although these two types of projects cannot be separated precisely, as some projects concern transmission and distribution together).
[8] Including waste-to-energy projects

In terms of the Bank's objectives in the EU, the situation during the period 2000-2005 is the following (non cumulative percentages):

- Energy lending (individual loans) in regions lagging behind in their economic development has amounted to 14.1 bn EUR (80% of the total of individual loans).
- Financing of Trans-European Energy Networks has amounted to about 3.8 bn EUR during the period 2000-2005, about 18% of the total energy financing during the period.
- Energy financing of projects contributing to protecting and improving the environment has amounted to 6.9 bn EUR, a significant part of which corresponds to renewable energy projects (2.3 bn EUR).

Financing of energy projects represents a larger part of the financing outside the EU than in the EU. In the last ten years, about 34% of the financing in the Mediterranean countries (including Turkey) has gone to energy projects. The part of energy financing in total financing for ACP and South Africa, reached close to 25% of the total in the last 10 years. The energy projects financed outside the EU have contributed mostly to covering the fast growing energy demand. In the MED countries, several projects financed contributed to the development of trade and cooperation with the EU or to regional energy integration. Some of these projects were TENs. Most of energy lending outside the EU has gone to the Maghreb and Near East countries (about 50% in 2000-2005), followed by ACP countries (13%), Asia and Latin America (13%), Balkans and other neighbouring countries (5%).

3. THE BROADER CONTEXT

3.1. World energy outlook

3.1.1. Supply and demand trends

Fossil fuel resources (oil, gas and coal) are still plentiful (see table 1). In the last world energy outlook, the IEA forecast that global oil production from conventional resources would not peak before 2030, based on the latest estimates of proven oil reserves. Based on current estimates on ultimate resources and energy consumption trends, conventional oil may reach a peak of production in the second half of the 21st century, and gas by the end of the century. Coal resources are even more plentiful than oil and gas.

Table 1: World fossil fuel proven reserves

Fossil fuel	Reserves	R/P ratio (1) (years)
Oil reserves in bn barrels	1051-1266	40
Gas reserves in trillion cubic metres	180	66
Coal reserves in billion tonnes	907	220

Source: IEA, 2004
(1) Reserves/Production ratio

However, there is significant uncertainty about energy resources and sometimes the information has been subject to political manipulation[9]. The fact that oil and gas reserves have been growing faster than oil and gas production seems to indicate that there are still substantial resources available. Total proven reserves of oil were 17% higher in 2005 than in 1995 and gas proven reserves have increased by 25% in the same period[10]. There is, nevertheless, a minority view that argues that the world will reach an oil production peak before or around the turn of this decade, after which global oil production will inevitably decline, the so-called Hubert theory[11].

[9] For instance, when OPEC moved to a quota system based on oil reserves, some members suddenly revised substantially their reserve estimates, for example Kuwait, which increased its reserves by 50% overnight.
[10] From BP, Statistical review of World Energy
[11] See for instance, PIW, The age of peak oil: Old myth or new reality? September 5, 2005.

In the IEA reference scenario, world primary energy demand is projected to expand by 52% between 2003 and 2030. The increase of global energy demand will mainly come from developing countries (more than two-thirds of the expansion). Despite some improvement in expanding infrastructures of developing countries, little progress will be made in terms of reducing the number of people who lack access to modern sources of energy, particularly electricity. The continuing reliance of a significant number of people in developing countries on traditional energy sources, such as wood, is creating severe health and environmental problems.

At world level, there has been a continuous decline in primary energy intensity. From IEA statistics[12], each 1% increase in global GDP has been accompanied by a 0.6% increase in primary energy consumption since 1971. Energy elasticity to GDP has fallen over the period, from 0.7 in the 1970s to 0.4 from 1991 to 2002.

Within these overall aggregate figures, the situation may differ from country to country. GDP elasticity of energy demand is in general lower in develop countries that in developing ones, following a long-term declining trend. The same path seems to be followed by developing countries, Its continuation calls for sustained efforts and individual country situations have to be carefully monitored. Concerns have for instance been expressed in the recent past about China with apparent GDP elasticity levels higher than in the 1980s and 1990s.

This decrease seems to be partially due to an increase in energy efficiency. In industry, the trend has been to a decrease of energy intensity, particularly in industrial countries. In the land transport sector, energy efficiency improvements have been almost absent in OECD countries, except in North America, which starts from a very high level of intensity[13]. In less developed regions or in emerging economies the energy consumption of transport in relation to GDP is usually increasing rapidly, because of increased ownership of cars and expansion of road transport market share[14]. Global energy efficiency trends in the household and service sectors are difficult to analyse, due to the difference between countries in climate and other cultural aspects. In developed countries, the IEA[15] found substantial energy efficiency gains in the residential and service sectors, but with significant differences between countries. The studies performed after the second oil crisis[16] point out that the energy efficiency programmes were responsible for about 13% of the intensity reductions in the industrial countries between 1972 and 1985.

The share of non-fossil fuels (renewable and nuclear energy) is expected to remain at 19% of the world's primary energy supply in 2003-2030 under the IEA reference scenario. However, non-fossil energies may cover most of the increase in world energy demand in the second half of the century, if environmental policies become tighter at world level.

Additionally, the dependence of major oil and gas importers on imports from distant, often politically unstable parts of the world, will increase. Rising oil demand will have to be met by a small group of countries, primarily Middle East members of OPEC and Russia. Therefore, risks related to energy security will grow.

3.1.2. Greenhouse gases emissions trends (GHG)

Climate change policies may potentially have a significant influence on the evolution of world energy supply and demand. It should be noted that CO_2 production from energy production and consumption is the most important GHG, around 80% of the total emissions. The long-term world energy scenarios foresee that global emissions will continue to increase, even if

[12] IEA, World energy outlook 2005.
[13] Countries with high gasoline/gas-oil prices, such as the EU, have the most energy efficient vehicles.
[14] World Energy Council, Energy efficiency policies and indicators. October 2001.
[15] IEA, Improving energy efficiency 2002.
[16] Lee Schipper, Energy efficiency. Lessons from the past and strategies for the future. Proceedings of the WB annual conference on development economics 1993

current climate change policies are substantially reinforced[17]. Therefore, it will be necessary to take a stronger political action to limit world GHG emissions. There seems to be an increasing political consensus at world level, led by the EU[18], on the need to slow the expansion of GHG emissions and eventually to reduce them. A recent expression of consensus was the G8 Gleneagles Summit Communiqué of July 2005, which recognises that climate change is a serious and long-term challenge and calls for specific action to support a sustainable, worldwide transition to a low carbon economy.

