FINANCING ENERGY EFFICIENCY IN COUNTRIES WITH ECONOMIES IN TRANSITION

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FOREWORD

This Working Paper is one of a series of eighteen studies carried out under the project: "Policies and Measures for Possible Common Action". The project was carried out by the OECD, together with the International Energy Agency, in 1996 and 1997 for the Annex I Expert Group on the United Nations Framework Convention on Climate Change (UNFCCC). The goal of the project was to assess a range of cost-effective greenhouse gas mitigation policies and measures for countries and Parties listed in Annex I to the UNFCCC. The eighteen working papers have been made widely available as analytical input to negotiations under the UNFCCC Ad hoc Group on the Berlin Mandate. The working papers may also provide input to national decision making processes on greenhouse gas mitigation policies. The measures analysed do not necessarily represent policy preferences of Annex I Parties.

The project benefited greatly from substantial input from delegates. Three successive chairmen of the Annex I Expert Group provided outstanding leadership for the project: Doug Russell (Canada); Ross Glasgow (Canada); and Ian Pickard (United Kingdom). The work was supervised by Jan Corfee Morlot (OECD). Fiona Mullins (OECD) drafted the initial framework which was used to structure the eighteen working papers.

The Annex I Parties or countries referred to in this document refer to those listed in Annex I to the UNFCCC: Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Czechoslovakia (now Czech Republic and Slovakia), Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom and United States. Where this document refers to "countries" or "governments" it is also intended to include "regional economic organisations," if appropriate.

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EXECUTIVE SUMMARY

This paper was carried out for the Annex I Expert Group on the UNFCCC, as a background paper for the *"Study on Policies and Measures for Common Action"*. The objectives of the study were:

a) to assess the energy efficiency potential of countries with economies in transition (EIT countries) which are signatories to Annex I of the UNFCCC;

b) to identify and assess barriers[1] to capturing this efficiency potential;

c) to address the energy efficiency financing barrier in detail, highlighting current problems and potential opportunities.

The study focuses on demand-side efficiency. There are enormous potential energy efficiency gains on the supply side, and constraints to financing, but these are not as problematic as on the demand side. Only limited analysis of the transport sector was possible due to the lack of data and assessments carried out in the region. The report does not address methane or other greenhouse gas emissions from energy. Transport fuel efficiency has been covered in another common action working paper: *"Reducing CO_2 emissions from road vehicles"*(Working Paper 1: OECD/GD(97)69)

The term 'business-as-usual' (BAU) is commonly used when comparing energy scenarios with and without policy interventions in order to assess the impact of policies. In EIT countries, the term needs to be used with care, as BAU in a situation of very rapid economic change and high uncertainty can be a confusing concept. In this study, the term BAU been used to represent a future where moves towards a market economy will continue (at differing rates of change depending on the country), but where specific policy initiatives which might encourage energy efficiency are not implemented. The term "technical efficiency potential" refers to estimates of energy efficiency potential from engineering analyses which typically compare technologies and practices currently in common use with those available through newer technology or practices that are in common use either in OECD Member countries or in the country itself. The term "economic efficiency potential" refers to estimates of energy efficiency potential using economic criteria (such as payback period and internal rates of return) that are typically used by investors. The term "achievable efficiency potential" has been defined for this study as between one-half and two-thirds of the estimated "economic" potential, based on advice from experts in the region.

Emissions of CO_2 from Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS), rose steadily, from 800 Mt CO_2 in 1950 to 4 800 Mt CO_2 in 1988. The share of global emissions contributed by these countries increased from 15 per cent to 24 per cent during this period. Since then, there has been a sharp decline in CO_2 emissions in EIT countries due to economic restructuring and recession. The global share has fallen to 18 per cent. EIT countries have high per capita CO_2 emissions - 11 tonnes CO_2/capita - compared to 8 tonnes/capita in Western Europe, and a global average of

[1] Throughout this study, the term "barriers" refers to a range of market impediments which inhibit the uptake of cost effective efficiency opportunities.

4 tonnes/capita (1992 figures). Three Annex I EIT countries are in the top fifteen global emitters: Russia (3rd), Ukraine (7th) and Poland (12th).

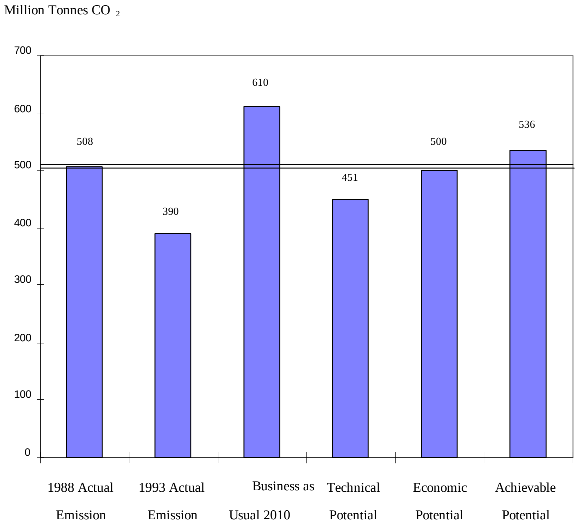
Four countries were chosen for detailed efficiency assessments: Poland, the Czech Republic, Bulgaria and Ukraine. Less detailed reviews of Slovakia (focusing mainly on the buildings sector) and Russia are also included. Some care needs to be taken over the wide range of assessments produced for EIT countries. The economies of these countries are changing rapidly and fundamentally, and many energy efficiency studies do not fully acknowledge the practical barriers to capturing the efficiency potential that are described in this study. Data prior to 1992 has to be treated with some caution in view of the substantial changes in each country since then and the often poor quality of statistics. However, based on a wide range of indicators, it is clear that EIT countries are relatively energy-inefficient compared to other Annex I countries. Even when compared to some of the least energy-efficient economies in OECD, EIT countries use between 2 to 7 times as much energy to produce a unit of economic output (measured in dollars at the official exchange rate). Comparing the Specific Energy Consumption (SEC) for building or industrial products, EIT countries use 20-50 per cent more energy to heat buildings than Northern European countries. Producing a range of industrial products currently takes 15 per cent to 100 per cent more energy than in the OECD. This report identifies enormous "achievable" energy efficiency improvements and CO_2 savings.

Substantial savings of CO_2 may be achieved at no net cost by capturing the economic and achievable energy efficiency potentials in EIT countries. For these energy saving potentials, the up-front investment could be recovered through the stream of saved energy costs. Though there is great difficulty in making comparisons between a wide range of studies based on widely differing economic and other assumptions, it is possible to make some generalisations about the cost-effectiveness of the efficiency potential. Most energy saving investments considered in the categories of 'economic' and 'achievable' energy efficiency potential in this study show an internal rate of return of 12 per cent or more - many have a return far greater than this. The energy saving potential is not constrained by the supply of cost-effective energy saving projects, but rather by the barriers associated with developing, managing and financing cost-effective projects.

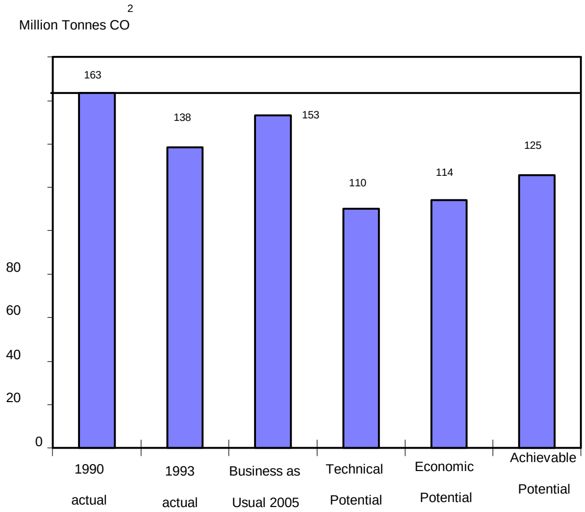
Energy prices have a major impact on the achievable efficiency potential in EIT countries. More expensive energy increases the value of savings, the return on investment for any project, and the number of projects that are cost-effective. A short review of energy price developments in EIT countries indicates that while subsidies still remain, particularly in the residential heating and electricity sectors, prices have converged significantly with market levels in the past 12 months. For the industrial sector, this has already happened or is close to being achieved in a number of countries. In a number of instances, energy prices are actually higher than in some OECD Member countries. The energy price trend is upward in all countries, subject to political and social constraints (energy costs make up 10-15 per cent of household costs in countries such as Hungary and Romania, compared to 2-5 per cent in the OECD). Given the lack of affordable capital for investing in efficiency, poor access to information, high levels of non-payment of energy bills in many countries (figures of 25 per cent non-payment are not uncommon), and other barriers such as ownership uncertainties, raising energy prices alone will not ensure the capture of a significant part of the efficiency potential in EIT countries.

FIGURE 1: CO_2 REDUCTION POTENTIALS THROUGH ENERGY EFFICIENCY

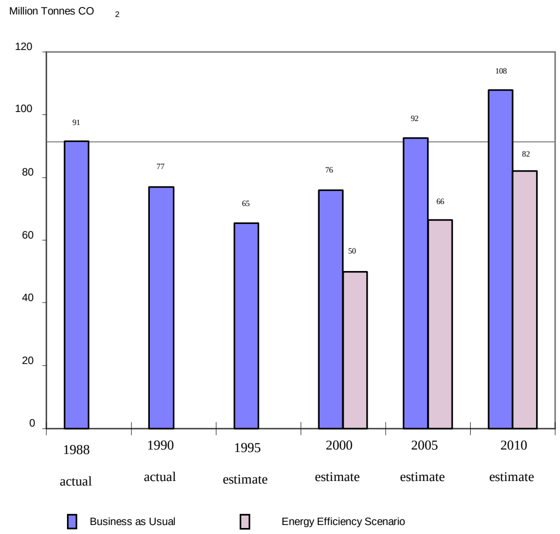
The Potential Contribution of Energy Efficiency to the Reduction of Poland's CO_2 Emissions



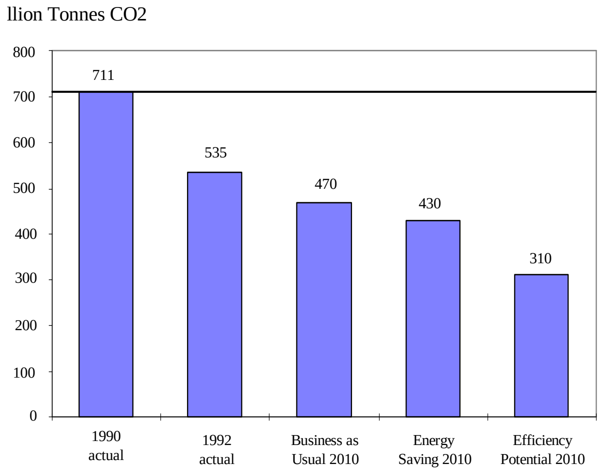
The Potential Contribution of Energy Efficiency to the Reduction of the Czech Republic's CO_2 Emissions



The Potential Contribution of Energy Efficiency to the Reduction of Bulgaria's CO2 Emissions



The Potential Contribution of Energy Efficiency to the Reduction of Ukraine's CO2 Emissions



Note: Descriptions of the BAU and Energy Efficiency scenarios are given in both Section 3 and Appendices 1.1 to 1.5

Barriers to financing energy efficiency and potential solutions

There are extensive empirical data indicating that levels of energy efficiency in both OECD and EIT countries are below the optimum for economic efficiency. A range of market impediments inhibit the uptake of cost-effective efficiency opportunities. These are usually termed ‘barriers’ to energy efficiency. There is a substantial potential for energy efficiency projects with less than a 3 year payback, even at current energy prices. One estimate by the EBRD has suggested that the market for energy efficiency projects with a less than 3.5 year payback period is worth at least $52 billion, requiring an investment of around $6 billion per year. The actual investment flows are at present an order of magnitude lower. Despite the current low levels of investment in demand-side efficiency in the EIT countries, a number of innovative financing and policy options have been tried.

The major barriers in EIT countries and possible solutions to these barriers are outlined in the Table 1 below:

Table 1. Barriers and possible measures to address them

Barriers:	Possible Solution(s)
<u>1. Macro-economic climate</u> **(i) High inflation, unstable currency,** **(ii) Political and policy uncertainty** **(iii) High incidence of debt, defaults, barter trading**	• Improve economic performance • Project guarantees • Longer term loans by MDBs to local banks to facilitate long term finance • Establish criteria for AIJ pilot projects (e.g. monitoring, verification) • Blend grant aid or soft loans with credit at market rates to lower average rates • Establish funds dedicated to energy efficiency
<u>2. Lack of information & experience</u> **(i) General information on energy efficiency poor**	• Information programmes, advertising campaigns, appliance labelling.
(ii) Lack of metering **(iii) no standard measurement protocol for measuring savings**	• Provision of meters and improved energy billing • Acceptance of standard protocol for measuring efficiency savings
(iv) Lack of experience in business and risk management	• Training for technicians, managers, and financiers, e.g. using the energy efficiency or EC energy centres, or through encouraging joint ventures with multinational corporations
(v) Donors and project developers unaware of opportunities	• Expand activities of PPC in matching projects and donors
3. <u>Lack of credit history, credit-worthiness</u> **(i) enterprises, municipalities and other borrowers have not yet developed credit history** **(ii) poor cash flow** **(iii) lack of collateral**	• Finance through leasing; and/or municipal bond finance, performance contracting through ESCOs, AIJ projects or joint ventures • Expand local banking through MDB financing and government rationalisation of banking sector • Link energy efficiency investments to other modernising investments to secure long-term viability (e.g. housing)

Barriers:	Possible Solution(s)
<u>4. Institutions/ownership</u> **(i) Historical legacy of central planning policies**	• Define and implement an explicit energy efficiency strategy in national policy. • Create utility regulatory structure that favours DSM e.g. make energy savings potential an explicit planning requirement when privatising utilities
(ii) State-owned energy monopolies	• Government policy to facilitate creation and involvement of ESCOs
(iii) Split incentives for building tenants and owners; multi-ownership of buildings	• Rationalise and clarify ownership, and improve incentives e.g. provide renovation package deal when privatising apartment blocks which includes energy efficiency improvements; and allow building owners to increase rents where efficiency upgrade reduces energy costs of tenants e.g. through leasing
(iv) weak institutional frameworks	• Build capacity and resources of standards setting institutions
5. <u>Small scale of efficiency projects</u>	• MDB lending policies e.g. on-lend to local institutions who disperse to smaller projects directly, greater use of revolving funds • Bundle projects together • Establish and capitalise ESCOs
6. <u>Energy prices</u> **(iii) Low energy prices**	• Develop approach and timetable for price increases to reflect full costs of supply and distribution; recognising social and political constraints on the rate of adjustment.
(iv) Pricing uncertainties	
(v) Energy subsidies	• Make subsidies transparent/explicit, and develop an approach and timetable for gradual removal of subsidies • Use energy efficiency investments to reduce the need for subsidies.
(vi) Externalities not internalised (-this problem is widespread world-wide)	• MDBs and governments to incorporate externalities in financial assessment of projects. • Tax pollution emissions or establish emissions (or abatement) trading

Lack of national economic stability is likely to be a key obstacle to achieving significant volumes of private capital flow. The economic situation in EIT countries is changing rapidly. Energy prices for many fuels are converging with world market price levels in many EIT countries, but low prices in some sectors (such as the residential sector), and general instability of prices continue to cause uncertainty among potential investors. Higher interest rates are placed on efficiency projects in EIT countries because they are regarded by investors as ‘new’ and ‘unusual’. The weakness of the domestic banking sectors in EIT countries and the intense competition for scarce capital, which is often available only for short term lending, has ‘crowded out’ potential energy efficiency investment. In some countries governments offer Treasury bonds at extremely attractive rates in order to finance domestic debt, which reduces the incentive to loan money for investment projects, including energy efficiency. Energy policies in each country are still evolving. Though a number of energy laws and utility privatisation programmes have been enacted, and examples of good policy initiatives can be found, detailed implementation strategies and programmes are the exception rather than the norm. Energy efficiency still has a relatively low priority among many governmental institutions, and the institutional framework for implementing efficiency is still incomplete.

Given the dominance of local capital for energy and environmental investments, mobilising local industrial and domestic consumer energy expenditure will be crucial for successful capture of much of the energy efficiency potential. Incentives to foreign companies seeking to invest in energy efficiency could be considered. AIJ pilot projects are already demonstrating the potential to overcome cost, managerial and technical barriers to realising energy and CO_2 savings and are making progress on ways to accurately monitor and verify the savings.

Though local resources currently dominate expenditure on energy projects, the development institutions are key actors in securing the economic and environmental benefits of energy efficiency in the EIT countries. MDBs and other financing institutions do not favour smaller-scale efficiency projects, because small projects incur higher transaction costs in proportion to the revenue streams generated. There is also institutional inertia in favour of larger supply-side projects. Intermediary options between large scale sources of funds and the many relatively small-scale projects that exist in the region are needed, such as capitalising energy services companies (ESCOs), which could take on smaller performance contracting projects and disburse loans to a large number of smaller projects; and on-lending by IFI's to local banks.

Lack of experience in developing projects, particularly in the investment appraisal skills necessary to define 'bankable' projects, is a barrier that is common to all EIT countries. The EBRD regard this as the most important barrier to significant energy efficiency investments in the region. It could be very effective to provide small grants, information, or technical co-operation, to support project preparation and other capacity building for local managers, project developers, local bankers, and decision makers.

The network of Energy Efficiency Centres in the region (e.g.. SEVEn, CENEf, FEWE), which are mainly staffed with local experts, are good examples of the type of institutional development needed. Governments could also make energy subsidies transparent and explicit, with a timetable for reducing subsidies relatively quickly using efficiency investments; develop and enforce pollution tax/levy regimes; create a positive investment climate for ESCOs through information, and pilot and commercial projects in public sector buildings. Ratification of multilateral agreements, including the agreement on Long Range Transboundary Air Pollution, and the Energy Charter may help realise gains in greenhouse gas emissions in EIT countries.

Some of the measures outlined in Table 1 above could be targeted as possible opportunities for "common action" by Annex I Parties in capturing the CO_2 reduction potential of energy efficiency in EIT countries. However, these policy options require further study and development in order to be presented as specific options under the *"Study on Policies and Measures for Common Action"*. Some of these options, such as national monetary, fiscal, and energy policies, are currently being addressed in various ways by each of the EIT countries as they make the transition to a market economy and are not proposed as an area for further work in this study series. Further study is proposed on both developing mechanisms to enhance private sector efficiency investment, and strengthening the emphasis of international institutions' funding policies on energy efficiency, particularly for areas where the largest cost-effective gains are evident.