At world level, the expected levels of GHG emissions are far in excess of those that would minimise greenhouse effects. The sixth environmental action programme defined an indicative long-term global temperature target of not more than 2°C above pre-industrial levels to minimise the adverse effects. From the studies carried out by the Environmental Energy Agency (EEA)[19], this most likely would require global emissions to be limited to an increase of 35% above the 1990 level by 2020 and then to decrease to 15% below the 1990 level by 2050. Taking into account the substantial inertia in the energy system, several decades will be necessary to change current energy trends. Therefore, climate change risks seem a more immediate threat than the risks of exhausting fossil-fuel resources.

The Environmental Council of March 2005 adopted the conclusion that to achieve stabilisation in an equitable manner, developed countries should reduce emission by about 15-30% by 2020 and 60-80% by 2050, below the base year levels (1990). Based on these targets, the EEA considers an EU emission reduction target of 40% below the 1990 level by 2030 (16-25% by actions inside the EU and the rest with international emissions trading). Under this scenario, the EEA concludes that the carbon price in the EU will increase to EUR 30/t CO_2 in 2020 and to EUR 65/t CO_2 in 2030. In the world scenario of 15% reduction by 2050 in relation to the 1990 level, the global permit will increase from EUR 6/t CO_2 to EUR 25/t CO_2 by 2020 and to EUR 60/t CO_2 by 2030. These carbon prices are similar to the prices of other recent studies. The high CO_2 prices in the long run shows that limiting climate risks to an acceptable level will imply substantial costs to reduce the emissions. However, the willingness to pay at world level to avoid CO_2 production is limited, particularly among developing countries.

3.2. Energy price scenarios

3.2.1. Oil prices

Crude oil

The substantial rise of oil prices since end 2003, which initially was seen as a short-term phenomenon, was gradually perceived as a sign of the end of the period of low oil prices that had prevailed since the mid-1980s. The substantial excess production capacity built since the second oil crisis of 1979-1980 was mostly absorbed by the early 1990s. Excess capacity went down to under one million barrels per day at end 2003. This spare capacity is not enough to stabilise the market in case of a sudden change in the supply or demand. This tight market situation combined with bottlenecks in oil transportation and refining, largely explains recent price increases.

High oil prices accelerate the use of more efficient technologies. However, demand in developed countries is concentrated in rather inelastic markets, such as transportation and petrochemicals, but most of the additional demand will come from developing countries. Oil demand elasticity in developing countries is largely related to economic growth. The long-term GDP elasticity is uncertain, but it is expected to be lower than in the past.

The impact of higher oil prices on oil supply in the medium-long term is subject to substantial uncertainties. Newly discovered reserves in non-OPEC countries have tended to be smaller and

[17] See IEA, Energy to 2050. Scenarios for a sustainable future. 2003

[18] By 2030 the EU GHG emissions will represent about 12% of world emissions. Therefore, its contribution to total emission reduction will be rather small.

[19] See for instance EEA report, Climate change and a European low-carbon energy system N§1/2005 and ICF Perspectives Analyzing the price of carbon in 2008-2012 Spring/Summer 2005

more expensive to develop than in the past. This implies that non-OPEC production will have difficulties in significantly increasing in response to higher oil prices. In contrast, OPEC production can be developed at low cost, particularly in the Middle East and North Africa. Therefore, the capacity and willingness to invest in upstream oil and gas of this group of countries will have a significant impact on the oil price developments

Additionally, there is considerable uncertainty on the cost profiles, and future developments for unconventional oil (oil sands, biofuels, etc) and gas to liquids economics depends on alternative use for gas. These alternatives to conventional oil often need high up-front investments and the high oil price volatility increases the risks of these investments.

In this context, most international institutions and market players have revised upwards their oil price scenarios. The recent oil price scenarios are a significant departure from the previous ones. This again demonstrates the difficulties in forecasting the oil market. The recent EU Commission (DG TREN) baseline scenario assumes that oil import prices will reach 58 USD/bbl in 2030 (in 2005 USD). There are substantial uncertainties on the duration of the cycle of high prices. Many expect that prices will decline to 45-50 USD/bbl by 2010 and then gradually increase.

Refining Sector
Since 1990, world oil demand has grown by 14.5 mbd and as a consequence, refinery utilisation at the global level has increased, reaching close to 90% in the last few years. Within the global total, important regional imbalances have also emerged. The deficit of refining capacity in the US reached 5.0 mbd, or 25% of total product demand. Refining margins have responded to the regional imbalances in the refining sector as well as to the underlying trends in crude and product supply and demand.

3.2.2. Gas prices

Gas markets are regional, because of the high cost of gas transportation. Therefore, gas prices are very different in each of the regional markets, depending on the supply and demand situation. However, the decline in the cost of the LNG transportation chain, combined with increasing regional market imbalances, is leading to the creation of a world LNG market. As a result, LNG provides higher security of supply than pipeline gas.

Traditionally, the evolution of gas border prices in Europe has shown a good correlation with oil prices (particularly low sulphur fuel-oil), because contract prices are generally indexed to oil products. Gas prices in continental Europe have increased in the last few years, following the increases of oil prices, but with a certain delay due to contract provisions. Against this background, most forecasts assume that gas prices in the EU will continue to follow oil prices.

However, similarly to what happened in the US and UK after liberalisation, in continental Europe contract lengths are shrinking, oil-price indexation is diminishing in importance, and flexibility in the terms of contract (take-or-pay obligations) is increasing[20]. It is likely that this trend will continue in the future, because of the development of gas-to-gas competition in the European gas market and because gas is less and less in competition with oil products in the energy market, due to the fast development of gas consumption in the power sector. Therefore, it seems reasonable to assume that gas prices will not remain fully linked to oil prices in a high oil price scenario, because such a link could lead to a substantial decline of the gas demand expansion in Europe.

[20] From A. Neumann, C. von Hirschhausen, Less long-term gas to Europe? A quantitative analysis of European long-term gas supply contracts. 2004.

3.2.3. Coal prices

Steam coal imported prices[21] at the European border have increased since 2003. This increase has been driven by the substantial demand expansion for power stations and steel manufacturers, particularly in Asia. Additionally, like for oil, the increase of freight costs has also been reflected in the coal prices at the European border. However, in 2005, prices started to decrease. Following the disruption of 2003-2004, most analysts expect that coal prices will stabilize at around 55 USD/t CIF ARA in the next few years.

The international coal market is characterised by a substantial level of competition, because of the existence of many players (coal, oil, gas and electricity companies, etc.) with different objectives and a good investment climate in the main coal exporting countries. At periodic intervals, producers have instituted industry agreements on prices, but these agreements have not survived very long. Productivity in the mining industry is increasing, mainly as a result of capital intensification (expansion of open-cut mining) and this can exert a downward pressure on realised prices in the long term.

In energy equivalent terms, the difference between oil/gas prices and coal prices has substantially increased in the last few years, as a result of the increase of oil prices. Taking into account the recent oil/gas price scenarios, this situation should persist in the long term. Therefore, coal has become more competitive in relation to oil. More importantly, coal competitiveness in relation to gas has significantly improved[22], as long as gas prices follow oil prices.

3.3. EU energy outlook

3.3.1. Supply and demand trends

From the EU Commission recent forecasts[23], corresponding to current trends and policies, primary energy demand is expected to grow by about 0.5% per year up to 2030 for the EU-25. Energy intensity should continue to decrease following a similar trend to that in the 1990s (1.5% per year). Renewable energies, especially wind, are the fastest growing energy source, but the share of renewable will still be modest in 2030 (12.2%). Gas is the fastest growing fuel after renewable energy sources. The fast increase of gas consumption is mainly related to the expansion in the power sector. In contrast, oil demand increases modestly. Consumption of oil products will continue to concentrate on the transport sector. Nuclear and solid fuels consumption declines. In relation to previous forecasts, the part of coal and renewable energy sources in total energy consumption increases significantly, while gas consumption is much lower than previously expected.

However, the future role of nuclear and coal is still rather open at this stage (see section 3.3.4). A likely reinforcement of climate change policies will penalise fossil fuels, particularly coal, and favour renewables and nuclear. In the power market is where most of the changes are expected (see section 3.3.4).

EU energy dependence on the outside expected to increase

From the EU Commission forecast, indigenous energy production peaks around 2005. Its decline stems from lower fossil fuel production (especially North Sea oil and gas) and the progressive nuclear phase-out. Indigenous energy production in 2030 is 25% lower than in 2000. According to the current policies, this decline is not offset by rapidly expanding

[21] The coal market is mainly comprised of three different markets: internationally traded steam coal, coking coal and domestic coal.
[22] This has also been observed in the past, i.e. that the difference between oil and coal prices increases, when oil prices increase.
[23] Commission Staff Working Document. Annex to the Green Paper A European Strategy for Sustainable, Competitive and Secure Energy What is at stake-background document COM (2006) 105 final SEC(2006) 317/2.

production of renewables. As a result, the EU dependence on energy imports substantially increases. By 2030 import dependence reaches about 66% compared to 47% in 2000.

Regarding fuels, the highest import dependency will continue to be for oil (94% in 2030). For natural gas this dependence grows from 50% in 2000 to 84% in 2030. Import dependence for solid fuels increases from 30% in 2000 to 59% in 2030.

3.3.2. Energy efficiency

The energy intensity of the new member states[24] is significantly higher than the EU 15 countries (191 Kgoe/1000 Euro for EU 15, against 680 Kgoe/1000 Euro for 10 new members in 2002). This seems to indicate that there may be a larger potential to increase the energy efficiency in the new member countries than in the EU 15 countries.

Higher energy prices and the reinforcement of the energy efficiency programmes should reduce the growth rate of energy demand. From the EU Commission green paper on energy efficiency, the largest energy saving potential (see table 2) is estimated in transport, buildings and through the development of CHP, while the potential in industry is lower now, after significant progress in the past. Additionally, there is a significant energy efficiency potential in the SME sector. From past experience, the development of the energy savings potential in transport and buildings is the most difficult to do. The potential saving represents about 10% of the primary energy consumption under the assumption of a rigorous implementation of the adopted measures. It increases to close to 20% with the implementation of additional measures (see table 2).

Table 2: Potential savings in the EU in Mtoe

Sector	**2020 Rigorous implementation of adopted measures**	**2020+ Implementation of additional measures**
Building: heating/cooling	41	70
Electric appliances	15	35
Industry	16	30
Transport	45	90
CHP	40	60
Other energy transformation, etc.	33	75
Total energy savings	190	360

Source: EU Commission, Green paper on energy efficiency. 2005

3.3.3. Renewable energy outlook

Over the last two decades, the expansion of renewable energy in the EU has mainly taken place in the electricity market, thanks to the introduction of market access regulations and attractive tariffs. Initially, the development of renewables focused on hydropower (mainly mini-hydro). However, wind energy has been the main driver of the expansion. Wind energy has only significantly increased in a few countries in the EU (mainly Germany, Denmark and Spain) that have put in place attractive support schemes. The expansion of renewable energy production outside the electricity sector has been very limited until now, except in a few countries, such as in Scandinavian countries (biomass).

The Commission estimates[25] that in the EU15 the share of renewable energy sources in the total gross primary energy supply will increase from 5.8% in 2002 to 10% in 2010, which is

[24] The energy intensity of the new member states is slowly converging to the rest of the MS, as the energy intensity is decreasing faster than in the EU 15 countries.
[25] From COM (2004) 366 final of 26.5.2004.

less than the target of 12%. To provide a focus for faster progress, the Union has established two other indicative targets through legislation:

- To increase to 22% the share of electricity generated by renewable energy in 2010 (adopted in 2001)
- To increase from 0.6% in 2002 to 5.75% the percentage of biofuels in diesel and gasoline used for transport in 2010 (adopted in 2003).

Concerning the first target, the Commission expects that the share of renewable electricity will not exceed 18-19% in 2010. Wind energy production is expected to exceed the initial expectations, but the expansion of other renewables in the electricity market, mainly biomass, is expected to be significantly lower than foreseen initially. Across the whole EU15, the share of biofuels in 2002 was 0.6% of the petrol and diesel market. It is too early to assess the progress in achieving the target for biofuels, but in the countries that have adopted specific legislations the biofuels share is expanding. Finally, the expansion of renewable energy markets for heating and cooling is far less than initially expected.

There are large differences in the development of the renewable energy potential across countries and types of renewable energy sources. Only the hydropower potential has been substantially developed in the EU, and to some extent the wind potential (but only in a few countries as mentioned before). In addition, there has been a development of waste-to-energy projects, as part of waste management policies. The potential of other renewable energy sources, particularly biomass, is underdeveloped in the majority of EU countries. However, biomass is now expected to be among the fastest developing renewable energy in coming years, particularly biofuels (bio diesel and bio-ethanol) for transport.

Biofuels in the EU cost significantly more than the alternative fossil fuels replaced (diesel and gasoline respectively). However, biofuels and other renewable energy technologies are seen to have the potential to become economically viable within a reasonable timeframe, thanks mainly to the development of new technologies.

3.3.4. The power sector

The power sector is the energy-consuming sector where most changes are expected in coming years. About two-thirds of the existing thermal power stations, including nuclear, will need to be replaced from now to 2030. The type of power stations that will be built to replace the existing stations is still largely open. It will depend on the climate change policy, energy price developments and security of energy supply considerations.

After the oil price collapse of 1986, electricity from CCGT using gas has become the most competitive alternative to cover electricity demand in the majority of the EU countries, except in countries that have cheap domestic coal and lignite. Additionally, in relation to electricity from coal, gas has significant environmental benefits, as well as lower capital costs, and can be built more quickly. Electricity from oil is not a competitive alternative, except in remote areas such as islands, where gas or coal is costly to deliver.