1. OBJECTIVES AND APPROACH

Objectives

The objectives of this study are:

a) to assess the energy efficiency potential of countries with economies in transition (EIT countries) which are signatories to Annex I of the UNFCCC;

b) to identify and assess barriers[2] to capturing this efficiency potential;

c) to address the energy efficiency financing barrier in detail, highlighting current problems and potential opportunities.

The major focus of the assessment is the demand-side rather than the supply-side (i.e. more efficient power stations).

Approach

The approach followed was to:

- analyse the most relevant and up-to-date studies for each country.

- work closely with local experts (from the EC Energy Centres, the independent Energy Efficiency Centres, and Ministries) to ensure accuracy, access to important studies, and up-to-date legislative information.

- carry out a wide range of telephone and fax interviews with local and international financial institutions, project developers, and bilateral aid agencies to capture new initiatives, lessons learned and viewpoints on problems and potential solutions.

The study has attempted to take a pragmatic view of both the efficiency potential in the region and specific countries addressed, and the opportunities for securing this potential through appropriate investment. The study focuses less on theoretical 'technical' potentials for efficiency improvements, and more on the cost-effective 'economic' and 'achievable' efficiency potentials[3]. This approach reflects the

2. Descriptions of the BAU and Energy Efficiency scenarious are given in both Section 3 and Appendix I.

3 For the four countries assessed in detail for this study, the economic potential was generally assumed to provide less than a 3 to 5 year payback period on investments (with a large proportion often below this level), based on at least an 8-12 per cent discount rate. The 'realistic' efficiency potential was set at a level between half and two-thirds of this to reflect the non-fiscal barriers inhibiting cost-effective efficiency investments.

reality that a proportion of the cost-effective potential will not be captured due to a range of barriers. The definition and interpretation of 'economic' and 'achievable' efficiency potential has been based upon the guidance of experienced project developers in the field, representatives of financial institutions active in funding energy (and specifically energy efficiency) projects in the region, policy makers in eastern and western Europe and North America, and IIEC's own experience of achieving efficiency improvements through policy and project developments. The achievable potential is, of course, heavily dependent on the political priority placed on energy efficiency and CO_2 reductions and is to some extent an arbitrary figure. it is clear, however, that even when the figures for 'economic' energy efficiency are significantly scaled back to give an indication of 'achievable' potential, very large energy efficiency potential remains.

The economic and political situation in EIT countries is changing rapidly as they make the transition to market economies. New initiatives from institutions such as the EBRD, the EC's PHARE programme, the World Bank and IFC, and local and national environmental funds, are evolving quickly. This study is thus attempting to assess a moving target, and identifies key trends and developing initiatives to provide an indication of possible future changes.

Structure of study

Section 2 sets the context of the study, providing an overview of macro-economic issues, energy efficiency potential, and CO_2 emissions reduction potential. Section 3 summarises detailed research that was undertaken to establish the energy efficiency potential in selected countries (Poland, Czech Republic, Bulgaria, Ukraine, Slovakia and Russia). The full detailed assessments are contained in Appendix 3 (available on request from the OECD). Section 4 examines energy efficiency financing issues and describes initiatives that are being undertaken in EIT countries by multi-lateral, regional and bi-lateral institutions, multi-national companies, and local initiatives. Section 5 examines barriers to financing energy efficiency and possible solutions to these barriers. Preliminary conclusions and an indication of areas for further work in Part II of this study are presented in Section 6. Nine appendices contain more detail on the arguments advanced in this main report. These appendices are available on request from the OECD.

2. CONTEXT

Macro-economic Overview

Economic trends and the macro-economic and legislative policies of EIT countries form the basis for the local investment climate. All EIT countries experienced drastic GDP decline in the early 1990s. As is shown in Table 2 below, a number of EIT countries have experienced GDP growth in recent years (Slovakia, Czech Republic, Estonia, Poland, Lithuania, Romania, Hungary, Bulgaria, and Latvia). Two of these countries (Slovakia and Czech Republic) have also achieved single digit inflation. Poland, a leader in GDP growth (though not in the transition to a market economy overall), has nearly recovered the level of economic output achieved in the late 1980s. The remaining countries of central and eastern Europe are not expected to do so for another two to four years. Output is still falling in Belarus, Russia and Ukraine.

Table 2. The EIT Economies - Gerneral Economic Statistics

	GDP % change[(7)]	Current account ($b or %)	Trade account ($b or %)	Gov't balance %GDP	Inflation CP[(1)] (%)	Unemploy-ment (%)
Belarus[1]	-10 (1995)	-8.4%	na	-1.5	260 (1995)	2.5 (1994)
Bulgaria[1]	2.5	0.1	0.4	-7 (1994)	50	12.8 (1994))
Czech Rep	6.3[(2)] Q395	0[(2)]	3.5[(2)] Nov95	0[(2)]	7.9[(2)] Dec95	3.2[(1)] (1994)
Estonia[1]	6	-0.2	-0.4	1	22	3.5 (1995)
Hungary	2.9[(2)] (1994)	-2.9[(2)] Oct95	-2.6[(2)] Oct95	-8.2[(1)]	28.3[(2)] Dec95	10.3[(3)]
Latvia[1]	1	na	na	-1.6	23	6.5 (1994)
Lithuania[1]	5	-3%	-4%	-1.0	30	6.6
Poland	5.5[(1)]	-2.3[(2,4)] Nov95	-1.6[(2)] Nov95	-3.1[(1)]	22[(2)] Nov95	14.5[(3)] (1995)
Romania	4	na	na	-3	30	na
Russia	-4.0[(2)]	4.8[(2)] (1994)	12[(1) (5)]	-5.7[(2)]	131.4[(1)]1995	3.5[(1)]
Slovakia	7[(6)] (1995)	0.2[(1)]	0.1[(1)] (1994)	-3 [(1)]	7.6[(6)] Nov95	12.8[(6)]
Ukraine[1]	-5	-1.3	na	-4	150	0.4 (1994)

sources:
(1) EBRD Transition Report 1995. 1995 data are projections
(2) The Economist, 20 January 1996
(3) Business Central Europe
(4) Many observers believe that the 'true' c/a is in surplus if unofficial border trade is included
(5) Excluding rest of CIS; excluding gold
(6) FT survey on Slovakia 23 December 1995
(7) 1995 unless stated

The economies of the Czech Republic, Hungary and Estonia began to show positive growth in 1994[4]. Economic trends are not yet established, which makes it difficult for the investor to extrapolate after only one or two years of growth. Domestic economic growth is very important for the long term viability of local industry. The commercial competitiveness of locally-produced goods in foreign markets is another key factor. In many cases there is concern that the product produced may be unlikely to succeed in open competition with goods from industrialised countries.[5]

In terms of macro-economic policy, unemployment, inflation levels, and the budget deficit are significantly influenced by actions of governments, some of whom may be newly formed or are anticipating early elections. For example, the governments in Poland and Ukraine were only recently installed in 1995, the Czech Republic and Russia have faced elections recently and there is such political tension between the President and the Prime Minister in the Slovak Republic that a 1996 Financial Times leader (in a survey on the country) was headlined: "Infighting obscures economic progress".[6]

Table 3. Currency and Interest Rates in EIT countries

Country	Interest Rates	Currency (units/$)	PPP relative to US$
Belarus	na	12 125	2.3
Bulgaria	commercial loans 3 mo 51% commercial deposits 1 mo 25% central bank borrowing 1yr 34%	73.74	3.6
Czech Republic	commercial loan <1yr 12.8% central bank discount 9.5 Oct95	27.31	2.5
Estonia	deposit 8.3% commercial lending 17.8%	11.90	na
Hungary	commercial loan s.t.31.5% Government 1 year bills 32 Oct95	142.16	1.6
Latvia	na	0.55	2.3
Lithuania	commercial lending 3 mo 30% Government bands 6 weeks 28%	4	2.4
Poland	commercial lending s.t. 23.88	2.55	2.2
Romania	no valid interbank or commercial rates	2.756	2.4
Russia	commercial lending s.t.170	4735.50 market 0.65 official	2.0
Slovak Republic	average of all loans across all maturities 15.75 Sep95	30.30	3.0
Ukraine	Loans fell in 1995 from 658% to 113%	186 800	2.2

sources: Financial Times 29 January 1996; World Bank Atlas 1996; EBRD country officer; International Financial Statistics, January 1996; The Economist, 20 January 1996; Ukraine in Numbers, National Bank of Ukraine; Average compound one year rates.

Many of the EIT countries have high budget deficits (e.g. Poland, Russia and Hungary), which is crowding out other investments. For example, the Polish Treasury has issued notes with a guaranteed

4 European Bank for Reconstruction and Development, 'Transition Report 1995: Investment and Enterprise Development', London, 1995, p. 172.

5 Representative of NUTEK, personal communication, Stockholm, January 1996.

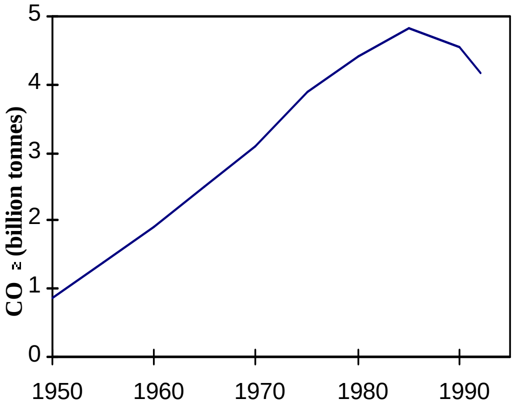
6 The Financial Times, 'Country Survey: Slovakia', 20 December 1995.

return of 8 per cent above inflation to finance its deficit. This high 'real' rate of return was required to attract sufficient investor interest when there was already a very large amount of Polish Government debt on the market. Such 'crowding out' is evident in other countries of the region with high budget deficits as well, notably Hungary. As all investments compete for funds, these securities with higher and more secure returns have at times absorbed a disproportionate amount of the available investment funds from banks and industry. Thus, high government borrowing requirements can cause an extremely high cost of capital and make otherwise profitable investments look uneconomic. Recent interest rates in EIT countries are compared in Table 3 above.

Overview CO_2 emissions in EIT countries

Three Annex I countries in Central and Eastern Europe are among the top 15 global CO_2 emitters - the Russian Federation (3rd), Ukraine (7th), and Poland (12th)[7]. Emissions of CO_2 from Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS) rose steadily from 800 Mt CO_2 in 1950 to peak at 4 800 Mt CO_2 in 1988. Since then, there has been a sharp decline in CO_2 emissions arising from decreasing primary energy consumption and, in particular, reduced coal consumption. Over the period 1950 to 1988, these countries increased their share of global emissions from 15 per cent to 24 per cent by 1988. Since 1988, the decline in carbon dioxide emissions from the region combined with the rapid rises elsewhere have reduced the global share to 18 per cent. Eastern European countries have high per capita CO_2 emissions - 11 tonnes/capita - compared to 8 tonnes/capita in Western Europe and a global average of 4 tonnes/capita in 1992. The carbon intensity (CO_2/GDP) is also high by international standards. The combination of high carbon emissions per capita, and high carbon intensity is characteristic of the Region. In contrast, OECD Member countries tend to have high per capita emissions but low carbon intensity, while developing countries tend to have low per capita emissions and high carbon intensity. Figure 2 shows CO_2 emissions from Eastern Europe, excluding former GDR.

Figure 2. CO_2 Emissions from Eastern Europe, Excluding Former GDR[8]



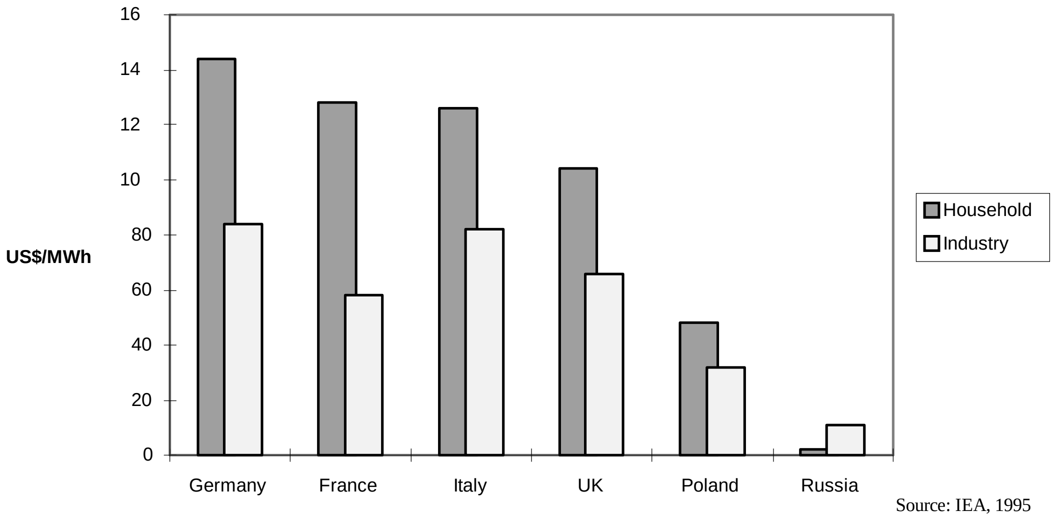
7 Marland G., Molnar S., Sankovski A., Wisniewski J., 'Greenhouse Gas Emissions and Response Policies in Central and Eastern Europe', *IDOJARAS* Journal of the Hungarian Meteorological Office, 1995.

8 Ibid.

Overview of Energy Prices

Prior to 1989, energy prices in EIT countries were considerably below world market prices. Since then, energy prices have increased quite rapidly in most of the countries, particularly in the industrial sector[9]. Figure 3 below shows relative electricity prices in 1993.

Figure 3. Electricity Prices for households and industry Poland, Russia and selected IEA countries 1993[10]



Source: IEA, 1995

Energy prices for many sectors in EIT countries have converged rapidly with OECD energy price levels in the past 12-18 months. Energy prices in some countries and sectors had not reached market levels in early 1996 however. Large subsidies in the residential sector and non- payment of energy bills are serious problems that are likely to continue for some time because of the social consequences of rapid energy price increases. Energy subsidies undermine the cost-effectiveness of all energy investments, and energy efficiency investments are disproportionately affected due to the lack of credit history of project developers and the unfamiliar nature of efficiency projects to many financial institutions. However, raising prices in the residential sector have political and social costs that have led to caution in the process of reform. Where consumers, particularly residential ones, have no capital or capacity to respond to higher energy prices by investing in efficiency measures, they may simply stop paying their energy bills. For example, in Russia, by January 1994 energy consumers owed $7 billion to the fuel and energy industries, and inter-enterprise debt was of an equivalent amount. In 1995, Gazprom cut gas supplies to St Petersburg by 10 per cent in response to the city owing $227 million.

A conclusion of this study is that low energy prices alone should not be a major barrier to energy efficiency in most Annex I EIT countries. Many projects are already cost-effective at current energy prices.

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9 Specific country by country assessments of energy pricing levels are provided in Appendix 3.

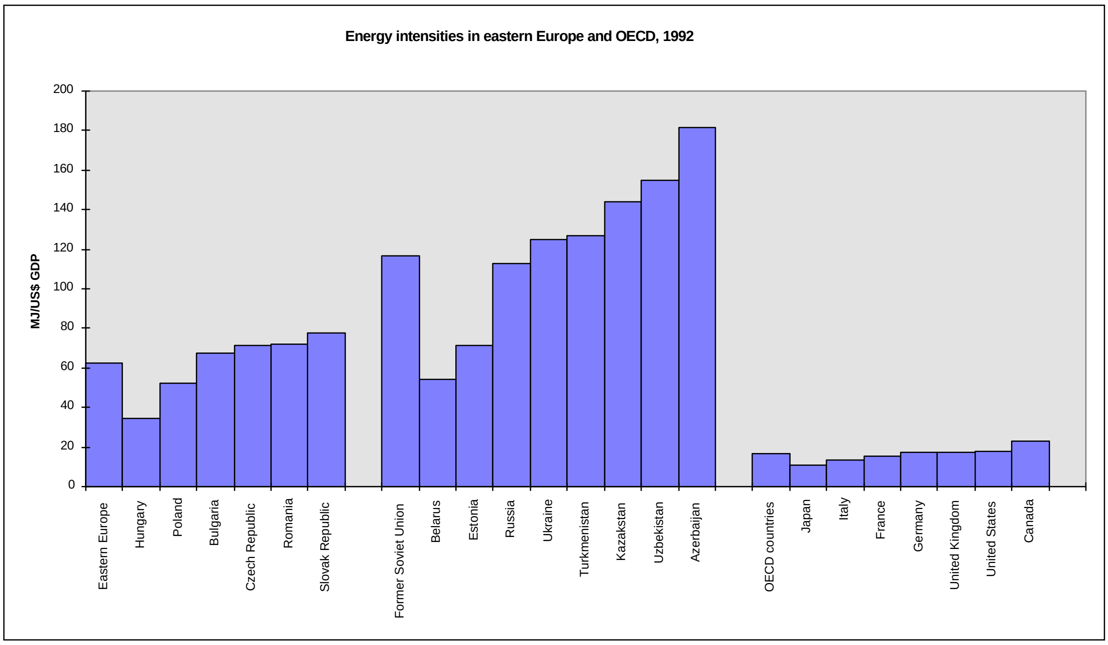
10 IEA, Poland Country Study, Final Draft, Paris, 1995. Centre for Global Energy Studies, IEA, 'Oil and Gas Statistics of the Former Soviet Union', Paris, 1995.

Overview of Energy Efficiency Potential

Based on a wide range of indicators, the Economies in Transition (EIT countries) from Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS) are energy inefficient relative to the OECD. Even when compared to some of the least energy efficient economies in the OECD, EIT countries use several times the amount of energy to produce a unit of GDP. Overall, EIT countries use between 2-7 times as much energy to produce a unit of economic output as the OECD. In contrast, energy consumption per capita is broadly comparable with the OECD (see Figures 4 and 5).

Energy intensity (energy consumption per unit of GDP) is one indicator of energy efficiency. Energy intensities mask a number of key trends, and need to be adjusted to take account of the structure of individual economies (e.g. larger industrial sectors, focused on energy-intensive industries such as steel and chemicals are more common in the EIT countries than in the OECD), the purchasing power of consumers in these countries i.e. adjusted for purchasing power parity (PPP), and the climate. Despite this, the energy intensity does give a crude indicator of the relative way economies use energy, and EIT countries do not compare well with OECD Member countries.