Gas versus coal

Under the energy price scenarios given in this review, the electricity from a new coal-fired power station is at present cheaper than from a new CCGT using gas.

If the environmental benefits of gas in relation to coal are introduced into the calculation, the competitiveness of these two alternatives changes. Depending on the assumptions considered (investment, energy efficiency, etc.) the electricity from the two options has a similar cost for CO_2 prices at around EUR 10-15/t CO_2 (see figure 3). But the comparison between these two options largely depends on the evolution of the two technologies, particularly clean coal technologies (mainly super-critical or ultra super-critical steam generation and integrated

gasification combined cycle). Additionally, the development of carbon capture and storage (CCS) technologies may potentially have a significant impact on the use of fossil fuels in power generation. Carbon capture technologies are currently still in a development/demonstration phase and they may achieve a commercial phase by 2020. Thus there are still considerable uncertainties on CCS costs in the long run.

Overall, taking into account a likely reinforcement of climate change policies, gas should continue to expand its market share (provided that gas prices are not too high). However, clean coal technologies underpin the place of coal in power generation in the long run. Additionally, coal generated electricity gives protection against high oil or gas prices and thus contribute to security of energy supply.

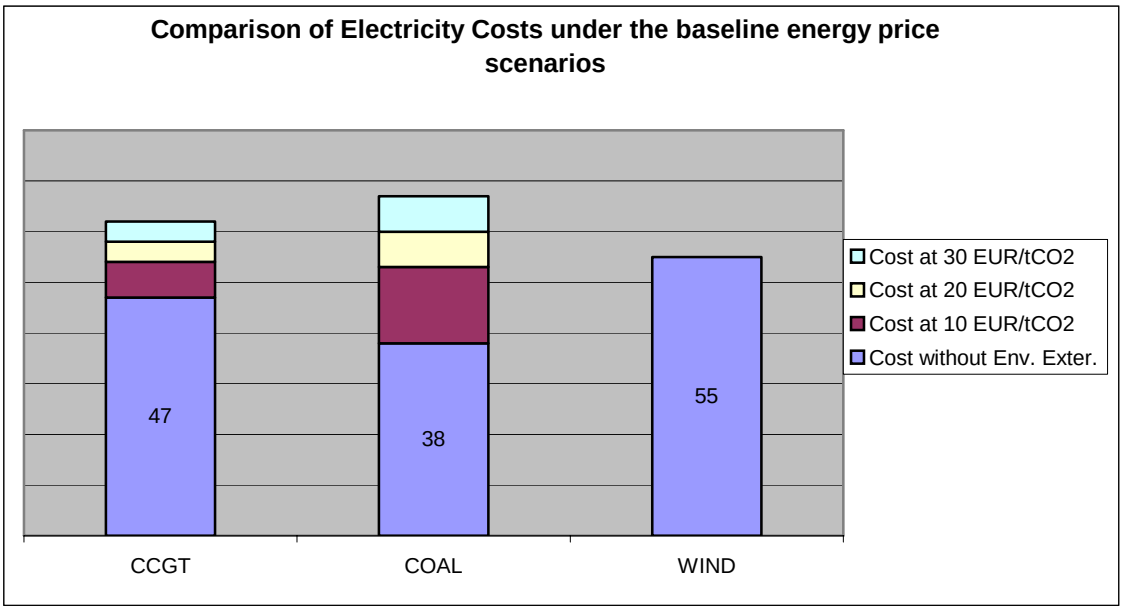
Renewables

The expansion of renewables into the power market is related to the financial support mechanism and thus it is not directly related to energy prices. The most competitive option today is normally wind energy. Under the energy price scenarios presented in this report (see figure 3), the CO_2 price necessary to make wind power competitive in relation to gas-power has decreased to around EUR 10-15 t/ CO_2 in good locations within the EU[26] (if wind energy is not significantly penalised due to its variability in relation to conventional power stations). However, the cost of wind electricity increases in some cases, as a result of the development of marginal areas in on-shore locations in mature markets and of the wind potential off-shore. Additionally, renewable offer good protection against energy price fluctuations and risks related to the energy dependence from the outside, thus contribute significantly to security of energy supply.

As mentioned before, except for some types of biomass, the cost of most of the other renewable energy technologies for power generation is higher than wind energy. Therefore, they need a higher CO_2 price than wind power to make them competitive with fossil fuel alternatives. However, the market expansion of various renewable energy technologies will continue to result in cost reductions. In addition, it is recalled that for renewable energy projects involving new and innovative technologies, although not meeting the Bank's standard criteria for economic viability, the Bank has decided to consider funding them when it can be demonstrated to have the potential to become economically viable within a reasonable timeframe.

[26] In the case of wind energy, the electricity cost corresponds to recent projects evaluated by the Bank in good locations in the EU and using a discount rate of 5%.

Figure 3: Comparison of the cost of electricity in a natural gas, imported coal and wind power station under the baseline energy price scenario (in early 2006 EUR per MWh)



Notes:
CCGT: Average investment and O&M cost of recent projects financed
Large imported coal power station: based on recent projects analysed and information form technical reviews
Wind energy costs for projects financed by the EIB in "typical onshore location" in the EU. Costs vary between 50 and 60 EUR/MWh
Expected life of 15, 20 and 15 years respectively for the gas, coal and wind power stations. No dismantling cost considered at the end of the lifespan.
Environmental costs, include GHG and non-GHG externality costs.
For a 5% discount rate

Nuclear

The development of nuclear electricity is very uncertain at this stage. This is notably related to public acceptance, waste disposal solutions, as well as commissioning and decommissioning acceptance criteria. Very few nuclear power stations have been built in the last few years and thus the cost of recent plants does not seem a good reference to assess future costs. Additionally, any future development of nuclear energy will be based on the new generation of reactors and the cost of the new generation is uncertain at this stage (within the EU only the Finnish nuclear reactor is under construction and it is expected to be commissioned by 2010). There is a tendency to extend the life of the existing power stations provided they pass the safety test. The future role of nuclear energy mainly depends on political decisions. It should be noted in this respect that a debate has just been launched about nuclear in several EU countries.

3.3.5. Energy investment trends

The part of energy investments in the total investments in the EU has substantially declined since the early 1980s[27]. This reflects the significant overcapacities created after the two oil crises, particularly in the power and refinery sectors. Since early 2000, the overcapacities have been absorbed. In the refinery sector, the rationale for the construction of new distillation capacity to serve the European market remains unclear considering the modest expected increase of total oil demand[28]. The investment needs in the power sector, on the other hand, are substantial in the long term, due mainly to the need to replace a substantial part of the existing power stations in the period 2010-2030.