Figure 4. Relative Energy Intensity for CEE, the CIS and the OECD, 1992[11]



Source: EBRD Transition Report 1995

Other indicators, for example, the Specific Energy Consumption (SEC) for producing a unit of product (e.g. tonne of steel) or the amount of heating required for buildings, adjusted for climate differences, show a similar pattern. For instance, heating a square metre of apartment floor space to a given temperature requires 20-50 per cent more energy in CEE countries than in Scandinavia. The SEC for a wide range of industrial products is between 15 per cent to 65 per cent higher in the Czech Republic than in Scandinavian countries[12]. One study estimated that there are more than 11 000 industrial furnaces in the

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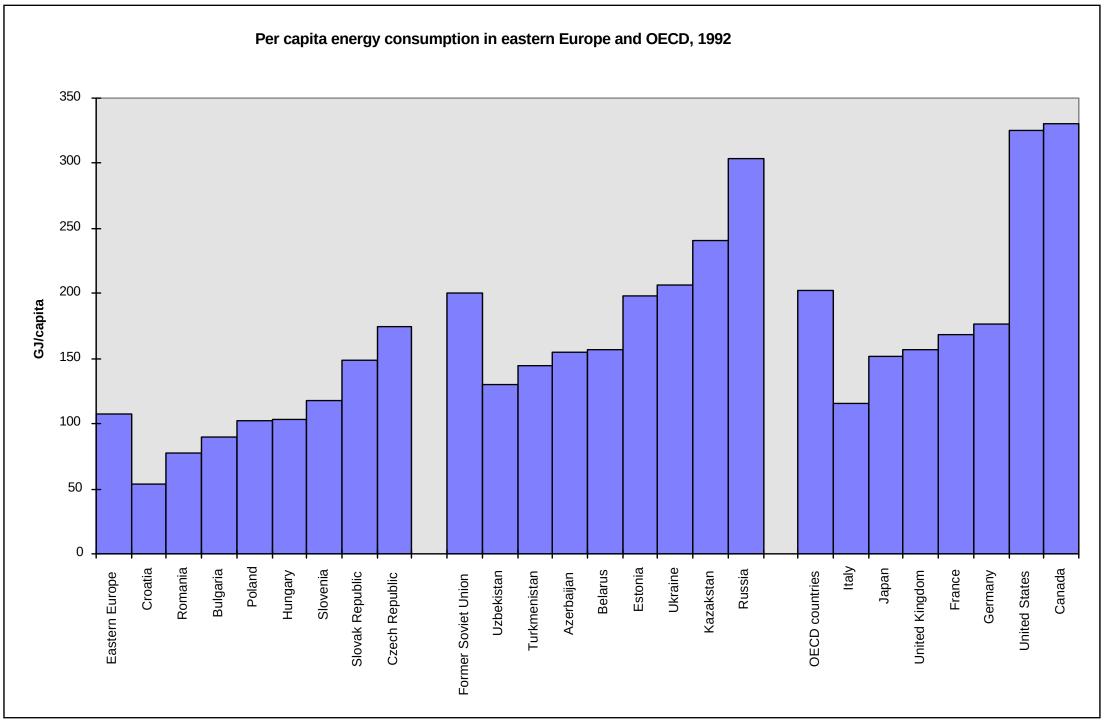
11 World Bank Data, compiled by the Energy Efficiency Unit, EBRD, London, 1995.

12 H.f. Kaan, N.H. van der Linden, M. Malý, 'Phase 2: Energy conservation in Buildings. Netherlands Energy Research Foundation (ECN)', ECN-C-95-016, Petten, April 1995.

Czech Republic which consume 30 per cent more energy than their Western counterparts to perform the same task.

Figure 5. Comparison of per capita energy consumption between CEE, CIS and OECD, 1992



Source: EBRD Transition Report 1995.

A number of additional statistics give a sense of the scale of the cost-effective efficiency potential of the whole region. A study of the industrial sector of CEE countries estimates the potential market for energy-efficient products at $20 billion[13], assuming a three-year payback for projects. The market for efficiency projects with payback periods of less than 3.5 years has been estimated by the Energy Efficiency Department at the EBRD to be worth at least $52 billion, requiring an investment of around $6 billion per year.[14] Another evaluation in the industrial sector by the Oko Institute in Germany found that 80-90 per cent of the industrial motors and generators in CEE could be replaced with more efficient models, with a payback period of four years or less.[15] Though these regional assessments are based on quite conservative economic assumptions (e.g. less than 3 to 5 year payback periods), they give no more than broad indicators of the efficiency potential in the EIT countries.

13 Mark Hopkins, 'Business Opportunities in Eastern Europe for Energy-Efficient Industrial Products', The Alliance to Save Energy, Washington DC, January 1992.

14 Peter Hobson, Energy Efficiency Unit, EBRD, London, personal communication, January 1995.

15 Russell Sturm *et al.*, 'Seizing the Moment: Global Opportunities for the US Energy Efficiency Industry', IIEC, Washington DC, January 1993, p. 118. Peter Hobson, 'Financing the Pot of Gold: Problems and Solutions with Energy Efficiency Finance in Eastern Europe', World Energy Council Journal, July 1994.

3. DETAILED COUNTRY ASSESSMENTS

Choice of Countries for Assessment

The EIT countries each have different characteristics, but unfortunately resources were not available to assess all 12 countries in detail. In making the choice of countries the following factors were taken into account:

a) the need for a range of countries representing the main variations in economic transition found in EIT Annex I signatories;

b) the availability of reliable data;

c) the population (both large and small EIT countries); and

d) the need for a range of countries with differing industrial structures.

The four countries chosen for detailed assessments were the Czech Republic, Poland, Bulgaria and Ukraine. In addition, a less detailed assessment was carried out for Slovakia (mainly buildings) and a short review of Russia is provided. The Czech Republic has made the most rapid progress in its economic, pricing and policy reforms and so represents one extreme. Poland has also made rapid progress with its economic reforms but it faces greater economic problems due to higher levels of indebtedness than the Czech Republic and because of its outdated industrial sector, and so is to some extent representative of countries such as Hungary and Estonia. Poland is also the largest market within the CEE. Bulgaria has made some progress with its economic reforms, but a great deal remains to be done, and it is thus to some extent representative of countries such as Romania which are medium-sized, still have extensive state control of the energy industry, and where energy subsidies are still common. Ukraine is representative of large countries which are undergoing major reforms, and was part of the former Soviet Union. Some information is also provided for Russia. The assessment of the Slovakian buildings sector illustrates the challenge of improving the subsidised, district heating sectors throughout most of the EIT countries.

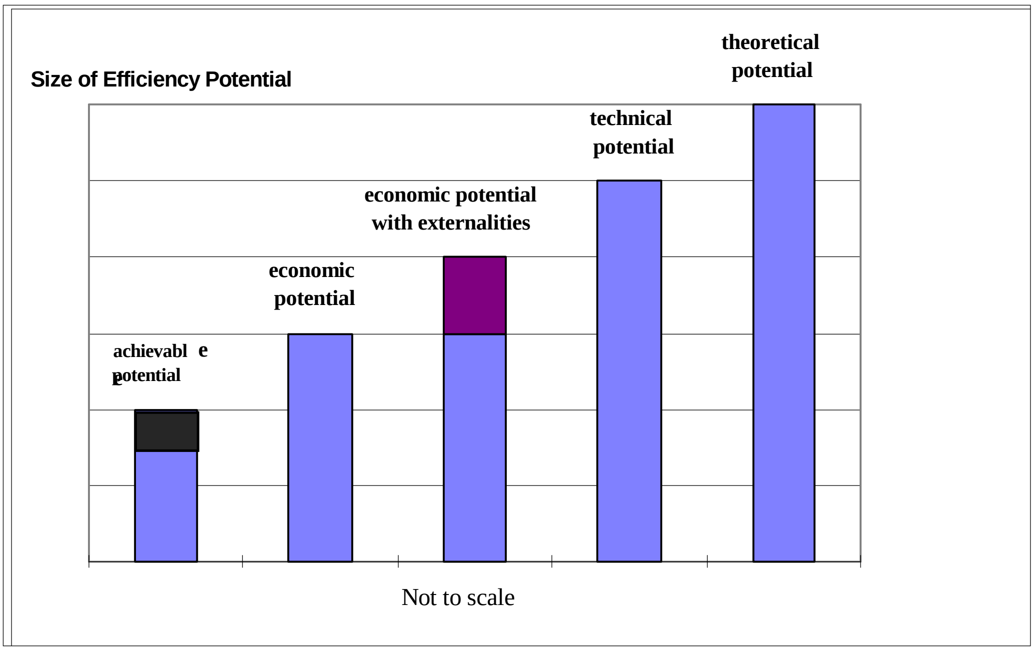
Approach

A number of the evaluations reviewed for this section of the study have assessed the *technical* energy efficiency potential of EIT countries. Other evaluations reviewed for this study assess the *economic* potential for energy efficiency. The boundaries between the types of studies are not clear cut, but assessments of technical potential tend to be engineering type analyses which compare energy technologies and practices currently used in the country or sector with newer technology and practices either common in other countries (the OECD), or in the country itself. Economic assessments use more explicit economic criteria (payback periods, internal rate of return etc.) typically used by investors.

Unfortunately there is no consistency between studies in the assumptions used. Payback periods from a few weeks to 10-15 years were found in the economic assessments reviewed for this study. Some studies have estimated the cost-effective energy efficiency potential at local prices, others assumed world prices. The prices assumed do not always represent the long run marginal cost of new supply. Discount rates ranged from 8-12 per cent, and do not always reflect the opportunity cost of capital in the particular countries. Despite these variations in assumptions, the assessments show that a considerable potential for energy efficiency exists at a level well below the energy prices paid by industrial consumers, the long-run marginal costs for electricity and gas utilities, and the type of payback periods expected for other energy investments such as power plants and oil and gas fields.

The barriers to financing energy efficiency that are identified in this study inhibit the uptake of some of the 'economic' energy efficiency potential. To reflect the negative impact of the barriers on energy efficiency investment, a further category of 'achievable' efficiency potential was developed for this study. In the absence of detailed assessments of indicators such as levels of privatisation and investment trends in each country, or the existence of metering, a somewhat arbitrary assumptions had to be made on how much of the potential is achievable. After some discussion with local experts and others, a judgement was made to set this at a level between half and two-thirds of the 'economic' potential based on an acceptance that many studies have under-estimated the problems of actually securing efficiency opportunities, and that it has in some cases taken longer than expected for energy prices to reach proper market levels. Figure 6 below summarises the efficiency potential assumptions for this study.

Figure 6. Schematic framework of assessments of energy efficiency potential



Source: After Pearman (ed.), 1993

For the Czech Republic and Poland, the achievable efficiency potential was set at two-thirds of the estimated economic potential, reflecting the progress in these countries made in establishing capital markets, liberalising energy prices, and energy policy reforms. For Bulgaria and Ukraine, the achievable efficiency potential was set at half of the estimated economical potential reflecting the slower rate of economic progress to date. Though recent economic reforms in the Ukraine are currently progressing quite quickly, there is a great deal still to be accomplished and it is too early to tell how well the country will fare. The most important conclusion from this overall approach is that significant efficiency potentials still remain to be captured.

The term ‘business-as-usual’ (BAU) has been used in this study to represent a future where moves towards a market economy will continue (albeit at differing rates of change, depending on the country), but where specific initiatives which might encourage energy efficiency are not implemented. The term BAU is commonly used when comparing energy scenarios with and without policy and fiscal interventions in order to assess the impact of these, but the term needs to be used with care in EIT countries, as ‘business-as-usual’ in a situation of very rapid economic change can be a confusing concept.

Energy Efficiency Potential in Poland

Table 4: Poland and the Energy Sector at a Glance

Population	38 million (1993)
Number of Households	12.2 million
Currency new Zloty (nZl);	nZl 2.5 = US$ 1 (1995)
GNP (billions US$)	66.5 (1988); 94.6 (1994)
GNP per capita (US$)	1 790 (1989); 2 470 (1994)
GNP per capita with PPP adjustment (US$)	5 380 (1994)
Inflation, 1995	22% per annum (Dec 1995)
Annual CO_2 emissions	359 Mt (1992)
Carbon dioxide emissions UNFCCC base year (million tonnes CO_2)	484 Mt (1988)
Primary energy supply (TPES)	5 280 PJ (1989); 4 061 PJ (1993)
Fuel mix (1993):	
coal	77%
gas	8.4%
oil	14.6%
hydro	<1%
TPES per capita	107 GJ (1993)
Annual electricity consumption (TWh)	131 (1993)
Energy Intensity (per US$1 000)	49 GJ (1989); 70 GJ (1993)

Note: data are presented for different years due to efforts to provide most current values.
Sources: World Bank Atlas, 1996; Business Central Europe 1996; IEA, 1995.[16]

Background

Poland has a population of nearly 40 million people, and it is the largest of the Central and Eastern European economies. After the fundamental political changes in 1989, the transformation from the centrally planned to the market economy is well underway. Poland has nearly recovered the level of economic output of the late 1980s. Inflation is falling. At the same time, there is growing recognition of the urgency of the country’s environmental problems. Energy efficiency does appear to be a prominent

16 IEA, Energy Policies of Poland: 1994 Survey, Paris, 1995. IEA, Energy Policies of Poland: 1990 Survey, Paris, 1990. World Resources Institute, A Guide to the Global Environment: 1992-93, Washington DC, 1992. The World Bank, The World Bank Atlas 1996, Washington DC, 1995. The World Bank, Annual Report 1991, Washington DC, 1991. The Economist Newspaper Ltd., Business Central Europe, December 1995 / January 1996, Romford, 1996.

goal in governmental energy policy statements, but this has not yet been reflected in specific initiatives and investment priorities. Poland's fuel mix is overwhelmingly dominated by coal, which accounts for 77 per cent of primary energy supply (TPES), and 96 per cent of the fuel for electricity and heat production. Oil accounts for 15 per cent of TPES, and natural gas for 8 per cent. Hydro contributes only 0.3 per cent of TPES. Poland's energy intensity is two to three times that of OECD Europe.[17] This is mostly due to inefficient equipment in Polish factories, and to the inefficiencies in Poland's district heating system (the most extensive network in the world).

Carbon Dioxide Emissions

Poland's CO_2 emissions rank twelfth in the world.[18] Its energy-related CO_2 emissions dropped by about a third between 1980 and 1988 (Poland's baseline year for its commitments to the Framework Convention on Climate Change), from over 700 Mt/year to 500 Mt/year.[19] 1990 saw another big decrease, down to 400 Mt/year. Since then, emissions have been stable, dipping slightly in 1992 and then increasing in 1993.[20] Under a business-as-usual scenario, CO_2 emissions are projected to rise to over 600 Mt/year by the year 2010, 20 per cent above the baseline level.

Energy Efficiency and CO_2 Reductions Potential

A wide range of assessments have been produced for Poland which use differing assumptions,[21] and some care needs to be taken with data prior to 1991 as it will not be as relevant and may be less reliable than more recent data. Because of these uncertainties, conservative assumptions have generally been used.

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17 IEA, Energy Policies of Poland: 1994 Survey, Paris, 1995.

18 Kluwer Academic Publishers, Joint Implementation to Curb Climate Change: Legal and Economic Aspects, editors Onno Kuik et al., Dordrecht, 1994.

19 Ministry of the Environment, Poland, 'National Report to the First Conference of Parties to the United Nations Framework Convention on Climate Change', Warsaw, 1994.

20 World Energy Council, 'The Energy Economy in Central & Eastern Europe in Transition: 1995 Report', London, May 1995.

21 Energy efficiency assessments consulted for this study on Poland include:

RCG/Hagler Bailly, 'Demand Side Management for Poland', prepared for US AID, 1993. S. Sitnicki, K. Budzinski, J. Juda et al. 'Poland: Opportunities for Carbon Emissions Control', Fourth International Energy Efficiency and DSM Conference Proceedings, Berlin, October 1995. Popiolek and K. Dyhr-Mikkelsen, 'Establishing the potential for DSM and Market Intervention in Warsaw, Poland', Fourth International Energy Efficiency and DSM Conference Proceedings, Berlin, October 1995. K.H. Zmijewski, The Role in Energy Efficient Buildings, THERMIE Workshop on Insulation and Controls Proceedings, DG XVII, European Commission, January 1993. S. Meyers et al., 'The Residential Space Heating Problem in Eastern Europe: The Context for Effective Strategies.' Lawrence Berkeley Laboratories, Berkeley, 1995. ACEEE, 'Energy savings in residential multifamily buildings - Demonstration project in Krakow, Poland', ACEEE 1994 Summer Study of Energy Efficiency in Buildings Proceedings, Washington DC, 1994. Zbigniew Leraczyk and Edward Weksej, 'Energy Management - Experience of the Bielsko Biala City (Poland)', Energy Efficiency Business Week Proceedings, SEVEn, Prague, October 1995. Marc Ledbetter, 'The Practical Aspects of Implementing DSM in Poland', Financial Times Conference on World Electricity, London, 1994.

The technical potential for energy efficiency in Poland is estimated at 26 per cent of current final energy consumption, the economic potential is about 18 per cent of primary energy consumption, while the achievable potential is probably about two-thirds of that, or around 12 per cent of primary energy consumption.[22] [23] As 96 per cent of the fuel burned for electricity and heat production is from coal, it is reasonable to assume that achieving this achievable potential would lead to a near 12 per cent decrease in CO_2 emissions.

The initial cost of reducing CO_2 emissions varies according to the sectors in which the reductions are made. Two measures with a particularly high potential for reductions in the industrial and district heating sectors are the installation of heat metering and controlling devices, and the installation of long-life, high-efficiency steam traps for heat recovery. The former would cost US $2.5 per MWh energy conserved, amounting to an initial cost of US $6 per tonne of CO_2 saved, up to a total of 7.3 million tonnes. The latter would cost US $0.20 per MWh, or an initial US $0.5 per tonne of CO_2, up to a total of six million tonnes. It is important to note that these measures will ultimately be financially profitable, due to the associated energy savings. The net benefit would be US $81 and US $86 respectively, for every tonne of avoided CO_2 emissions.

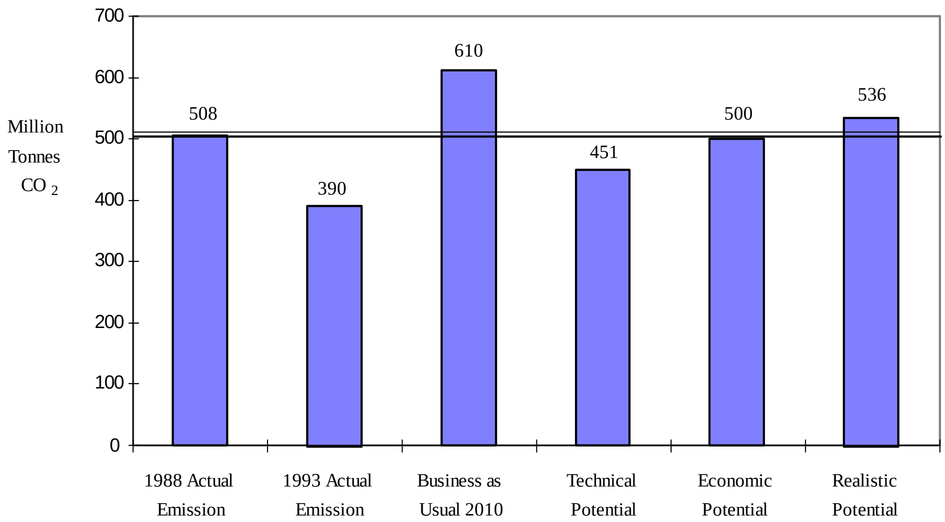
Macro-economic studies conclude that by the year 2030, reductions of 80 million tonnes in industry and 40 million tonnes in non-industrial areas can be achieved at a negative net cost.[24] Figure 7 below shows Poland's CO_2 emissions in 1988, and in 1993, followed by the emissions predicted under the business-as-usual scenario for the year 2010. The technical potential for energy efficiency would clearly keep emissions below the 1988 baseline level. Accepting that only 'economic' measures would be feasible - and that only two-thirds of these would be 'achievable' because of barriers - the graph shows that this 'realistic potential' scenario would almost keep emissions from exceeding the 1988 baseline level in the year 2010.

22 S. Pasierb *et al.*, 'Analysis of the National Energy Efficiency Potential in Poland', Polish Foundation for Energy Efficiency (FEWE), Katowice, August 1993.

23 J. Michalik *et al.*, 'Evaluation of the Feasibility and Profitability of Implementing New Energy Conservation Technologies in Poland', Polish Foundation for Energy Efficiency (FEWE), Katowice, October 1993.

24 US Country Studies Programme, 'Analysis of Greenhouse Gas Abatement in Poland' DRAFT, January 1996.

Figure 7. The Potential Contribution of Energy Efficiency to the Reduction of Poland's CO_2 Emissions



Source: IIEC, 1996

Examples of Energy Efficiency Projects

A number of energy efficiency projects are currently being undertaken in Poland, many with 'soft loan' or grant elements from bilateral agreements or EU technical co-operation funds. These include Joint Implementation projects for district heating efficiency and coal-to-gas conversion[25]; a GEF project to stimulate the residential market for energy-efficient lighting[26]; a World Bank loan that includes a component for upgrading district heating systems; THERMIE demonstrations projects such as the replacement of a hospital heating system; and research projects into the cost-effectiveness of different levels of housing insulation. The EBRD has a number of projects at an early stage of development.[27] While Poland is slowly gaining experience with a range of energy efficiency financing, energy efficiency investments have yet to enter the mainstream of corporate and financial activities, and certain financing schemes, such as those involving municipalities or ESCOs, have yet to be fully proven in Poland.

Capturing the CO_2 reduction potential

The key elements of a successful strategy for capturing the efficiency potential in Poland will be to encourage greater private sector participation through the development of ESCOs to ease the costs and difficulties of the capital markets, and to give a higher priority to energy efficiency through energy policy and informational programmes. While Poland is not facing such severe problems with high costs and scarcity of capital as in countries such as Ukraine and Russia, it is still difficult for energy efficiency

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25 Meredydd Evans, 'Joint Implementation in Countries in Transition: An Analysis of the Potential and the Barriers', Pacific Northwest Laboratory, Richland, March 1995.

26 Stewart Boyle, Marc Ledbetter and Russell Sturm, 'Efficient Lighting in Poland: An Innovative IFC/GEF Project', International Institute for Energy Conservation, London, presented in the Right Light Three Conference Proceedings, Newcastle-upon-Tyne, 18-21 June 1995.

27 Bernard Jamet, Energy Efficiency Unit, EBRD, London, personal communication, February 1996.

project developers to access longer-term and affordable finance. Getting inflation rates down, and cutting budget deficits (so that Government bonds do not crowd out the market as at present), are two of the main priorities to ease these problems.

Energy Efficiency Potential in the Czech Republic

Background

In Central and Eastern Europe, the Czech Republic has made the most progress in its transition from a planned to a market economy, a stable currency, an advanced state of reform in the banking industry and a high rate of foreign investment. The Czech Republic was recently invited to join the OECD, has been given an 'A' level investment rating by Standard & Poors, and is on the path to attaining membership of the European Union[28]. Between 1990 and 1994, Czech energy-end use declined by 30 per cent. The Czech Energy Agency states that this led to a rise in the overall energy intensity (ratio of energy input per unit GDP) for the country, such that in 1994 the energy intensity relative to Gross Domestic Product was two to four times higher than Western Europe. The industrial sector is set to lose its role as the leading contributor to GDP (57 per cent of GDP in 1990). Industrial energy prices have reached world market prices, which has caused the collapse of some heavy industry. Further industry closures have resulted from the loss of low-priced raw material inputs and the guaranteed COMECON market. Government forecasts predict a shift from an industrial-based to a more services oriented economy. The services sector is expected to increase from 27 per cent of GDP in 1990 to 47 per cent in 2010.[29]

The Czech Republic is self-sufficient in electricity generation; net imports/exports are near zero. CEZ, the state-owned national utility, generated 77 per cent of the country's electricity in 1995. Coal dominates the electricity generation sector, including low quality brown coal that is associated with high emissions of sulphur, nitrous oxides, and particulates. Northern Bohemia, where several power stations are situated, is commonly referred to as the Black Triangle, due to vast areas of decimated forests and problems with public health. The Czech Republic has one nuclear station (Dukovany) and is aiming to complete a second (Temelin) in 1997. Carbon dioxide is the main greenhouse gas, accounting for 84 per cent of the global warming potential in the Czech Republic. Net CO_2 emissions in 1993 were 138 million tonnes[30]. Over 95 per cent of the emitted CO_2 is generated through fossil fuel production and combustion.

28 The Economist Newspaper Ltd., 'The Annual: 1995', Business Central Europe, Romford, 1996.

29 Milos Tichy, 'Inventory, Projection and Methods to Mitigate Emissions of Greenhouse Gases', SEVEn, 95/014/a, Prague, 1995.

30 Ibid.

Table 5: The Czech Republic and the Energy Sector at a Glance

Population	10.33 million (1995)
Number of Households	3.8 million
Currency Koruna ceska (CZK);	CZK 27.22 = US$ 1 (1996)
GNP (billions US$)	33.0 (1994)
GNP per capita (US$)	3 450 (1989); 3,210 (1994)
GNP per capita with PPP adjustment (US$)	7,910 (1994)
Inflation, average 1985-1994	11.8%
Annual CO_2 emissions	138 Mt (1993)
Carbon dioxide emissions UNFCCC base year (million tonnes CO_2)	163 Mt (1990)
Primary energy supply (TPES)	1 746 PJ (1994)
Fuel mix (1993):	
- brown coal	53.0 %
- hard coal	11.5 %
- gas	13.0 %
- oil	14.5 %
- nuclear	7.5 %
- hydro/renewables	0.5 %
TPES per capita	168.7 GJ (1994)
Annual electricity consumption (TWh)	56.6 (1994)
Energy Intensity (per US$1 000)	51.0 GJ (1989); 55.7 GJ (1994)
Installed generation capacity	13 850 MW (1994)
Annual electricity consumption per capita	548 kWh (1993)

Note: data are presented for different years due to efforts to provide most current values.
Sources: SEVEn, 1994 and 1995; IEA 1994; World Bank Atlas 1996, Business Central Europe 1995 [31]

31 "At a Glance" Table Sources (Czech Republic): Milos Tichy et al., 'Greenhouse Gas Emissions, Scenarios and Mitigation Measures', SEVEn, 94/014/a, Prague, 1994. Milos Tichy, 'Inventory, Projection and Methods to Mitigate Emissions of Greenhouse Gases', SEVEn, 95/014/a, Prague, 1995. IEA, 'Electricity in European Economies in Transition', Paris, 1994. The World Bank, 'The World Bank Atlas 1996,' Washington DC, 1995. The Economist Newspaper Ltd., 'The Annual: 1995', Business Central Europe, Romford, 1996.

Energy Efficiency and CO_2 Reduction Potential[32]

A series of energy audits evaluating the industrial sector has estimated an average savings of 12 per cent on the electricity side, and roughly 10 per cent on the thermal, with little or no capital investment.[33] Recommendations for capturing this potential included personnel training, improvement of 'housekeeping', and better management of operational procedures. For the industrial sites which required investment, the payback time varied from a few weeks to six months. While making business more profitable, energy efficiency also reduces harmful emissions of greenhouse gases. With implementation of the recommended low to no-cost projects across the Czech Republic, 10 million tonnes of CO_2 could be eliminated - 7 per cent of the country's 1993 emissions. The rapid payback periods on projects in the industrial sector is partially due to energy prices rising close to world market prices. [34]

In spite of subsidised energy prices in the residential sector, large potential exists for cost effective energy efficiency measures. The Prague-based Centre for Energy in Housing (STÚ) has completed a thorough assessment of the potential for energy savings in residential homes and apartments.[35] Using the data from this study and assuming an 8 per cent discount rate, a financially viable potential energy savings of 53 PJ, or about 18 per cent of total consumption of heating fuel was estimated. This is the equivalent of 6 million tonnes of CO_2. The Czech Energy Efficiency group SEVEn estimates the cost-effective energy saving potential in the residential and commercial sectors as 1.3 TWh per year, which is approximately

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32 Key Documents used in the preparation of the Czech Republic country focus: Milos Tichy, 'Inventory, Projection and Methods to Mitigate Emissions of Green House Gases', SEVEn, 95/014/a, Prague, 1995. Jaroslav Marousek *et al*., 'Reducing Carbon Dioxide Emission in the Energy Field Through Energy Efficiency', SEVEn, 93/012/a, Prague, 1993. Vladimir Sochor, 'Possibilities and Problems in the realisation of Energy Efficiency Projects in the Czech Republic', SEVEn, Prague, September 1995. Ministry of Environment and Ministry of Industry and Trade, 'The Czech Republic's First Communication on the national process to comply with the commitments under the UN Framework Convention on Climate Change', Prague, 1994. Milos Tichy, Zora Vorackova, and Petr Dvorak, 'Greenhouse Gas Emissions, Scenarios and Mitigation Measures', SEVEn 94/014/a, Prague, September 1994. IEA, 'Energy Policies of the Czech Republic: 1994 Survey', Paris, 1994. Jaroslav Marousek et al., 'Reducing Carbon Dioxide Emissions in the Energy Field Through Energy Efficiency', SEVEn, Prague, 1993. Mark Hopkins, 'Business Opportunities in Eastern Europe for Energy-Efficient Industrial Projects', the Alliance to Save Energy, Jan. 1992. F.D.J. Nieuwenhout et al., 'Energy Conservation Stimulation Programme for the Czech Republic, Phase 1: The Manufacturing Sector', ECN Netherlands Energy Research Foundation, ECN-C-94-018, August 1994. H.f. Kaan et al., 'Energy Conservation Stimulation Programme for the Czech Republic. Phase 2: Energy conservation in Buildings', Netherlands Energy Research Foundation (ECN). ECN-C-95-016. April 1995. Milos Tichy, SEVEn, Prague, personal communication February and March 1996. Petr Hlobil, IIEC-Europe, Prague, personal communication, February and March 1996.

33 Mark Hopkins, 'Business Opportunities in Eastern Europe for Energy-Efficient Industrial Projects', Alliance to Save Energy, Jan. 1992. Milos Tichy, SEVEn, Prague, personal communication, February 1996. Petr Hlobil, IIEC-Europe, Prague, personal communication, February 1996.

34 Vladimir Sochor, 'Possibilities and Problems in the realisation of Energy Efficiency Projects in the Czech Republic', SEVEn, Prague, September 1995.

35 H.f. Kaan, N.H. van der Linden, M. Malý, 'Energy Conservation Stimulation Programme for the Czech Republic. Phase 2: Energy conservation in Buildings', Netherlands Energy Research Foundation (ECN), ECN-C-95-016, Petten, April 1995.

1.2 million tonnes of CO_2 annually.[36] SEVEn calculated the cost of conserved energy at about 0.90 CZK/kWh (0.033 US cents/kWh), which is equal to the subsidised price of electricity to residential customers. Appliance use in households is widespread and growing in the Czech Republic. The government is considering measures such as energy labelling schemes to encourage consumers to buy more efficient appliances.[37] An estimate of the appliance sector potential for energy savings was prepared by the Belgian consultancy, Tractebel.[38] They estimated achievable savings in the appliance sector of about 1.4 TWh per year (about 1.4 million tonnes of CO_2), with, according to the study, "costs to realise these savings potentials....generally clearly below the long term cost limits of electricity production ".

Looking at energy use in the transport sector, one detailed assessment developed by the Austrian group EVA evaluated the potential for energy savings.[39] This report found that through simple measures such as traffic restrictions, promotion of public transport and encouragement of the use of more efficient vehicles, about 28 per cent of expected energy use (or about 60 PJ) could be saved, which is equivalent to approximately 6.9 million tonnes of CO_2. Based on a wide range of studies and discussions with experts in the Czech Republic, the estimated achievable energy efficiency potential in the industrial sector should yield CO_2 savings of 15.5 million tonnes. In the residential sector the 'achievable' savings are estimated as 12.2 million tonnes. The savings from both sectors (27.7 million tonnes of CO_2) would reduce the expected emissions of CO_2 in 2005 by 18 per cent.

The Czech Republic should have few problems in meeting its UNFCCC obligations to stabilise CO_2 emissions at 1990 levels by 2000. While the CO_2 emissions are expected to start rising between now and 2000, the government estimates that its CO_2 emissions in 2000 should be 12 per cent below 1990 levels because of industrial restructuring, and the closure of some industries, and energy efficiency improvements. Figure 8 illustrates that the Czech Republic could reduce CO_2 emissions to around 20 per cent below 1990 levels with 'achievable' efficiency measures.

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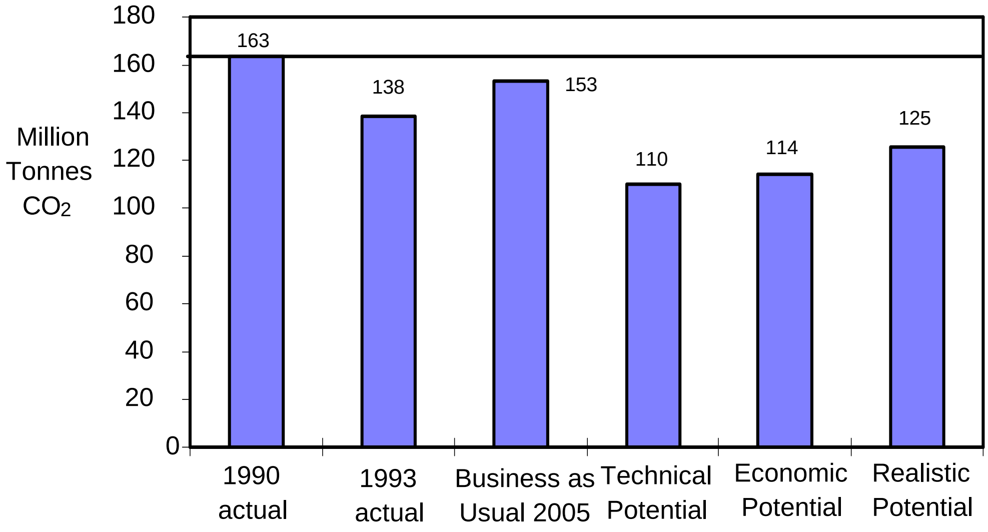
36 J. Marousek *et al*., 'Reducing Carbon Dioxide Emissions in the Energy Field Through Energy Efficiency', SEVEn, 93/012/a, Prague, 1993.

37 Ministry of Industry and Trade, DRAFT Energy Efficiency Act, Prague, 1995. Petr Hlobil, IIEC-Europe, Prague, personal communication, February 1996.

38 TRACTEBEL, 'Power Sector Least Cost Development Study for the Czech and Slovak Republics', prepared for the PHARE programme, April 1993.

39 Energie Verwertungsagentur (EVA), 'Opportunities to Improve Energy Efficiency in the Czech and Slovak Republics', Report Summary, Vienna, June 1994.

Figure 8. The Potential Contribution of Energy Efficiency to the Reduction of the Czech Republic's CO_2 Emissions



Source: IIEC, 1996

Examples of Energy Efficiency Projects

In 1993, the state-owned Czech utility, CEZ, ran a program to promote the adoption of energy efficient lighting in the residential sector. The utility was able to help start the market for these bulbs by subsidising the purchase price of 156 000 compact fluorescent lamps (CFLs) by 40 per cent.[40] Under the PHARE programme, the European Commission has provided 5 million ECU to create a revolving fund for financing energy efficiency projects. Negotiations are currently underway with the EBRD to open a credit line for this fund, which would triple the pool of finance to 15 million ECU. The fund would primarily offer credits for the co-financing of projects, up to a maximum of 49 per cent of the project costs, and for obtaining bank guarantees for the credits offered by other financial institutions.[41] In the town of Decin, the US has been working closely with the town leaders and local groups on an Activities Implemented Jointly (AIJ) pilot scheme to improve the district heating system, and replace a coal fired heat-only plant with a co-generation facility providing heat and electricity. For the same heat output, this plant offers a 31 per cent drop in greenhouse gas emissions and a 90 per cent drop in sulphur dioxide.[42]

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40 Ministry of Environment and Ministry of Industry and Trade, 'The Czech Republic's First Communication on the national process to comply with the commitments under the UN Framework Convention on Climate Change', Czech Republic, Prague 1994. Petr Hlobil, IIEC-Europe, Prague, personal communication, February 1996.

41 Vladimir Sochor, 'Possibilities and Problems in the realisation of Energy Efficiency Projects in the Czech Republic', SEVEn, Prague, September 1995.