[27] For EU15 energy investments represented 7.2% of the GFCF in 1986 and decreased to 4.9% in 2000.
[28] However, there will be a need for further upgrading units to reduce fuel oil and increase lighter products, and future changes for product quality.

From the EU Commission[29], electricity related investment in the EU over the next 20 years is projected at around 700 billion EUR and total investment needs in gas infrastructures over the same period at estimated at 200 billion EUR.

It should be noted, however, that investments in renewables are a large part of the total in recent years: about 60% of the total investments in power generation in the EU in 2001-2003.

3.3.6. CO_2 prices

The European emission-trading scheme has recently started (in January 2005). In the period 2005-7 it is in a pilot phase[30]. Carbon credit prices reached higher levels than initially expected up to mid April 2006 (close to EUR 30/t CO_2) but then declined to EUR 10-15/t CO_2

In the short to medium term, the fundamental determinants of the market's viability are the level of the cap relative to what would be emitted in the absence of constraints or penalties, and the political/administrative commitment to enforcing the regulatory mechanism. The price level is additionally influenced by a range of factors, some of them technical fundamentals (e.g. the fuel cost of generating electricity from coal and gas respectively) and others of a more "incidental" character /e.g. the timing of information release to the market.

In the long run, the carbon market will give indications on the EU marginal abatement costs and will stimulate emission reductions in developing and transition economies (through CDM projects). The cost of mitigation in the long run will depend mainly on the stringency of the target, economic growth (and related energy demand growth) and the assumptions regarding the techno-economic development of low or zero-carbon energy sources, in particular renewables, carbon capture and sequestration and nuclear. Stringent targets should lead to a significant increase of carbon permit prices, as indicated in section 3.1.2.

Under a background where CO_2 production continues to expand at the world level, the adoption of stringent reduction targets by the EU in a future, reinforced Kyoto, in the absence of an equal commitment by other important parties, will have negative implications for the international competitiveness of the EU in relation to the rest of the world. Therefore, it is unlikely that in the long run CO_2 prices reach very high levels, such as the ones presented in the EEA study (65 EUR/t CO_2 by 2030), except if there is a strong policy commitment at world level to reduce emissions. Additionally, technical developments will tend to reduce abatement costs in the long run and thus limit the CO_2 prices.

4. PROPOSED TARGET AREAS

4.1 General considerations

Following the first energy crisis of 1973, energy became a priority of the EU. Although the response to the crisis was basically national, the EU developed a "benchmarking" and "peer review" process at European level of the national energy policies, by establishing common energy objectives. These objectives were the following:

- Reduction of energy import dependence
- Reduction of the dependence on imported oil
- Reduction of the share of oil in electricity production
- Decrease in the energy intensity of the economy

The development of these objectives implied a significant increase in energy investments in the EU (energy investments peaked in the mid-1980s- 60% above pre-crisis levels). EIB made a significant contribution to the financing of this substantial investment expansion by

[29] From Commission Staff Working Document. Annex to the Green Paper..op.cit.
[30] It covers only the facilities that received carbon credit allowances (about 50% of EU emissions) and CDM projects. In the second phase, it may be extended to other sectors and gases, and include JI projects.

increasing considerably its financing of energy projects that were in line with the community objectives, particularly for rational use of energy. The lessening of the tension in the oil market since the oil price collapse of 1985 was accompanied by a reduction in the level of intervention of governments in the energy sector.

From the mid 1980s, the realisation of the internal energy market became the long-term objective, which was able to give a new impetus to the community energy policy. In this context, the key EU priorities became the development of competition in the energy markets (specifically electricity and gas) and a better integration of the national markets, through the development of the TENs. Energy TENs includes the interconnections with neighbouring countries, because of their contribution to security of energy supply. The EIB supported this policy by stepping up its TENs financing and its financing in the markets opened to competition, particularly the UK.

The 1996 White Book on Energy Policy defined this new approach. Five main objectives were outlined in the white book: internal energy market, security of energy supply, environmental protection, research and technological development in the energy sector and cooperation on energy matters with partner countries. This was reflected in the Bank's approach, as energy objectives were integrated into these general objectives.

In November 2000, the EU Commission initiated an unprecedented debate about the European strategy for the security of energy supply, which was reflected in a green paper on the subject (COM (2000) 769 final of 29.11.2000). The green paper sketches out the following bare bones of a long-term energy strategy: clear action in favour of a demand policy; development of new and renewable energies; the contribution of atomic energy in the medium term must be analysed; stronger mechanism ought to be provided to build up strategic stocks and to foresee new import routes and support every form of technological progress.

The priority given to the development of renewable energy was reflected in the adoption of targets for different EU countries, in order to ensure the achievement of the EU objectives and a rapid spread of best practice throughout the EU. In line with this, the Bank defined lending targets for renewable energy. These targets are the following:

- Loans for renewable energy, measured as a proportion of total energy sector loans, to be doubled over the period 2002-2006, to a minimum of 526 M EUR/a over the period 2002-06. This target is being achieved, as average RE lending in the first 3 years (2002-2004) amounted to 525 M EUR/a
- End 2004, the target was increased to allocate to renewable energy projects, on average by 2008-2010, up to 50% of total Bank lending in the EU for new electricity generation capacity only. It is too early to say whether or not this target will be achieved.

As mentioned before, there is a strong link between the energy policy and the environmental policy, particularly in relation to climate change. This link is also reflected in the EIB environmental policy.

The cooperation with neighbouring countries on energy matters has two main objectives: Firstly, extending the benefits of the internal energy market to them as a contribution to their stability; secondly, secure imports from these countries, as they supply or transit a major part of the Union's natural gas and, increasingly, oil. In pursuing these objectives, the Community has in recent years established three important instruments, the European Union-Russia energy dialogue, the Euro-Mediterranean Energy Forum, and the South-East Europe Regional Energy Market. The Bank has contributed to these objectives, mainly through its financing of energy TEN's involving neighbouring countries.

Additionally, the policy to contribute to the social and economic development of less developed countries also has an important energy dimension (increasing access to modern sources of energy and promoting sustainable energy solutions). This is reflected in the significant part of the Bank's energy lending in developing countries as presented in the first chapter of this paper.

Recently, the EU Commission has prepared a green paper on energy efficiency[31]. This paper proposes to make a strong push to promote energy efficiency in the EU. In section 4.3 the Bank's proposed action in support of the EU energy efficiency policy is presented. The EIB has traditionally financed rational use of energy projects. However, the volume and type of projects financed has changed over time, reflecting the investment trends in the EU[32].

In March 2006 the EU Commission published a Green Paper "Energy"[33] that puts forward proposals for a new comprehensive European energy policy. The paper intends to respond to the top priority that energy issues have acquired in the European agenda, following in particular the increase in oil prices and security of energy supply concerns in recent times. It identifies six priority areas:

- Completing the internal European electricity and gas markets
- Enhancing security of supply in the internal market, including emergency oil and gas stocks and prevention of disruptions
- Promoting a more sustainable, efficient and diverse energy mix
- Effective action to address climate change, mainly through energy efficiency, increasing the use of renewable energy sources, and carbon capture and geological storage
- Development and deployment of new energy technologies (Strategic European energy technology plan)
- Common external energy policy to enable Europe to play a more effective international role in tackling common problems with energy partners.

The Green Paper is an ambitious new attempt to develop a common European energy strategy. In relation to previous Commission policy proposals, a specific emphasis is noted on enhancing security of energy supply, on the external dimension of the energy policy and on energy R&D. However, the traditional priority areas remain, notably internal energy market, energy efficiency and renewable energy sources.

The previous historical presentation shows that the Bank has responded quickly and effectively to requests to support the objectives of the EU energy policy. In recent years, two main factors have put energy back on the key priority list of the Union: the policy in relation to climate change and the renewed tensions in the oil market. This situation calls for clear reprioritisation of energy in the Bank.

EIB support to energy projects should contribute to the implementation of the EU energy goals. The EIB approach in energy matters takes into account the new strategy of the EIB group approved in the 2005 June Board. This new strategy proposes that the "Bank's role in the EU should evolve further, from its previous focus of universal provider of funding, to a role of a flexible partner acting with more tailor-made products adapted to local market circumstances and to the needs of counterparts". In partner countries the objective is to better serve the development objectives of the Union with a more coherent and staff-intensive approach that would put more emphasis on country and sector intervention strategies and involve more risk-taking, coupled with greater availability of subsidies and closer cooperation with all actors.

In recent years, the Bank has significantly enlarged the range of financial and advisory instruments available. This allows the Bank to intervene in practically all phases of the project cycle in most areas.

As for any project supported by the Bank, the development of the EIB's role in the energy sector will take into account the Bank's five key operational priorities in the EU[34] and its

[31] COM (2005) 265 final of 22.6.2005
[32] In the last few years, the Bank has contributed to increasing the energy efficiency in the power sector, through its financing of electricity grids, CCGT and CHP plants.
[33] COM(2006) 105 final 8.3.2006
[34] Economic and Social cohesion, Innovation 2010 Initiative, Trans-European Networks, Environmental Protection and Improvement and support to Small and medium sized enterprises.

external mandates as well as its approach to value added (the three pillars). Based on the main objectives of the EU energy policy, the EIB action can be organised in five main areas:

- Large energy projects, including energy TEN's
- Energy efficiency
- Renewable energy sources
- R&D in energy matters
- Cooperation with Partner and Neighbouring countries

Co-operation with the European Commission is fundamental to achieve the proposed energy strategy. Similarly, institutional and operational cooperation with other IFIs is an important element to achieve the EIB objectives in energy matters, particularly the EBRD in the case of central and eastern European countries and with the WB and other MDB and bilateral development agencies in the case of developing countries.

4.2. Large energy projects, including energy TENs

Large energy projects (such as large power stations, national and international energy grids, major energy import facilities or the development of large domestic energy resources) are key elements in the national and EU energy policy. Depending on the case, these projects contribute significantly to several policy objectives. Among these projects, energy TENs are a top priority of the EU energy policy, because of their contribution to the creation of the internal energy market, to diversification of energy imports and to enhancing the security of energy supply.

Another priority area of the EU is the upgrading and construction of new infrastructure necessary for the security of EU energy supplies (notably new gas and oil infrastructures) and the development of a pan-European Energy Community including Neighbouring countries. One important component of the latter is the extension of TENs to third country partners. Additionally, some TENs projects contribute to the development of the regions lagging behind in their economic development, which is a top priority of the Bank.

The development of large projects is an integral part of the long term national and EU energy strategy. Because of their long life, the development of these projects needs a clear policy framework. This includes inter alia authorisation procedures, stable policy and clear regulatory framework, as well as the construction of related infrastructures. The mobilisation of the large capital necessary to build them is often not easy. Large projects involving several EU countries or neighbouring countries are the most difficult to implement, particularly those involving developing or transition economies.

EIB target areas

Financing large energy projects is a traditional activity of the Bank and the most important in volume terms in the energy sector. The Bank has acquired a significant expertise in this area through its involvement in most large energy projects in the EU and with neighbouring countries. The main role of the Bank has been in the provision of long term funding on competitive terms. It also provides a quality stamp to the project through its detailed due-diligence process, that can often facilitate its co-financing. Outside the EU, the Bank provides political risk coverage, as established in the different external mandates given to the Bank by the EU.

The new Bank policy calls for an evolution of the Bank from a universal provider of funding to the role of a flexible partner acting with more tailor-made products. This is relevant to large energy projects. Risks related to these projects are increasingly transferred to the parties that can better tackle them, in the context of the development of competition in the energy markets. This has implications in the way the projects are financed. The Bank has developed specific products for this type of situations, which often involve taking more risk.

Additionally, the Bank's experts cooperate with the EU Commission and Member States to identify issues related to TENs projects, through their participation in the different energy TENs working groups.

Key Bank priority areas in the large energy projects:

- Ensure that EIB financing is focused on highest priority projects in the EU, taking into account the priority areas identified in the Green Paper and the other important Bank objectives, particularly economic and social cohesion
- Support European interest and priority TENs projects, as well as TENs of common interest.
- When required, contribute to addressing project issues and financial aspects, in order that they do not impede otherwise viable/priority projects.

4.3. Energy efficiency in the EU

The policy to increase energy efficiency concerns all economic activities (energy, transport, industry, households, services and the primary sector). Similarly to renewable energy, increasing energy efficiency is a traditional priority of the EU energy policy, because of its contribution to environment protection, security of energy supply and the competitiveness of the EU economy in general. The recent green paper on energy efficiency aims at giving a higher priority to energy efficiency than in the past. Energy efficiency is also specifically covered in the 2006 Green Paper "Energy" under "Effective action to address climate change", and is also included in the other priority areas.

Energy efficiency policies promote energy saving investments and behavioural changes in relation to energy consumption. Additionally, one specific objective is the development of the Energy Service Companies (ESCOs), as the ESCO industry is still in its infancy stage in the EU.

The development of the energy efficiency potential is a complex task, mainly because energy efficiency investments are normally embedded within other investments. This implies that the decision to invest in energy efficiency is interrelated with other, often more important objectives (covering additional demand for instance).