42 Stephen Kinzer, 'US Utilities Help Czechs to Curb Greenhouse Gases and Air Pollutants' the New York Times, September 16, 1995, Page 8A.

Capturing the CO_2 reduction potential

While in other EIT countries, the multi-lateral and bi-lateral institutions may need to lead the implementation of energy efficiency projects, in the Czech Republic, the government and private sector could play a major role, as the Czech Republic has one of the most robust capital systems in the region. The government could show its support for energy efficiency while encouraging the growing market for ESCOs by having government buildings audited and retrofitted by Czech ESCOs. In addition to this, financing mechanisms such as the PHARE programme's revolving fund, which will make capital available at lower interest rates and in smaller amounts for energy efficiency projects such as building upgrades, lighting retrofits and industrial rehabilitation.[43] The Czech Republic also presents a good opportunity for AIJ projects, as shown by the AIJ demonstration project in Decin.

Energy Efficiency Potential in Bulgaria

Table 6: Bulgaria and the Energy Sector at a Glance

Population	8.46 million (1995)
Number of Households	2.9 million
Currency Lev (Lv)	66 = US$ 1 (1994)
GNP (billions US$)	31.5 (1989); 10.3 (1994)
GNP per capita (US$)	2 320 (1989); 1,160 (1994)
GNP per capita with PPP adjustment (US$)	4,230 (1994)
Inflation, average 1985-1994	41.7%
Annual CO_2 emissions	66 Mt (1993)
Carbon dioxide emissions UNFCCC base year (million tonnes CO_2)	91.5 Mt(1988)
Primary energy supply (TPES)	1 320 PJ (1988); 977 PJ (1993)
Fuel mix (1993):	
- coal	35.1 %
- oil	24.8 %
- natural gas	16.3 %
- nuclear & hydro	19.9 %
- other	3.9 %
TPES per capita	115.1 GJ (1993)
Annual electricity consumption (TWh)	38.1 (1994)
Energy Intensity (per US$1,000)	47.2 GJ (1989); 118.5 GJ (1993)
Installed generation capacity	12 074 MW (1991)
Annual electricity consumption per capita	450 kWh (1994)
Electricity Intensity (kWh per 1988US$)	1.57 (1993)

Note: data are presented for different years due to efforts to provide most current values.
Sources: World Energy Council, 1995; World Bank 1995; EnEffect, 1995; IEA 1994; Business Central Europe, 1995.[44]

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43 Milos Tichy, SEVEn, Prague, personal communication, February 1996.

44 "At a Glance" Table Sources (Bulgaria): World Energy Council, 'The Energy Economy in Central and Eastern Europe in Transition: Report, 1995', London, 1995. The World Bank, 'The World Bank Atlas 1996', Washington DC, 1995. Dr. Zdravvko Genchev, 'Practical Steps for Joint Implementation of Climate Technology Initiatives through Energy Efficiency Projects', AIJ workshop proceedings, 25-27 September

Background

Bulgaria, in the midst of profound political and economic changes, has started to show signs of economic recovery. After four years of decline, Bulgaria's economy stabilised in 1995, and is projected to grow 3 to 4 per cent per annum over the next decade.[45] The economy is still dominated by the state sector, though efforts are underway to introduce private capital. Bulgaria's largest trading partner is the EU, which takes a third of exports (twice the level of exports to Russia).

Triple digit inflation existed as recently as two years ago. However, this rate has been brought down drastically by economic intervention through aggressive macro-economic policy measures hammered out by the World Bank and other MDBs active in Bulgaria. The official inflation estimate for 1995 was 32.9 per cent.[46] Bulgaria's energy sector is in crisis. Scarce indigenous energy resources, problematic external supply links, subsidised energy prices, and inefficient end-use technologies have contributed to an unsustainable situation. Facing these conditions, Bulgarian energy officials, namely the powerful Committee on Energy (COE), have placed strong emphasis on building nuclear power plants, which they perceive as the key to the country's energy independence.

In Bulgaria, the average electricity price covers 83 per cent of domestic production costs and just 32 per cent of the cost of imported electricity.[47] Energy subsidies in the electricity sector have had a distorting effect on seasonal load curves and increased the overall costs of the system. Between 1985 and 1992, the proportion of primary energy utilised for generating electricity increased from 35 per cent to 45 per cent because of a large increase in residential electric heating demand. Residential peak electricity demand for the 1995-96 winter led to the re-starting of Unit 1 at the Kozloduy nuclear plant - a unit which has been universally condemned on safety grounds by a wide range of experts.[48] In April 1995, the EBRD asked the government to raise electricity prices from $0.016 to $0.035/kWh (118 per cent increase) to bring them closer to market levels and allow the utility to move into solvency in preparation for a significant power sector loan. The government, however, has been reluctant to raise prices.

Carbon Dioxide Emissions

Bulgaria has signed and ratified the Framework Convention on Climate Change (UNFCCC). Of the greenhouse gas emissions mix, CO_2 accounts for 99 per cent of global warming potential at 66 million tonnes per annum in 1993.[49] The energy sector accounts for more than 80 per cent of the greenhouse gas

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1995, EnEffect, Sofia, 1995. IEA, 'Electricity in European Economies in Transition', Paris, 1994. The Economist Newspaper Ltd., 'The Annual, 1995', Business Central Europe, Romford, December 1995.

45 European Bank for Reconstruction and Development, 'Transition Report 1995: Investment and Enterprise Development', London, 1995.

46 A. Stoykov, EnEffect, Sofia, personal communication, 7 March 1996.

47 IEA, 'Electricity in European Economies in Transition', Paris, 1994.

48 East European Energy Report, 'Bulgaria, Dependence on lignite and Kozlodui to remain as reform gets going', the Financial Times, London, September 1995. East European Energy Report, the Financial Times, London, October 1995, November 1995, and December 1995.

49 Katja Simeonova, 'Bulgaria Country Study to Address Climate Change Mitigation Analysis and Key Mitigation Options', ENERGOPROEKT, Joint Implementation Conference Proceedings, EnEffect, 25-27 September 1995, Sofia.

emissions. Because of structural adjustments and market reform, CO_2 emissions have been falling in recent years.

Energy Efficiency and CO_2 Reductions Potential[50]

Industrial energy efficiency is one of the most cost-effective options that will allow a diminishing of energy intensity while improving the overall profitability of the industrial sector in Bulgaria. The PHARE program has estimated that about 10-15 per cent of energy use could be saved at little or no capital investment (with pay-back periods lower than six months) through general housekeeping, simple controls and employee awareness training.[51] A 1995 Bulgarian Government study found a potential of more than 10 per cent of projected energy demand could be avoided by 2000, and 16 per cent by 2020. This avoided energy consumption translates into 11.6 million tonnes of CO_2 conserved annually by the year 2000 and 34.1 million in 2020.[52]

The buildings sector has a large potential for energy efficiency investments. Over ninety percent of residential building stock is privately owned. According to a Danish-Bulgarian study, improvements to energy use in apartments - such as window seals, insulation, balcony retrofits and improved blinds, would have payback periods from 1 to 4 years (assuming heating with electricity).[53] The electricity savings from these measurements is estimated to be around 33 per cent of total electricity consumption, or 3.3 TWh. According to the World Bank the required investment to realise this benefit for all homes across Bulgaria would be of the order of US $200 million, or about $43 per tonne of CO_2 avoided.[54]Overall, according to the PHARE program, the economically justified potential for energy efficiency improvement ranges between 20 and 40 per cent, depending on the pay-back period of the investments. As one of the most energy-import dependant countries in Central and Eastern Europe, Bulgaria has a strong motive to promote the adoption of these measures.[55]

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50 Main Reports used in the preparation of the Bulgarian Country Focus: IEA, 'Electricity in European Economies in Transition', Paris 1994. EnEffect, 'Workshop Papers and Project Proposals, Joint Implementation of Climate Technology Initiatives', Sofia, 25-27 September 1995. East European Energy Report, issues spanning 1994 and 1995, the Financial Times, London. Department of Statistics, 'Bulgarian National Book of Statistics, 1994', Sofia, 1994. Mark Hopkins, 'Business Opportunities in Eastern Europe for Energy-Efficient Industrial Products', Alliance to Save Energy, Washington DC, 1992. Violetta Groseva, 'Changes in Energy in Bulgaria and Efficient Energy Use', EC Energy Centre, Sofia Bulgaria, 1994. Synergia and IABPO, 'Energy Auditing and Technology Assessment in Bulgarian Buildings', September 1993. RCG/Hagler Bailly, 'Bulgaria Electricity Study: Electricity Demand Forecast', prepared for USAID, February 1994.

51 Groseva, 'Potential and Opportunities for Investments in Energy Efficiency in Bulgaria', Joint Implementation Conference Proceedings, EnEffect, 25-27 September 1995, Sofia.

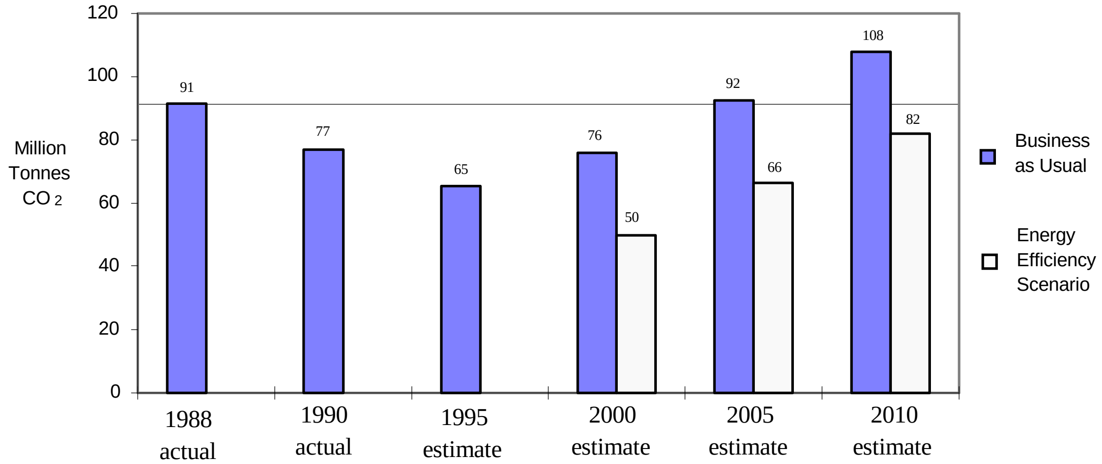
52 Op. Cit..

53 Birch & Krogboe, 'Sofia District Heating - Evaluation of Short Term Energy Conservation Measures and Investments', Virum, Denmark, 1992.

54 World Bank, 'Bulgaria Energy Strategy Study', Report No. 10143-BUL. Washington DC, April 30, 1992.

55 Violetta Groseva, 'Changes in Energy in Bulgaria and Efficient Energy Use', EC Energy Centre, Sofia; 1995.

Figure 9 The Potential Contribution of Energy Efficiency to the Reduction of Bulgaria's CO_2 Emissions



Source: IIEC, 1996.
Note: 1988 is the base year chosen by Bulgaria. CO_2 savings would actually increase with time, as further energy efficiency measures were introduced. In this figure, a conservative estimate has been made assuming that there would be no further take up of efficiency measures other those reviewed in this report.

Examples of Efficiency Projects

Despite the current low energy prices, there is large potential for energy savings in Bulgaria through efficiency. EnEffect, the Bulgarian Foundation for Energy Efficiency, recently held a conference in Sofia on Activities Implemented Jointly (AIJ) which highlighted 13 potential projects, including district heating and electricity generation efficiency improvements, street lighting, and hospital energy use retrofits. The replacement of tunnel lighting on a Boulevard in Sofia would not only improve the quality of lighting in the tunnel, but would pay for itself in electricity savings in about two months. The dollars per ton cost of CO_2 mitigated for this project is estimated as US $6.30.[56] In another project proposed by EnEffect, waste heat from a chemical plant would be utilised for district heating in a city near the plant called Razgard. The project would involve the construction of a district heating system in the town, saving 39 000 tonnes of CO_2 per year, at a 3.75 year payback. The investment required for this project would be US $6.8 million.[57]

The European Bank for Reconstruction and Development (EBRD) is considering establishing a special-purpose energy services company (ESCO) in Bulgaria. The EBRD would be a minority share-holder, with the majority ownership by a local investor who would manage the ESCO.

Capturing the CO_2 reduction potential

The key to capturing the energy efficiency potential - and CO_2 savings - is the availability of capital and technical expertise. While Bulgaria is making strides to move towards a market economy, its economy

56 Project Proposals, Joint Implementation Conference, EnEffect, 25-27 September 1995, Sofia.

57 *Ibid.*

remains a difficult one for the private sector, compared to other CEE and CIS countries. Investment groups such as the World Bank, the European Bank for Reconstruction and Development and other lending and aid agencies could play a critical role in the recovery of Bulgaria's industrial market, which would accelerate private sector involvement.

If the national energy policy currently under development maintains its strong emphasis on energy efficiency, Bulgaria stands to benefit greatly.[58] To ensure the successful implementation of the policies and proposed mechanisms for improving national energy efficiency, sufficient budgetary resources and political endorsement would be required.

AIJ pilot projects, are being investigated by the Bulgarian Energy Efficiency Centre, EnEffect, and could present a good mechanism for international investment. Additionally, the ESCO that the EBRD is looking to establish would provide a mechanism to overcome some barriers and implement cost-effective projects. The ESCO could play a key role in realising CO_2 savings by improving energy efficiency through its projects. Finally, continuing a programme of energy price increases would gradually improve the payback periods for energy efficiency investments.

Energy Efficiency Potential in Ukraine

Background

The Ukraine has a population of 52 million, second only to the Russian Federation in Eastern Europe. The economy of the Ukraine is dominated by heavy industry, which has accounted for up to 70 per cent of final energy demand in 1992; this has declined, but remains over 50 per cent. The Ukraine is heavily dependent on gas (46 per cent of primary energy), most of which is imported from Russia, and on domestic coal (30 per cent) which is mined in marginal seams and with increasingly difficult industrial relations. Steep price rises for imported energy and efforts to raise consumer prices towards market levels have placed a considerable strain on consumers and on the economy as a whole. The problems of closing the remaining reactors at Chernobyl have attracted world attention and G-7 commitments to grants and loans totalling in excess of US $3 billion.

The Ukraine's energy intensity is at least several times the OECD average,[59] mainly due to the large share of heavy industry and all-round poor energy efficiency. Since 1990, the economy, in general, and heavy industry, in particular, have been in sharp decline. GDP has fallen by over half and energy consumption by one-third since 1990. As a consequence, energy intensity has actually been rising since 1990. The outlook for the Ukraine is very uncertain and projections of economic growth and related energy consumption should be treated with caution. For the purposes of this assessment, the growth scenario

Table 7: Ukraine and the Energy Sector at a Glance

Population	51.7 million (1995)[60]
Households	17 million
Currency	Karbovanets (interim), Hryvnia (planned 1996)
Exchange Rate	Kv 188 500 = US$ 1 (2/1996)

58 DRAFT "Energy Efficiency Law", ENERGOPROEKT 1995.

59 European Bank for Reconstruction and Development, 'Transition Report 1995: Investment and Enterprise Development', London, 1995.

60 Number supplied by Vladimir Demkin, Ministry for Environmental Protection & Nuclear Safety, Ukraine.

GNP (billions US$)	80.9 (1994)[61]
GNP per capita (US$)	1 570 (1994)
GNP per capita with PPP adjustment (US$)	3 330 (1994)
Inflation	10 155% (1993) c. 150% 1995
Annual CO_2 emissions	612 Mt (1992)
Carbon dioxide emissions UNFCCC base year (million tonnes CO_2)	711 (1990)
Primary energy supply (TPES)	8 343 PJ (1993)
Energy trade balance	3996 PJ (48% TPES) net imports
Fuel mix (1993):	
gas	46% (of which 80% is imported)
coal	30%
oil	14%
nuclear	9%
hydro	0.5%
biomass	0.5%
TPES per capita	162 GJ (1993)
Annual electricity consumption (TWh)	191.5 (1995)[62]
Energy intensity (per US$1,000)	116 GJ (1993)

Sources: EBRD[63] World Bank[64] [65], World Energy Council[66], Hagler Bailly Consulting[67]. The characteristics of the economy and the energy use of Ukraine have changed markedly since 1990. We have used the most up-to-date figures available at the time of writing, but figures more than be used with caution.

assumed by the 1995 TACIS study into the Energy Saving Strategy for Ukraine[68] has been adopted. The World Bank and EBRD have also developed scenarios, and these share a range of assumptions about economic growth, de-industrialisation, and the development of commercial, household and transport sectors. So far as it is appropriate to talk of 'business-as-usual' in such a climate, it is likely that BAU energy consumption and CO_2 emissions will be significantly below 1990 levels in 2000 and 2010.

The Government of Ukraine seeks to reduce its dependency on imported gas, to restructure its energy sector and raise prices, improve environmental performance, and to close the Chernobyl nuclear complex in partnership with the G-7. These pressures have led the Government to prioritise energy efficiency by creating a separate State Committee and encouraging development agencies and banks to establish energy

61 EBRD, 'European Bank for Reconstruction and Development Transition Report 1995', London.

62 Number supplied by Vladimir Demkin, Ministry for Environmental Protection & Nuclear Safety, Ukraine.

63 EBRD, 'European Bank for Reconstruction and Development Transition Report 1995', London, 1995.

64 World Bank, 'Ukraine Energy Sector Review', Washington DC, 13 April 1993.

65 World Bank, 'The World Bank Atlas 1996', Washington DC, December 1995.

66 World Energy Council, 'National Energy Data Profile: Ukraine', London, 1995.

67 RCG/Hagler Bailly, Kiev, 1995. David Wolcott presentation to Fourth International Energy Efficiency and DSM Conference, Berlin, October 1995.

68 Inno Tec Systemanalyse GmbH, IDAE, March Consulting Group, and RMK, 'Global Energy Saving Strategy for Ukraine - Forecasting and Energy Balance', prepared for the TACIS programme of the European Commission, March 1995.

efficiency programmes.[69] The high cost of imported gas (full market prices) has increased the use of poor quality domestic coal, and Ukraine's dependence on nuclear power for electricity generation has now reached 50 per cent[70].

In the Ukraine, energy subsidies amounted to 5 per cent of total government expenditure in 1992. At that time, energy prices were between 5 per cent to 45 per cent of world prices for the industrial sector, and 0.1 per cent to 32.3 per cent of world prices in the household sector. Though energy prices have risen considerably since 1992, by January 1996, gas prices were still only 60 per cent of the actual cost of the gas (despite a 34 per cent increase at that time). The government has a schedule of price rises for 1996 that will bring prices in the residential sector up to market levels by the end of 1996, if implemented.[71] The tariff structure in the Ukraine still creates major disincentives to energy efficiency in the heating, with a monthly charge for gas and heat being levied either per person or floor space. This will remain the case until price increases are accompanied with revised tariff structures and individual metering and controls.

Carbon dioxide emissions

As of April 1996, Ukraine had signed, but not ratified, the UNFCCC. The Soviet Republic of Ukraine was the world's seventh largest CO_2 emitter in 1990, with 711 Mt CO_2 from the energy sector.[72] CO_2 emissions have fallen since 1990, following the decline in primary energy consumption.

Energy efficiency potential

Most studies suggest enormous potential for energy efficiency, but some care needs to be taken over the wide range of assessments produced for Ukraine using differing assumptions. One study reports an 'economic' electrical demand-side energy efficiency 'supply' of 30.5 TWh at 6.8 US cents/kWh, 25 TWh at 5 US cents, and 13 TWh at 3 US cents at a range of assumed marginal cost price levels in the Ukraine. This is equivalent to the 11.5 TWh output of the two operating Chernobyl units. The most comprehensive assessment made so far has been a study for the European Union TACIS Programme.[73] Based on this study, IIEC has estimated that by 2010, CO_2 emissions could be reduced by 281 Mt CO_2 compared to 1990 - approximately 40 per cent of the 1990 emissions. Compared to a BAU projection for 2010, the 'energy saving scenario' results in additional savings of 40 Mt CO_2. However, the BAU scenario for Ukraine includes considerable energy efficiency improvements in order for Ukraine's economy to grow and its industries to compete. The distinction between BAU energy efficiency gains and an explicit energy saving strategy is less definite than the figures above imply. Figure 10 below illustrates the 1990 emissions, the sharp decline that had occurred by 1992 (which has continued subsequently); the 'business as usual' estimate for 2010; the impact in 2010 of a achievable energy saving strategy; and an estimate by

69 President Ordinance No. 666 "On Establishing the State Committee of Ukraine on Energy Saving" 26 July 1995; and the Decree of Cabinet Ministers of Ukraine No. 20 "On Regulation in Energy Saving Sector" 9 January 1996

70 EBRD, 'European Bank for Reconstruction and Development: Ukraine Country Profile', London, three years old should April 1996.

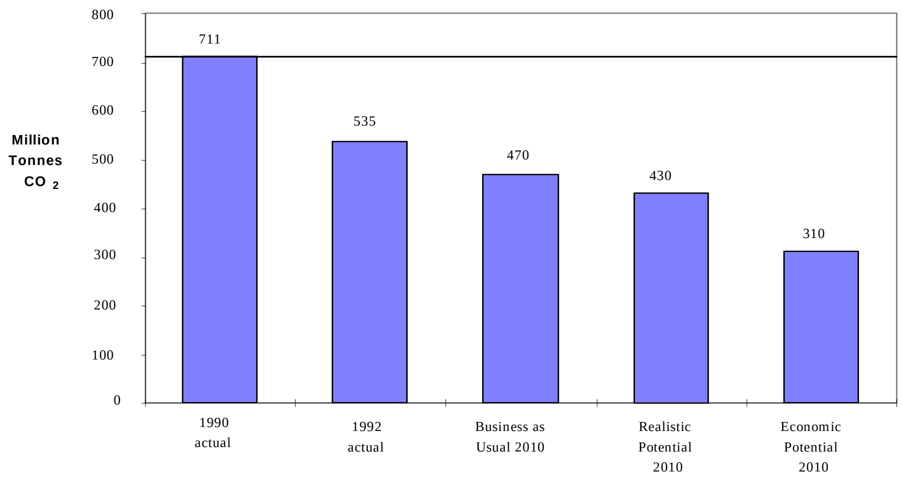
71 East European Energy Report, January 1996, Financial Times, London.

72 World Energy Council, 'National Energy Data Profile: Ukraine', London, 1995.

73 Op Cit..

IIEC of the overall economic potential for CO_2 abatement through energy efficiency. It has not been possible to estimate a technical potential for Ukraine, but comparison of energy intensities with other industrialised nations suggests this potential saving is considerable.

Figure 10. The potential contribution of energy efficiency to the reduction of Ukraine's CO_2 emissions



Source: IIEC, 1996

There is a very large supply of potential energy saving investments that have simple payback periods of less than five years if the energy savings are valued at world market prices. A number of consultants have performed audits at industrial facilities and found extremely attractive energy savings opportunities.[74 75.] Consultants to EBRD[76] estimated the marginal cost of many energy efficiency measures to be competitive with supply options, particularly if externalities are included in the assessment.[77] The carbon dioxide savings will be effectively at a net negative cost for these investments - a consequence of making economically-sound energy saving measures. In effect, the funding for carbon dioxide savings in the Ukraine could come from avoided energy supply costs to companies, households and the economy as a whole. However, recovery of initial investment depends on payment of energy bills and the continued solvency of the industrial enterprises in which investments are made.

- **Industry.** The estimates for the economic potential for energy efficiency vary considerably and are necessarily uncertain on account of the major structural changes in the economy. Because the heavy industrial sector dominates both the economy and the use of energy (up to 70 per cent of final demand in 1992), it is the scope for energy efficiency in this sector that most strongly influences the overall energy efficiency potential. However, this sector is

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74 Tebodin Consultants and Engineers, 'Energy and Environmental Audits of Industrial Enterprises in Ukraine', draft final report for the World Bank, Washington DC, March 1994.

75 Burns and Roe Enterprises, 'Energy Efficiency and Market Reform Project', prepared for US Agency for International Development (USAID), Washington DC.

76 Lahmeyer International, 'Ukraine Power Sector Least Cost Investment Plan and Training Programme', draft final report for the EBRD, London, July 1995.

77 The consultants estimated that energy efficiency was cost effective at cost of 3.0 cents without pollution externalities. At this cost, the DSM study gives an economic potential of 13 TWh.

undergoing major restructuring, as the most uncompetitive industries close. The most reasonable conclusion is that specific energy consumption in heavy industry will fall significantly through two distinct mechanisms: the most inefficient industries close and stop using energy; the remaining industries necessarily improve energy efficiency in order to compete and survive. At present, it is impossible to know which of these dynamics will predominate. In the numerous energy audits of large industrial plants, a portfolio of cost-effective measures with payback times measured in weeks and months with large energy savings have been identified. The main barrier to improving industrial energy efficiency is not the availability of extremely cost effective projects, but uncertainty over the overall financial future of many enterprises and the high rate of non-payment and arrears.

- **Domestic and Tertiary Sector.** In the buildings sector, too, there is a large scope for improvements in energy efficiency.[78] Consultants have estimated potential energy savings of 33 per cent in buildings, which equates approximately to 27 MT CO_2.[79] Buildings are poorly insulated and the occupants have little control over heat supplied. District heating systems have poor controls at the point of use and have poorly insulated and leaky pipe networks. In the domestic sector, energy efficiency may help to secure the politically difficult objective of raising energy prices to world market levels. Unlike industry, Ukraine's residential and commercial sectors do represent a stable customer base, though they are still afflicted by the problem of non-payment of energy bills.

- **Transport.** The evolution of the transport sector will lead to increasing CO_2 emissions from vehicles. Car ownership is very low by OECD standards and emissions from private cars are projected to rise steeply. The most important options to contain energy use in the transport sector will be: policies to encourage use of small, efficient, well-maintained vehicles; policies to limit car use in favour of public or non-motorised transport; and choices made about infrastructure investment and land-use planning.

- **Energy Transformation**. There is considerable scope for efficiency improvements in energy transformation (power generation and district heating) through replacement or rehabilitation of generating sets, boilers, transformers, heating pipe insulation and introduction of combustion control, power factor correction and controls at the point of use. One study reports an electrical demand-side energy efficiency 'supply' of 30.5 TWh at 6.8 US cents, 25 TWh at 5.0 US cents, and 13 TWh at 3.0 US cents.[80] This compares with the 11.5 TWh output of the two operating Chernobyl units. The potential is dominated by industrial electric motors, for shaft power, compressors, hydraulics etc. In the district heating sector, both World Bank and EBRD have developed major rehabilitation projects. Consultants' audits of district heating systems have shown a potential for large energy savings[81 82.]

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78 TSI Techinvest (Portugal) and Sogelerg Ingenierie (France), 'Study of the Potential for Developing Actions to improve the Overall Energy Efficiency in the Building Sector in Ukraine', prepared for the TACIS programme of the European Commission, Brussels, March 1994.

79 March Consulting, Ukraine Energy Saving Strategy: Buildings Sector, final draft report for the EU TACIS Programme, Brussels, May 1995.

80 Op. Cit..

81 Resources Management Associates of Madison, 'Energy Efficiency Audit Report: District Heating in the Ukraine', prepared for USAID, Washington DC, November 1992.

Capturing the CO_2 reduction potential

Despite the economic viability of energy saving in the Ukraine, there are considerable barriers to overcome to realise the potential - notably, the availability of capital, the high commercial risks faced by financial institutions and the low institutional capability to undertake auditing, investment and implementation of energy saving measures. The supply of cost-effective investment opportunities is not a constraint on the achievable potential - the main constraints relate to the capacity to exploit the available opportunities.

The key to exploitation of the energy efficiency potential of Ukraine will be the supply of capital and expertise. High commercial risk, and risk aversion among lending and development agencies, constitutes the most significant barrier to achieving the economic energy efficiency potential in Ukraine. The conditions for private sector involvement are gradually emerging, but at this stage in the reconstruction and development of Ukraine, the Multilateral Development Banks (MDBs) and other lending and development agencies have a critical role to play. In the industrial sector, MDBs and development agencies are still reluctant to provide the necessary capital and support while the future of many large industrial enterprises remains uncertain. One promising option for the World Bank or EBRD would be to establish and capitalise energy services companies (ESCOs) in Ukraine. Through these intermediaries, the MDB could develop portfolios of energy efficiency projects with sufficient hands-on engagement to ensure the projects' success, minimise risks, and enable accounting for energy and CO_2 savings. The EBRD is understood to be developing such an approach for Ukraine.

One further approach to the problem of the viability of industries would be to combine energy savings measures with other modernising investments, with a view to securing the overall viability, and energy efficiency, of the plants with greatest potential. For example, the rehabilitation of the Donetsk steel works will not only completely modernise the plant and secure its future, but also reduce electricity consumption by half and natural gas consumption by 90 per cent.[83] The questionable viability of many industrial enterprises makes investment in the industrial sector risky and constrains the achievable potential for energy efficiency.

Energy Efficiency Potential in Slovakia (Focusing on Buildings)

Background

The Slovak Republic has a highly industrialised economy, with industry accounting for 57 per cent of its net energy consumption, and in 1991, providing over 50 per cent of its GDP. Since 1990, there has been a significant decline in industrial output and energy consumption. The Slovak Republic is heavily dependent on imported energy (76 per cent of primary energy), with coal contributing the largest share of both primary energy and imports. The electricity sector is dominated by nuclear generation, which in 1992 contributed over 50 per cent of the fuel supply (an increase in nuclear electricity capacity is planned), so the CO_2 emissions attributable to the electricity sector are 7.41 Mt, or about 13 per cent of the

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82 Resources Management Associates of Madison, 'Feasibility Study for GEF Energy Efficiency and Greenhouse Gas Reduction Project: Ukraine District Heating Demonstration Project', prepared for USAID, Washington DC, October 1994.

83 Cited in Burns and Roe Enterprises, 'Donetsk Metallurgical Plant: Audit Report' prepared for USAID, Washington DC, May 1995.

national total.[84] The major sources of CO_2 emissions in Slovakia are the district heating, transport and industrial heating supply sectors. Slovakia has introduced new environmental legislation on air pollution emissions, which promises to impact CO_2 emissions while reducing harmful emissions such as sulphur dioxide and nitrous oxides. The legislation will stimulate fuel switching from high sulphur fuels (i.e. coal and heavy fuel oils) to natural gas and light oils. [85]

Table 8: Slovakia and the Energy Sector at a Glance

Population	5.33 million (1994)
Number of Households	1.7 million (1993)
Currency	Slovak Crowns (Sk); 29.7Sk = US$1 (2/1996)
GNP (billions US$)	11.94 (1994)
GNP per capita (US$)	3 450 (1989); 2,,230 (1994)
GNP per capita with PPP adjustment (US$)	6 660 (1994)
Inflation, 1995	4.8% per annum (Nov 1995)
Annual CO_2 emissions	58.3 Mt (1990)
Carbon dioxide emissions, national target base year (million tonnes CO_2)	61.5 (1988)
Total Primary Energy Supply (TPES)	843 PJ (1991)
Fuel Mix (1991):	
- coal	31%
- gas	27%
- oil	21%
- nuclear	16%
- other solid (including biomass)	1.7%
- hydro	0.8%
- import/export of electricity	2%
TPES per capita	148 GJ (1992)
Annual Electricity consumption (TWh)	24.5 (1992)
Energy Intensity (per US$1,000)	47 GJ (1989); 56 GJ (1994)

Note: data are presented for different years due to efforts to provide most current values.
Sources: World Bank Atlas 1996; Business Central Europe 1996; IEA 1994, National Communication to UNFCCC. [86]

Carbon dioxide emissions

Table 9 presents the expected growth of CO_2 and greenhouse gas emissions in the Slovak Republic. The data is presented in an aggregated format, using CO_2 global warming potential equivalents. A new

84 Mr. Ivan Mojik, Director of Air Protection Department, Ministry of the Environment, Slovak Republic, 24 April, 1996.

85 The First National Communication on Climate Change, Slovak Republic, May 1995.

86 Sources for ‘At a Glance’ Table (Slovak Republic): IEA, ‘Electricity in European Economies in Transition’, Paris, 1994. The World Bank, ‘The World Bank Atlas 1996’, Washington DC, 1995. The Economist Newspaper Ltd., ‘The Annual: 1995’, Business Central Europe, Romford, 1996. The First National Communication on Climate Change, Slovak Republic, May 1995.

emission inventory with new emission projections is being prepared as part of the US Country Study programme, and final data is expected by the end of 1996.[87]

Table 9. Estimate of CO_2 emissions for Slovakia[88](million tonnes CO_2)

Gas	1990	1995	2000	2005
CO_2 energy related	55.0	46.2	46.4	48.0
CO_2 non-energy related	2.8	2.1	2.3	2.8
CH_4	8.5	7.4	7.3	7.5
N_2O	5.1	3.0	4.9	5.3
Totals:	71.4	58.7	60.8	63.6

Note: These estimates based on "Scenario B" in the First Communication to the UNFCCC. Scenario B assumes an energy conservation of 31.5 PJ in 2005 and new data on the transport sector; Factors of conversion to CO_2 equivalents are from the IPCC, 1994.

CO_2 emissions were approximately 58 Mt in 1990 and had declined to 45 Mt by 1995 as the industrial sector contracted. The Slovak Republic has said that it "will undertake all activities to achieve the 'Toronto target' (20 per cent CO_2 emission reduction in 2005 compared to 1988)."[89] One of these activities is a national energy strategy that includes the promotion of energy efficiency. As long as the planned new nuclear and hydro power plants are built, Slovakia is likely to meet its national target for 2005, as well as the UN UNFCCC stabilisation aim (although transport growth is likely to offset these emission reductions in the energy supply sector to some extent). It is clear that in the absence of a successful energy strategy, the expected growth scenario laid out in the First National Communication on Climate Change results in emissions greater than the 1988 peak year of CO_2 emissions by 2005.

Energy Efficiency and CO_2 Emissions Reduction Potential

Studies have been conducted on the scope for energy saving in four major industries (ferrous metallurgy, chemicals industry, building materials, and paper and pulp), which account for nearly 80 per cent of industrial energy use.[90] The list below shows the main industries and the amount of energy consumed in excess of the most efficient western equivalent industries:

- ferrous metallurgy — 20 per cent reduction possible by replacing outdated furnaces with arc furnaces, and adopting continuous casting;
- chemicals — ethylene production standard; ammonia production 23 per cent higher energy consumption; other chemicals still higher;
- building materials — 25 per cent higher energy consumption for brick production;
- paper and pulp — 40-50 per cent more heat for drying pulp; 20-25 per cent more electricity.

87 Op. Cit..

88 Op. Cit..

89 Op. Cit..

90 Kaan *et al*., 'Energy Conservation Stimulation Programme for the Slovak Republic - Phase 1: Energy Conservation in the Manufacturing Sector', Netherlands Energy Research Foundation (ECN), Petten, 1994. Op. Cit..

An energy savings potential of 65 PJ, or a 33 per cent reduction in the energy consumption of these industries, was identified.[91] As well as measures requiring large-scale investments, improved energy management would also yield significant energy savings. It is important to note that the estimated potential is a comparison with the most efficient western industries.[92] These figures are likely to underestimate the potential, as a new Air Act on CO_2 is expected to stimulate further switching from coal and heavy fuel oil to light fuel oil and gas.

Space heating in apartments provides a significant potential for energy savings. Heat consumption in Slovak buildings is 2-3 times higher than that in western European countries.[93] Heating and hot water systems in buildings account for about 80 per cent of their energy consumption.[94] There are approximately 1.67 million dwellings in Slovakia, almost equally split between flats and houses. Around 600 000 flats are of the prefabricated ‘panel’ design. In general, these have very poor thermal properties, although those built after 1983 (around 270 000), have external walls with a 50 per cent improvement in insulating properties because of the introduction of thermal performance requirements in this year.[95] According to the Austrian Energy Agency (EVA), comprehensive improvements in insulation could save as much as two thirds of the heat consumed, or 47 PJ per year.[96] The cost of such action is high, approximately 153Sk billion ($5.15 billion). However, simple improvements could yield one third of this savings potential - 15.6 PJ - while only requiring 1 per cent of the total cost. A study by the Dutch ECN Institute highlights the potential for energy conservation in the building sector of the Slovak Republic. In the residential sector, measures such as the installation of thermostatic valves, seals to windows and doors, improvements to district heating systems, installation of attic insulation, insulation of exterior walls and the addition of a third pane of glass for triple glazing were analysed. The financially viable measures could save an estimated 27.4 PJ, or about 40 per cent of energy consumption in the residential sector. [97]

Table 10 compares the actual energy consumption for heating of non-residential buildings if certain heat saving measures were implemented. These measures involve new windows, additional thermal insulation in walls and under roofs, and an unspecified improvement in the heating system. The technical potential is for 42 PJ or 60 per cent energy savings - approximately 6% of 1995 final energy demand. This large potential is unlikely to be achieved in practice, but does illustrate the scale of savings that could be made in the tertiary sector.