The results of different studies show that some problems are the primary reason for not investing in energy efficiency despite the existence of a significant potential to increase energy efficiency[35]:

- Subsidised energy prices, mainly in developing and transition economies
- Hidden costs, in particular the cost of gathering information to identify energy savings opportunities and overhead costs.
- Access to capital, in part related to capital budgeting procedures within organisations that tend to give a lower priority to energy efficiency improvements.
- Limited information on energy consumption or energy efficiency opportunities
- Split incentives related mainly to the fact that the equipment purchaser may not be accountable for energy costs in some cases (house rental for instance).

EIB target areas

The Bank can finance efficiency investments, particularly concerning SMEs and the public sector. This will support the objectives of the proposed Directive on energy efficiency for end-users and energy savings. These investments are often encouraged by the government through a combination of instruments (provision of information, subsidies and financing) The Bank can also help in the preparation of efficiency investments, particularly for the public sector.

[35] See for instance, P. Sorrell and others, The Economics of Energy Efficiency 2004

In the project appraisal, Bank experts have sometimes analysed whether energy efficiency measures have been considered in the project design. This should be systematically carried out for all projects where a potential to increase energy efficiency may exist. The aim is for the EIB to give an "energy efficiency quality stamp" to the projects it finances.

CHP and cogeneration, as well as upgrading of existing district heating networks is clearly identified as a Bank priority, in order to give specific support to EU policy initiatives on the matter, in particular the Directive promoting cogeneration (Directive 2004/8/EC of 11 February 2004).

The potential of energy savings through the renovation of existing district heating is significant, particularly in the new member states and Eastern neighbours. In some cases there are significant organisational (including tariffs) and financing obstacles (creditworthiness of the municipalities that own the networks) to overcome in order to finance the upgrading of district heating networks. The Bank can also help public authorities in the preparation of bankable projects in this area (using the TA facilities available, as indicated before).

The Bank's energy efficiency target areas include:

- Support the development of CHP and the upgrading of existing district heating
- Financing of efficiency investments in general, particularly concerning SMEs and the public sector
- Support the development of new energy efficiency projects
- Explore with promoters possibilities to increase energy efficiency and and give an "energy efficiency quality stamp" to the projects financed by the Bank.

4.4. Renewable energy sources in the EU

Supporting the development of renewable energy is a priority of the EU energy policy, because of its contribution to reducing greenhouse emissions and improving the environment in general, and to improving the security of energy supply. This is specifically reflected in the recent Green Paper. The development of renewable energy also supports EU long-term competitiveness[36]. Additionally, new renewable energy technologies are a specific priority of the EU Commission R&D programme (see section 4.5).

Some EU countries still have a substantial potential for renewable energy to be developed. Hydropower potential is almost completely developed in the EU, except in some of the new member countries. Wind energy potential is well developed in Denmark, Germany and Spain, but not in the other countries. The situation is similar for other renewable energy sources. The development of biomass, particularly biofuels, is a specific objective of the EU, taking into account that the existing large potential is very underdeveloped in most of the EU countries (the EU Commission has proposed a Biomass action plan). Additionally, the Bank can contribute to the development of renewable energy markets in the regions lagging behind in this area.

The different renewable energy sources are at different levels of technological development. Hydropower is a mature technology. The cost of wind energy has substantially decreased in recent years[37]. Solar energy technologies to produce electricity are still in an early technological development phase. In this respect, some EU countries offer attractive financial support schemes[38] with the specific objective of contributing to the development or the market expansion of new renewable energy technologies.

[36] The EU is the world leader in the development of some of the leading renewable technologies, such as wind energy.
[37] On-shore wind technologies show signs of reaching a plateau in their technological development, although future potential for cost reduction lies mainly in the offshore wind developments.
[38] See Directive 2001/77/EC.

EIB target areas

Providing funding to the renewable energy sector in the EU is a priority of the Bank. The cost of most of the renewable projects is rather small in comparison with the minimum size of projects for direct financing by the Bank. Therefore, a significant part of the funding to renewables has been through GLs; which limits the financial value added of the Bank. In order to increase its value added, the Bank is increasingly funding renewable projects directly (even if their cost is slightly smaller than the normal size for a direct intervention), or through grouping together several small projects.

The Bank can provide significant value added by supporting the development of new markets and technologies. Once an adequate policy support framework of renewable energy is in place, the development of renewable energy depends on the availability of capital and access to finance. The experience from mature markets shows that development of the renewable energy markets is difficult at the beginning, because an untested policy supports framework and administrative process is an obstacle to attracting capital to the sector. Similarly, in the less mature markets financial intermediaries have limited expertise in financing this type of projects. A similar problem occurs with new technologies where financing is dependent on the level and perception of risks involved. Depending on the situation the Bank can use a combination of the instruments available to support the development of new renewable markets and technologies, through its direct intervention or by developing the appropriate partnerships with other banks.

In addition to its direct financial activities, the Bank can provide advisory services in some cases (in particular using Jaspers) to help the public sector to develop renewable energy programmes or projects, particularly in the less developed regions of the EU.

Project selection

There are substantial differences in the renewable support policies within the EU. The Directive 2001/77/EC envisages that a harmonised framework for support schemes will be implemented in the EU. However, it is hard to see how an EU harmonisation can integrate the different national policy objectives[39] (some of them not related to greenhouse reduction), which are behind the support policies. In the absence of a harmonised policy, the Bank is confronted with different support schemes depending on the country. This can be problematic, as the Bank uses a common approach for economic analysis in the Union.

Renewable energy projects are often difficult to justify economically. For many years, the Bank has included in the economic analysis, the environmental benefits (mainly related to CO_2) of renewable energy in relation to fossil fuel alternatives.

Recently, the Bank has enlarged the scope of the economic analysis of renewable energy projects to include the objective of supporting the development of new technologies.

The development of some renewable energy sources is related to objectives other than CO_2 reduction or development of a new technology. For instance, biomass development is often partially related to rural development or agricultural policy considerations. Therefore, it is necessary to include these objectives in the economic analysis, when relevant.

Key Bank priorities in the renewable energy sector in the EU:

- Achieving the existing targets concerning financing of renewable energy projects
- Development of the less mature renewable energy markets in the EU, particularly in New Member States
- Develop of underdeveloped renewable (particularly biofuels) and new renewable technologies with good long term prospects

[39] For instance, one objective behind the implementation of a renewables support policy in several EU countries was the promoting of a domestic wind power industry or other technologies.

4.5. R&D in the energy sector

The European Union R&D programmes are distinct from, and complementary to those of the EU member states. Energy is a traditional priority of the EU R&D programmes. Energy research has constituted the largest share of EU R&D investment since the early European community R&D programmes in the 1970s. Initially it represented nearly 70% of the total R&D programme. However, the share of energy has gradually decreased. In the latest R&D framework programme, it represents only 10.5% of the total.

Energy R&D contributes substantially to meeting the long-term objectives of the EU energy policy (including the climate change policy) and to meeting EU Lisbon commitments. The EIB can support the development of energy R&D activities by providing competitive long term funding for R&D energy projects. It also develops risk-sharing instruments for this type of projects.

A number of forward looking initiatives in the energy field are being developed by or with assistance and impetus from the Commission. They are the subject of Framework Programmes grants, of Euratom programmes, and of other initiatives such as the European Technology Platforms and Research Infrastructures. The Bank is closely following a number of these initiatives.

European Technology Platforms (ETPs) are a forum for stakeholders to map the future in specific areas and to coordinate research. They are organised bottom-up and led by industry, although initiated and accompanied by the Commission.

EIB target areas

The Bank is following up on the approximately 30 existing ETPs, in order to identify important facts or events relevant for the EIB activities in this area. The Bank also participates in a small Financial Engineering working group with the Commission and a few voluntary ETPs.

A few European Technology Platforms are devoted to Energy:

- Hydrogen and Fuel Cells (HFP): The Bank participates in the bodies that are developing the platform. Major demonstration and validation projects are now being prepared. The Platform also gives a good overall view of the various initiatives that are undertaken at national and regional level.
- Photovoltaics: Contacts with EPIA, the PV industry association, are underway to possibly develop a multi-purpose fund in support of technology research and development of the photovoltaic industry.
- A Thermal Solar ETP is now also being planned, which will be followed by the Bank
- Several ETPs have an important energy saving component, such as Manufuture, EuMat, Steel, Sustainable Chemistry. They are being followed up to identify priorities and develop contacts within the industry.

A further area for EIB contribution is related to the Research Infrastructures, particularly Large European Research Infrastructures. Obviously, the ITER project, which involves, alongside the EU, China, Japan, Korea, Russia and the US, is part of this.

The Bank's support of energy R&D includes:

- Increase commitments to energy projects under i2i
- Develop risk sharing instruments for this type of projects under SFF and introduce RSFF
- Boost complementarily between FP7 and i2i and support the ETPs and Research infrastructures in energy

4.6. Cooperation on energy matters with Partner and Neighbouring countries

As indicated previously, EU energy policy in relation to partner and neighbouring countries has two main objectives. In the case of neighbouring countries the aim is to extend the benefits of the EU internal market to them and to ensure the imports of energy to the EU originating in or transiting through these countries. Concerning developing countries in general, the main objectives of the EU policy in relation to energy are to promote access to modern sources of energy to the population and to promote the development of sustainable energy solutions. The aim is to contribute to the Partner countries' social and economic development, and to reduce the environmental impacts related to energy activities (the use of some traditional energy sources is creating severe health and environmental problems). In addition, an important long-term objective of the EU energy policy is to help partner and neighbouring countries to move to a low carbon economy. The Green paper "Energy" reinforced the external dimension of energy policy, with a potential relevance for EIB external mandates. It proposes to develop a pan-European Energy Community including neighbours and, more widely, to support low carbon energy technologies (notably energy efficiency and renewable energy sources). The role of EIB and EBRD is mentioned in relation with TEN-E and their extension to third countries and with the Neighbourhood Instrument.

The interconnection of the EU energy networks (electricity, gas and oil) with those of neighbouring countries is the main way to extend the benefits of the EU internal energy market to these countries. Moreover, development of new energy import routes contributes to EU import diversification.

Energy demand is expanding fast in developing countries. To meet this demand, including increasing the level of access of the population to modern sources of energy, substantial investments are necessary. Developing countries usually rely on foreign capital and foreign debt to finance a significant part of their investment needs. IFIs often play a significant role in financing their investment needs, including energy investments. Specifically, IFIs play a catalytic role in attracting private capital and finance into these countries, as political and regulatory risks are usually high. Therefore, foreign investors apply a considerable risk premium when investing in infrastructure projects, such as in energy; often they are not willing to invest at all.

Although there are major differences in the levels of development of the energy sector in developing and transition countries, there are also some common features. The institutional background is often weak. Energy tariffs are usually low and distorted. Energy institutions or companies are often poorly managed, which leads to substantial waste of resources. Therefore, institutional reform is often a precondition to ensure that projects achieve acceptable results. These reforms normally involve the opening up of the energy sector to private players. This supports a better and more efficient development of their energy sector.

Recently, the Bank has presented its position[40] on financing extractive industries in developing countries in the context of the extractive industries review commissioned by the WB. The EIB believes that extractive projects, such as oil and gas projects can assist development provided that the necessary conditions for good governance and transparency are fully respected, along with the mitigation of many negative environmental and social impacts and the enhancement of positive opportunities for local populations. Therefore, by selectively financing these projects, the Bank can provide value added, particularly as the promoters will be required to apply standards comparable to those for such projects in the EU, including as well the promotion of good governance and a high level of transparency.

[40] The EIB position on extractive industries is posted the EIB web site.

EIB target areas

The Bank's focus is in line with the EU priorities presented in the previous paragraph, namely: 1) in the case of neighbouring countries, access to the internal EU energy market and development of new energy import routes to the EU; and 2) in the case of developing countries, development of modern and efficient sources of energy and of sustainable energy solutions. In order to increase its impact the Bank should put more emphasis on sector and country energy strategies, notably to support reforms of the energy sector, including tariff reforms. Specifically, promoting that energy prices reflect economic costs contributes to energy efficiency. This activity is now facilitated by the Bank's provision of technical Assistance funds (TA) in some areas (in MED and in applicant, acceding and accession states). However, the limited availability of TA fund for ACP countries is an obstacle to carrying out this objective, but recent initiatives should significantly increase funds available.

The MED, ACP and ALA mandates have as a specific objective the development of the private sector. In this respect, as mentioned previously, the Bank can play a catalytic role in supporting of the development of the private sector in energy activities.

In this context, good cooperation with all the actors involved in development is particularly important, including the developing countries themselves, Member States, the EU Commission and the other IFIs.

The Bank develops a strategy to support the development of sustainable energy solutions in developing countries. This concerns environmentally sound energy services, including energy efficient and renewable energy sources. The main obstacle to the development of sustainable energy investments is linked to the fact that they are usually more capital intensive than conventional alternatives. Therefore, they are penalised by the high cost of capital in developing countries. The CDM offers financial support to some of these projects. Therefore, the Bank can now have an active role in this matter through the climate change funds (technical and financial facilities). Additionally, the Bank can use the technical assistance funds available to help promoters in preparing sectoral reforms or in a project preparation, when necessary.

The Bank's energy activities in Partner and Neighbouring countries will focus on the following:

- Contribute to a better integration of the energy markets of neighbouring countries, among themselves and with the EU
- Promote the development of new energy import routes
- Increase access of the Partner countries populations to modern sources of energy
- Support and encourage the participation of the private sector in energy activities
- Develop financing of sustainable energy solutions and in general support the development of a low carbon economy in developing countries.