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91 Austrian Energy Agency (EVA), ‘Opportunities to Improve Energy Efficiency in the Czech and Slovak Republics’, Vienna, June 1994.

92 Kaan *et al*., ‘Energy Conservation Stimulation Programme for the Slovak Republic - Phase 1: Energy Conservation in the Manufacturing Sector’, Netherlands Energy Research Foundation (ECN), Petten, 1994.

93 Kaan *et al*., ‘Energy Conservation Stimulation Programme for the Slovak Republic - Phase 2: Energy Conservation in Buildings’, Netherlands Energy Research Foundation (ECN), Petten, April 1995.

94 Op. Cit..

95 Bill Sheldrick, Alembic Research, personal communication, Feb 1996

96 Ibid.

97 ‘Cost-Benefit Analysis of Energy Conservation Measures in the Slovak Republic’, NEI.

Table 10. The technical potential for energy savings in non-residential buildings

Building type	number of buildings	current energy consumption (PJ)	technical energy saving (PJ)
Hospitals	195	10.1	3.4
Health centres	1 904	4.3	1.3
Schools	4 369	27.1	18.1
Kindergartens	3 642	5.6	3.7
College campuses	59	0.6	
Office buildings	1 345	13.1	10
Hotels	717	5.3	2.3
Department stores	151	0.5	0.3
Shopping centres	378	1.3	0.7
Other retailers	16 886	3.0	1.7
Totals	-	71.0	41.5

Source: The Netherlands Energy Research Foundation

Conservation Potential for End-uses of Electricity

Several assessments have been conducted by various consultants to quantify the potential for savings in the electricity sector. Table 10 presents a summary of the estimated potentials. A CO_2 equivalent for electricity savings was prepared for these studies using an estimate of the CO_2 generated per kilowatt hour. In 1992, Slovakia's electricity supply breakdown was 12 TWh nuclear, 8.5 TWh Oil/Gas/Coal, and 2 TWh Hydro, with 2 TWh net imports. The CO_2 emissions that year from the electricity sector were 7.41 Mt.[98] Assuming the nuclear and hydro supplies as baseload, reductions in electricity use through efficiency gains would be felt on imports and fossil fuel supply. With this assumption, one arrives at an estimate of aggregated CO_2 emissions from electricity generation of 706 Mg CO_2 per GWh. This figure was used to estimate the CO_2 savings potential of the projects listed in the studies in Table 11.

98 IEA, 'Electricity in European Economies in Transition', Paris, 1994. Ivan Mojik, Director of Air Protection Department, Ministry of the Environment, Bratislava, personal communication, 24 April, 1996.

Table 11. Estimates of the Electric Power Savings Potential

Study Group	Electricity Savings	Electricity Savings as a proportion	CO_2 Savings	Cost of measures
Power Smart (Canada)	742 GWh per year (demand side management)	3% of consumption	524 thousand tonnes per annum	US$107 million; investment paid for by energy savings
Tractebel (Belgium)	2 247 GWh by 2010 (realistic potential)	10% of capacity	1.6 million tonnes	US$0.013 per kWh; compared to tariff US$0.03-0.05/kWh
EGU (Slovak Energy Research Inst.)	2 600 GWh by 2010	n/a	1.8 million tonnes	n/a
SEI (Slovak Energy Inspectorate)	1 745 GWh by 2005	n/a	1.2 million tonnes	n/a
EVA (Austrian Energy Agency)	5 000 GWh (tech potential)	20% consumption	3.5 million tonnes	n/a

Source: Austrian Energy Agency (EVA), 1994

Energy Efficiency Potential in Russia (overview)

Table 12. Russia and the Energy Sector at a Glance

Population	148.7 million (1995)
Currency	Rouble; 4767 Roubles = US$ 1 (1/1996)
GNP (estimate, US$ billion)	392.5 (1994)
GNP per capita (US$)	2,650 (1994)
GNP per capita with PPP adjustment (International dollars)	5 260 (1994)
Inflation, average 1985-1994	124%
Annual CO_2 emissions	2100 Mt (1992)
Total Energy Consumption (TEC) (1994)	29,056 PJ
Fuel mix (1994):	
gas	51%
oil	22%
coal	18%
primary electricity	8%
TEC per capita	195.4 GJ (1994)
Annual electricity consumption (TWh)	721 (1994)
Electricity Use per Capita (thousand kWh per capita)	4.85 (1994)
Energy Intensity (per US$1000 of GDP)	74 GJ /US$1000 (1994)

Sources: World Bank Atlas 1996; Business Central Europe, 1996; IEA 1995; EBRD 1995

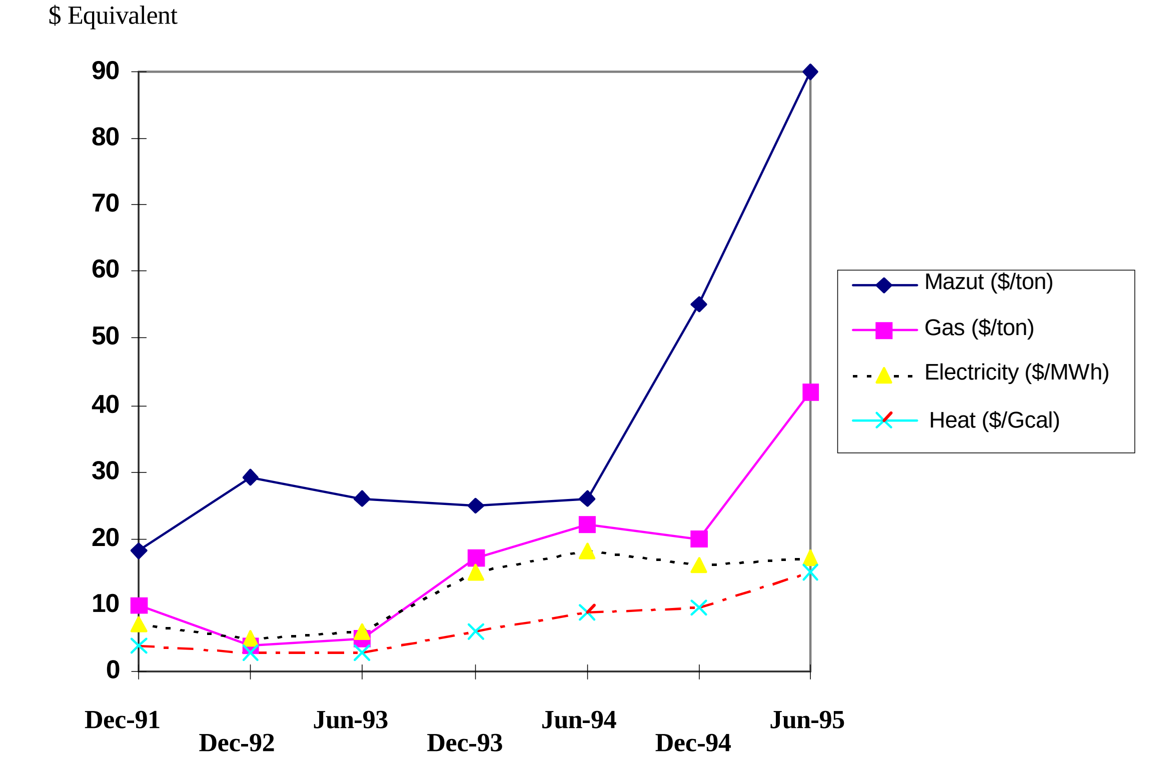
> "According to the new energy strategy, structural and technology reorganisation of energy intensive industries must become the main task and direction for the energy conservation activities. Such reorganisation will determine stabilisation of GDP energy intensity by 1997 and its decrease by 20-25% by 2010. Half of the overall energy conservation effect (its potential accounts for over 1/3 of the total energy demand) is expected due to the introduction of less energy intensive technologies."
>
> V. Bushuev, Deputy Minister of Fuels and Energy, (Interview in CENEf newsletter April-June 1995).

An overview of the Russian energy economy is provided in a paper by Igor Bashmakov in Appendix 9. This paper also discusses a wide range of policy issues and current initiatives to promote energy efficiency. It is clear, both from this paper, and studies by the IEA and Martinot, that the potential for energy efficiency is very large.

For Russia, the industrial electricity price in December 1991, before price liberalisation began in 1993, was 3 kopeks/kWh (around 0.5c/kWh equivalent), which was 10-20 times lower than typical prices in the USA, though PPP adjustments would reduce this margin. Since 1992, the prices of many goods have been freed from State control. Energy prices were still regulated by the State in 1994, and though domestic production costs are low, the true costs of depreciation, maintenance and capital improvement were not reflected in energy prices. The oil, gas, and electricity and heat supply industries received no government subsidies. By early 1994, oil prices were about 50 per cent of world levels, retail natural gas prices in European Russia were about 20 per cent of Western European levels, and electricity prices 10-50 per cent of those typically found in the USA.

By mid-1995, some energy prices, particularly in natural gas and heavy fuel oil, had risen to market levels, but residential electricity and heat prices remained well below the full cost of supply. Electricity prices in April 1995 were around 2c/kWh for industrial consumers and 1c/kWh to residential customers. Even at these low residential energy prices, non-payment of energy bills is a serious problem. Levels of non-payment of 25 per cent are common. For the City of Moscow, heat supply companies are paid their full tariff, while residential consumers are charged only 3-5 per cent of these amounts. These subsidies represented around 5-10 per cent of the total city budget. In other cities, the cost-recovery is greater, and by mid-1995, customers were charged 10-20 per cent, and 30 per cent of the cost of heat supply in some cases. While these residential heat subsidies remain, there is of course a major incentive to municipalities to utilise energy efficiency as an option for cutting their budget expenditure on subsidies. Figure 11 shows the evolution of energy prices for natural gas, heavy fuel oil (mazut), electricity and heat in Russia between 1991 and June 1995.

Figure 11. Natural Gas, Mazut, Electricity, and Heat Prices in Russia, 1991-1995



Source: Martinot, 1995

According to the IEA:[99]

- The potential for energy conservation is 40-45 per cent of the current level of consumption, based on 1995 energy prices.
- A 'realistic' scenario (which does not require "huge investments and a complete restructuring of the economy") would produce an estimated annual savings of 65-75 million tonnes of oil products, chiefly in transport; 100-110 billion cubic metres of natural gas (more than one-third in electricity and heat generation); and 330-390 TWh of electricity, largely by industrial consumers.
- Energy intensities have worsened by 47 per cent since 1989 due to GDP falling more than primary energy consumption.
- The specific energy consumption (SEC) in residential buildings (kJ per square metre per degree day) is around 190 in Russia, compared to 120 in Finland, 143 in the UK, 150 in Germany, and 150 in Poland.

By simple comparison with their Western equivalents, energy intensities could be reduced in Russia by 25 per cent for space heating supported by district heat, by 35 per cent for space heating from on-site boilers, 20 per cent for water heating, by 20 per cent for new cars and aircraft, and by 25 per cent for new

99 IEA, 'Energy Policies of the Russian Federation: 1995 Survey', Paris, 1995. Op. Cit., and.

appliances. Beyond this general assessment, it is more difficult to draw specific conclusions due to the poor quality of data (for example, the GDP figures are highly suspect).

District heating is a major consumer of energy in Russia, far higher than electricity usage. Heat loss in both housing and public buildings is high. In many of Russia's regions, the 'acceptable heat loss standard is 1.5 - 2 times higher than in similar climatic conditions elsewhere in the world'.[100] This reflects the lack of metering and control valves, the old age of heating equipment, the poor maintenance of equipment, old and poorly insulated supply and distribution pipes, and a lack of individual heat control in most apartments.

A number of demonstration and commercial projects in the district heating sector have taken place. These include multinational company projects in Moscow (Tushino district in Moscow), a thermostatic radiator valve (TRVs) project at a car plant in Moscow, manufacturing of TRVs for the Russian market, bilateral aid projects involving the replacement of coal and oil-based boilers by biomass boilers, energy audits and building shell improvements, and MDB projects upgrading district heating boilers.

The barriers which are inhibiting energy efficiency investments are many and varied. Some of the more significant ones for Russia are:

- non-payment of utility bills (one estimate by the IEA showed more than 70 trillion roubles of debt in the energy sector at December 1994);
- low energy prices in some sectors, though this is changing rapidly;
- culture - Russia has a very supply-orientated approach to energy problems and investments;
- despite a range of energy efficiency policies, legislation and governmental initiatives, actual implementation and compliance are very low (see Appendix 3 for further details);
- uncertainty and weakness in the banking sector;
- monopolies and state-ownership are still common, inhibiting new companies, and more innovative technological and financial approaches;
- poor building design and badly maintained equipment;
- a lack of clarity over the roles of Municipal and Federal Government and other Agencies; and
- high levels of corruption.

It is clear from the above that it is currently difficult to carry out straight-forward commercial energy efficiency project financing in Russia. Many of the projects completed so far have required grants, soft loans, free equipment supplies and technical assistance. Though many of the projects have demonstrated the technical viability of energy efficiency, they are hard to replicate in the absence of energy policy and price reform, a more stable economy, and a reformed banking sector. Technical co-operation, more innovative financing options, and ways of softening the transaction costs of projects, will be needed until these changes take place.

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100 Eric Martinot, 'Energy Efficiency and Renewable Energy in Russia: Perspectives and Problems of International Technology Transfer and Investment', PhD Thesis, submitted to University of California, Berkeley, 1995, p.58.

4. ENERGY EFFICIENCY FINANCING

This section reviews some of the activities of the major institutions involved in energy efficiency financing in the EIT countries. There is a shortfall of affordable capital to fund energy efficiency projects in EIT countries, but there is an increasing degree of activity and focus on the issue. A series of telephone and fax interviews with a wide range of multilateral and bilateral financing institutions, as well as project developers themselves, was carried out to review current activities. There are many institutions and bilateral programmes involved and not all were reviewed. This section documents some of the most important programmes and gives examples of what has and has not worked.

Total financial flows

Financial flows to the EIT countries and specifically for efficiency projects are relatively low. Total net resource flows for energy to all developing countries in 1993 and 1994 were $233 billion, according to a World Bank estimate.[101] Of this, $6 billion went to the EIT countries (see Table 13). The need remains much greater than this, however. The total financing needs for energy supply projects in developing countries and EIT countries is estimated to be $160 billion per annum from 1995 to the year 2000. One estimate has suggested that the investment needed in order for the EIT energy sectors to reach OECD country market standards for quality of service, viability, efficiency, environmental compatibility, and safety is between $2 to 3 trillion from 1990-2020, or an average of $70-100 billion per annum.[102]

Table 13. Net Finance Flows and Estimated Requirements for all Developing Countries and EIT countries (1993-94)

	Total provided in 1993 and 1994	Estimated Annual Capital Requirements for Energy
Total net resource flows to developing countries	$233 billion	$160 billion
Total to CEE/CIS	$6 billion	$70-100 billion

Source: World Energy Council, Joint Report by the International Institute for Applied Systems Analysis and the East/West Energy Programme of the WEC.

The needs for the region still dwarf the current financial flows. Some of this shortfall is being made up by local funds, for example, in Poland, but a large proportion of the needs are simply not being met. The Energy Savings Action Plan approved by the Hungarian government estimates that energy efficiency investments of a minimum of US$422m and up to US$1.25 billion are needed over the five-year period

101 International Finance Corporation, 'Annual Report 1995', Washington DC, 1995.

102 International Institute for Applied Systems Analysis and the East/West Programme of the World Energy Council, Report to the 16th Congress of the WEC, London, October 1995.

from 1994 to capture the cost effective energy saving potential and reduce pollution emissions. The Ministry of Industry and Trade has estimated a need for up to US$4b over the next ten years to raise Hungary's energy efficiency levels to OECD standards.[103] These figures are in stark contrast to actual expenditure levels, around a factor of ten lower.

It is important to note that of total expenditures on energy and environmental projects, only 1-20 per cent derived from non-local sources such as the MDBs. The bulk originates at a local level. For example, consider the estimated environmental needs and the funding actually available in Poland. It has been estimated that the country needs to spend at least $1.5 billion per year to bring the country to a sustainable economic and environmental path. The total spent by Poland in the 1990s was in the range of $800 million to $1 billion per annum (or roughly 1 per cent of GDP). Of this, pollution fees and fines should have generated $500 million per year (though less than $300 million per year was actually received), while multilateral and bilateral grants amounted only to $30 million in 1991. The breakdown in Poland for 1991 is shown in Table 14. This pattern persists in 1995, though bilateral support has increased since 1991.[104] The high dependence on domestic funds shown here shows the importance of investment in local institutions/capacity building and mobilising local industrial and residential energy expenditure for energy efficiency.

Table 14. Sources of Environmental Expenditure in Poland (1991)

Source of Funds	Percentage of total
State budget (grants)	5%
National funds (grants and soft loans)	15%
Regional environmental funds (grants)	25%
Enterprises (polluter's own resources and commercial loans)	30%
Municipalities (budgets and commercial loans)	20%
Foreign assistance (grants and development loans)	5%

Growth in private investment has been the most significant development in financial flows to developing countries and EIT countries in the 1990s. Of the $233 billion from the private and public sector referred to in Table 13, public development finance (multilateral development bank and other government) is estimated at between $54 and $60 billion (less than 25 per cent of the total). This is down from 56 per cent of the total in 1990 (total public sector flows of $57 billion in that year). While public flows have stagnated, private flows have thus increased four-fold to $173 billion. This private investment ratio has been particularly high in the far east and parts of Latin America. In contrast, the increase in private sector capital flow to the CEE/CIS region, excluding privatisation financing in Poland, Hungary and the Czech Republic, has so far been modest.

A number of the programmes and funds discussed below relate specifically to energy efficiency are either new or yet to be implemented. This reflects changes in attitude to energy and related policies, primarily by the multilateral development banks, and their attempts to address some of the barriers to energy

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103 Global Environmental Facility representative, personal communication, February 1996.

104 Tomasz Zylicz, 'Pollution and Natural Resource Taxes in Poland', Harvard International Institute for International Development Seminar, Tallin, April 1993.

efficiency in the region which are discussed in Section 5. Many institutions are either actively involved in financing in the EIT countries or are ready and willing to be involved when the conditions are right.

Table 15. Multi-lateral and Regional Development Banks and Programmes Funding Energy Development in Eastern Europe

World Bank Group
- **International Bank for Reconstruction and Development (IBRD)**
- **International Finance Corporation (IFC)**
  - **-Financial Institutions**
  - **-Lending**
  - **-Renewable Energy and Energy Efficiency Fund**
- **Global Environment Facility (GEF)**
  - **-General lending**
  - **-Environmental Enterprise Assistance Fund**
  - **-Small and Medium-Sized Enterprise Programme**
- **Global Environment Division**
- **Multilateral Investment Guarantee Agency (MIGA)**

European Bank of Reconstruction and Development (EBRD)
- **Energy Sector Loans**
- **Energy Efficiency Department**

EC Energy Programmes
- **PHARE**
- **TACIS**
- **Thermie**

Project Preparation Committee
European Investment Bank (EIB)
Nordic Environment Finance Corporation
Nordic Investment Bank

MDB Financing

The Multilateral Development Banks (MDBs) are given extra weighting in this review because:

- they are large scale lenders;
- they often have relevant policies strongly in favour of energy efficiency; and
- where they do not have policies or where they ignore them in their operational activities, they may inadvertently have a very negative impact on project lending.

The total funds committed to energy investments by the World Bank Group, EIB and EBRD between 1990 and 1995 amounted to $6.7 billion. Of the total during this period that went to the CIS region, 87 per cent was for oil and gas extraction in Russia.[105] The amounts that went to the CEE countries were more generally spread among a number of countries and were for energy projects as opposed to extraction

105 'Energy Transition in Central and Eastern Europe: Investment Needs & Financing Possibilities', Report 1995, London, September 1995.

projects.[106] Two-thirds of the total EBRD energy funds in 1990-1994 went to Hungary and the Czech and Slovak Republics. When Poland and Russia are included with these three countries, the proportion increases to 86 per cent.[107] This refers only to commitments, however, as EIT disbursements are usually slower. The World Bank average disbursement is 20 per cent per project per year and some do not occur at all. For example, of the aggregate FDI earmarked for the CEE and CIS countries up to and including 1991, ($13 billion for over 30 000 joint ventures and investment proposals), only 40 per cent was actually disbursed by 1995.[108]

Table 16. Energy Efficiency Financing in EIT Countries from the MDBs

EBRD:	**1992-94 [109]**	**Total energy sector lending in CEE/CIS**	**$3559m**
		Total end-use efficiency lending	**$56m**
		Percent of total energy lending for energy efficiency	**2%**
	1995[110]	**Total energy sector lending in CEE/CIS**	**$277m**
		Total end-use efficiency lending	**$17m**
		Percent of total energy lending for energy efficiency	**7.5%**
EIB[111]:	**1993-94**	**Total energy sector lending in CEE region**	**$591m**
		Projects with end-use efficiency components	**$14.4m**
		Percent of total energy lending for efficiency	**2.4%**
	1995	**Total energy sector lending in CEE region**	**$360m**
		Total end-use efficiency lending	**$11.2m**
		Percent of total energy lending for energy efficiency	**3%**
WB:	**1991-95**	**Total energy lending in CEE/CIS[1]**	**$1940m**
		Projects with end-use efficiency components	**$58m**
		Percent of total energy lending for efficiency	**3%**

1. Based on an assessment of 15 major energy sector loans by the World Bank between 1991 and 1995 (ranging from $15.7 million to $340 million). In the case of unspecified 'efficiency' or supply-side efficiency loans a generous 15%was allocated to demand-side efficiency. For other MDBs, where loans identified as 'efficiency' or supply-side efficiency are unspecified, an assumption of 15% of these being for end-use efficiency was made. An exchange rate of 1ECU:$1.24 was assumed for all currency conversions.

Both the World Bank and the EBRD have energy policies that include specific references to sustainable development and energy efficiency. In the past, critics have found, however, that sometimes these are ignored or have been difficult to institutionalise. The 1992 World Bank Energy Policy recommends that:

106 Ibid.

107 World Energy Council, 'The Energy Economy in Central and Eastern Europe in Transition: Report 1995', London, 1995.

108 European Bank for Reconstruction and Development, 'Annual Report 1991: A Changing Europe', London, 1991.

109 European Bank for Reconstruction and Development, 'Energy Operations Policy', London, 7 March 1995.

110 European Bank for Reconstruction and Development, 'Project List, 1995' London, 1995.

111 European Investment Bank, 'Country Report on Financing Provided in 1995', Luxembourg, 1995.

> "power loans be based on integrated energy strategies, to contain significant components to build the institutional capability to address energy efficiency, to require movement toward economic pricing and to establish or strengthen government regulatory systems that address improved end-use efficiency."[112]

In addition to this, the World Bank states that demand-side management issues and providing end-use energy support will be identified and given high-level in-country visibility, and where possible, a utility-based integrated resource plan "might be pursued".[113] Progress to date has been relatively slow, however. In response to criticisms that these recommendations were being ignored, the general Energy Policy was upgraded to an Operational Policy in September 1994. Furthermore, in its address to the Berlin Conference of Parties to the Framework Convention on Climate Change in March 1995, the World Bank stated that global externalities such as the impact on the environment are now to be identified and evaluated as part of the Environmental Assessment process. This will be included in the economic and sector work, which is part of an overall country programme and from which projects are identified.[114] Developing the tools necessary to perform this evaluation remains a task for the future.

The EBRD also makes both implicit and explicit reference to the use of integrated resource planning by selectively supporting those projects that rank high in priority as part of a long-term, least-cost plan (though this has tended to concentrate solely on supply-side options, so far) or, if feasible, an integrated resource plan to ensure supply and demand-side projects are considered on an equal footing.[115] In order to overcome the organisational inertia which tends towards large infrastructure projects, the EBRD established an Energy Efficiency Department in October 1994. This Department is staffed by energy efficiency experts with knowledge of alternative financing techniques that can overcome both the problems of the small scale nature of projects and local bank conservatism.

In summary, only a small proportion of the overall financial flows from MDBs for energy projects went to the EIT countries. Industrial and residential demand-side efficiency projects were, in turn, a small fraction of energy financing estimated at between 2 per cent and 7.5 per cent for the EBRD, 3 per cent for the World Bank and less than 3 per cent for the EIB in the period 1991-1995.

The World Bank

According to its review in "The World Bank and the Environment in Central and Eastern Europe: 1990-1995", the World Bank has committed $1.3 billion to help finance 12 stand-alone environmental projects in the CEE. This represents 7 per cent of total World Bank lending for all the CEE countries since 1990. In addition, it has supported environmental components or objectives in 27 other projects.[116] Few of these projects have energy efficiency components. Between 1980 and 1990, less than 1 per cent of World Bank energy sector loans went to demand-side efficiency options. Detailed discussions in the early 1990s led to

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112 Environmental Defense Fund and Natural Resources Defense Council, 'Power Failure', Washington, DC, March 1994.

113 The World Bank, 'The World Bank's Role in the Electric Power Sector', Washington, DC, 1992.

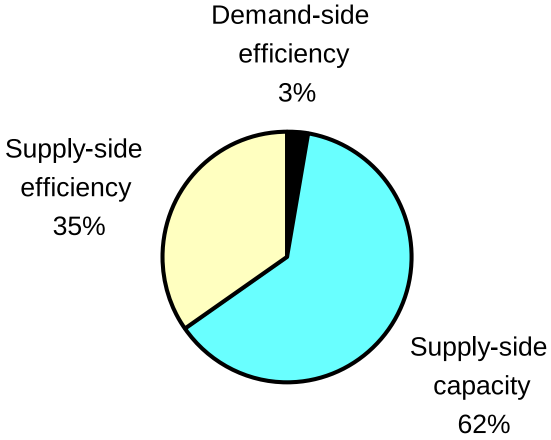
114 Environment Department of the World Bank, 'The World Bank and the UN Framework Convention on Climate Change', Washington, DC, March 1995, p. 9.

115 Op. Cit., p. 17.

116 The World Bank, 'The World Bank and the Environment in Central and Eastern Europe: 1990-1995', Washington DC, 1995, p. 1.

two new energy policies which gave a much higher priority to energy efficiency. For this study, 15 major energy sector loans between 1991 and 1995 (ranging from $15.7 million to $340 million) were assessed. Even allocating a rather generous 15 per cent of unspecified efficiency or supply-side efficiency loans to demand-side efficiency, no more than 3 per cent of total energy loans actually went to end-use efficiency projects. Around one-third of total energy sector lending during the period (totalling just under $2 billion) went to supply-side efficiency improvements, while the bulk went to energy supply projects.

Figure 12. World Bank Energy Lending to Eastern Europe (1991-1995) ($1.98 billion)



Source: World Bank Annual Reports

Finance is provided through several discrete operations. The IBRD works with countries on overall policy and makes local project trade-offs; the International Finance Corporation (IFC) finances commercial ventures and is currently emphasising the development of local financial institutions and leasing companies; the Global Environment Facility (GEF), (which is jointly managed with UNEP and UNDP), provides grant financing only, and this is strictly for the incremental costs of an environment project that would not otherwise go ahead as the preferred project option. Other types of financing are under consideration. The World Bank has initiated small-scale funding mechanisms and is continuing to develop these initiatives. The Multilateral Investment Guarantee Agency (MIGA) insures against non-commercial risks, though it has not been active in the energy sector in the EIT countries.

The World Bank - Russia

The World Bank has several targeted efficiency programmes in Russia, some of which may be used as pilot projects for the whole region:

Russia Energy Savings Fund. This Fund was established to address the inefficiencies in district heating in Russian cities, a problem known to be very common throughout Russia and the CIS. This Fund was approved in May 1995 and funding was available in March 1996. The total Fund size, projected to be $60 million (though only a small percentage is currently available), is to be used as loans and lines of credit. The mechanism for disbursing the funds is a loan to the Russian Energy Savings Fund (RESF) amortised for ten years. As an incentive, the RESF retains 0.5 per cent if the loan is repaid. Feasibility studies have been prepared for eight projects in three cities, financed by US AID. The studies are replicable in other cities, and in total ten cities meet the criteria of the Fund. Results of the projects and other related information will eventually be disseminated by the Russia Energy Savings Fund to other cities. Foreign ESCOs have begun to show an interest in the opportunities made available by this Fund.[117] The ESCOs will have to finance 20-30 per cent of the project.

Enterprise Support Programme. The mandate is to support the restructuring of local industry by making funds available to local commercial banks. The Enterprise Support Programme has been approved by the World Bank Board but is not yet fully implemented. Because significant improvements in energy efficiency were achieved by industrial companies during a more broadly based restructuring from 1992-95, this programme is anticipated to achieve benefits for energy efficiency, as well as overall industrial restructuring.[118]

Enterprise Housing Divestiture Programme. This is a major project established to support the World Bank Programme for the Russian Government, with specific emphasis on the privatisation programme. Many major enterprises own housing that is energy inefficient and expensive to maintain. This is thought to be a barrier to their attractiveness to potential investors. As a condition of a loan from this programme, ownership would be initially transferred to local government and proceeds would go towards efficiency improvements, to refinance mortgage or loan costs for new owners and tenants, and to reduce home energy bills. The World Bank has identified six cities with a list of possible projects. The loan will be on standard World Bank terms, with a five-year period of disbursement repaid in fifteen years at World Bank rates, currently about 7 per cent. The loan, which could be up to $300m, will be made to the Russian Government, which will then on-lend for an additional margin. This project is expected to be submitted for Board approval soon.

The World Bank - the IFC

The IFC is the private sector arm of the World Bank. The World Bank's energy sector strategy, as made explicit in its paper presented to the Conference of Parties in Berlin, "encourages the adoption of appropriate energy pricing and institutional reform."[119] Much of the IFC's work on efficiency, therefore, is through structural reform rather than at the project level.[120] It finances private sector ventures and projects through private investors. Its advisory work also helps governments stimulate domestic and foreign private investments. The IFC provides a range of variable rate loans, equity and quasi-equity and risk management instruments. Loans and equity investments totalled $2.9 billion globally in FY 1995. The ratio of project capital costs to IFC financing is about 7-to-1, implying a total project value of over

117 World Bank Energy Division Representative, personal communication, Washington DC, January 1996.

118 World Bank Division of Energy, Infrastructure and Environment Representative, personal communication, Washington DC, January 1996.

119 Op. Cit..

120 International Finance Corporation Representative, personal communication, Washington DC, January 1996.

$16 billion. Loans have commercial interest rates and are available in hard currency, with maturities up to twelve years. The range of investments is between $1 million and $100 million, though in practice the minimum threshold is often $10 million. Participation is normally limited to 25 per cent of a project's costs, implying a minimum project size of $40 million. The IFC is attempting to address the problem of bias towards large-scale projects through a Renewable Energy and Energy Efficiency Fund (due to start up in late 1996), and two GEF programmes targeted at small projects (see below).

Financial Institutions Division. The objective of this group is institution building, in order to address the limited access to long-term funding by financial institutions in the region. This programme supports local banking through long- or short-term on-lending, establishing leasing companies, contributing to venture capital funds and making direct equity investments.

Leasing activities. The IFC has 40 leasing companies in 37 countries world-wide. The Bank makes an excellent return on these. For example, when a leasing company has been sold, the return on the initial investment has often been in the region of 25-30 per cent.[121] In the CEE/CIS region, leasing companies have already been established in the Czech Republic, Romania, and Estonia and there is the possibility of establishing companies in Russia, Ukraine, Bulgaria and Albania in the near term. These are being actively developed because the equipment need in the region is so great that the collateral is expected to hold its value well. Leasing companies are usually established with a local partner for four reasons: 1) to identify local clients; 2) to provide access to local currency; 3) to provide on-going financing, (the lack of which has proved to be the greatest constraint to growth in the region); and 4) for local political reasons.[122]

Equity Funds. The IFC equity funds typically target minority shareholder roles thought too risky for most private sector participants. A foreign joint-venture partner is generally required, with two exceptions: the First Hungary Fund,which takes majority participation up to 100 per cent, and a $12 million Ukraine Fund for small management-owned companies, where another joint venture partner would be unwieldy for the management. For equity participation there is a dichotomy between countries in the region. Enterprises in Poland, the Czech Republic, and Hungary - countries that have relatively well-developed banking sectors - are reluctant to accept equity participation. The other countries of the region have fewer options and have been more willing to do so.[123] Where there is already a foreign partner in-place, it is relatively easy for the IFC to become involved.

One manager of an IFC fund in Poland, which invests in Poland, Hungary, the Czech Republic and the Slovak Republic, has indicated that equity may not be the right strategy for these countries because of the reluctance on the part of entrepreneurs to have an outside shareholder. This reluctance may also be cultural.[124] Clauses in the shareholders agreements designed to protect the minority shareholder, in particular, frighten owners.[125] Convertible loans, legally available in Poland since 1995, or a combination of equity and convertible loan, might be a better structure. Between $500-600 million of equity is available to be invested in Poland, but the fund managers are having difficulty in locating investments. As

121 Financial Institutions Division Officer, personal communication, the International Finance Corporation, Washington DC, February 1996.

122 Financial Institutions Division Officer, personal communication, the International Finance Corporation, Washington DC, January 1996.

123 Ibid.

124 Advent Fund Officer, personal communication, London, February 1996.

125 Partner of the Renaissance Fund, personal communication, January 1996.

a result, the three biggest funds in Poland, managed by CS First Boston, Invesco and Barings, respectively, are largely invested in listed securities; there is very little private equity.[126] A partial list of IFC equity funds in the region (most with some EBRD participation as well) is outlined in the box below. In general, these funds have not had any direct involvement in energy efficiency investment. They are relevant here because they are in the local market and able to make small-scale investments, both of which should make them better placed for energy efficiency projects.

IFC Supported Equity Funds

- **Copernicus Fund.**
- **Slovenian Development Capital Fund. Total fund size $25 million.**
- **Creditanstalt Advent Hungary Private Equity. Total fund size $15 million.**
- **Euromerchant Balkan Fund. Total fund size $25 million in Bulgaria.**
- **Ukraine Fund. Total fund size $11.5 million.**
- **Estonia Industrial leasing Ltd. Joint venture leasing of $1.9 million plus $0.2 million equity (without EBRD participation).**
- **New Europe East Investment Fund. Focusing on privatised companies or newly established ventures. Typical investments $5-15 million.**
- **Advent Fund. Regional pool of $10 million including funding of local capital pools but not including the co-investment opportunities of key investors such as the Abu Dhabi Investment Authority and GE Capital Regional Fund.[127]**
- **Alliance ScanEast Fund. With Finnish co-investment. IFC contribution $4million.**
- **Renaissance Fund. Total fund size $30 million.**
- **First NIS Regional Fund. Invests only in NIS countries and only up to 20 per cent maximum as limited by Luxembourg law, the country of incorporation.**
- **Baring Investment Management Ltd. Total equity $160 million of which the first two tranches of $105 million have been drawn.**
- **Czech and Slovak Private Equity Fund.**
- **Hungarian Capital Fund Ltd.**

The Renewable Energy and Energy Efficiency Fund

The Global Renewable Energy and Energy Efficiency Fund is a World Bank proposal that is intended to have GEF financing, with the IFC as executing agency. The proposal was confirmed at a GEF council meeting in April 1996. This projected multi-million dollar Fund is in the process of being established, and it is expected to be in place by the end of 1996.[128] $30 million was granted from GEF in April 1996. The objective is to tap private sector resources and to channel them towards renewable energy and energy efficiency projects in developing countries and the economies in transition. Specifically, it will benefit

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126 Investment Officer, Barings Emerging Markets Department, personal communication, London, January 1996.

127 Advent Fund Investment Officer, personal communication, London, January 1996.

128 Renewable Energy/Energy Efficiency Fund Task Manager, personal communication, International Finance Corporation, Washington DC, January 1996.

the international community by cost-effectively reducing greenhouse gas emissions through smaller-scale efficiency and renewables projects. According to an IFC banker, "These projects would penetrate new markets with technologies proven elsewhere or involve transactions too small to be attractive to existing sources of investment."[129] The total size of the Fund is planned to be between $130 to $230 million, consisting mostly of private investors, with the IFC contributing about 20 per cent of the total fund size. The Fund will provide both equity and possibly debt instruments, and will not require government guarantees. Funding is expected to be used by ESCOs, large industrial end-users, manufacturers of energy-efficiency products and for financial intermediaries for renewables and efficiency. [130]

The Hungarian Energy Efficiency Co-Financing Fund (HEECF)

This fund is a World Bank proposal that is intended to have GEF financing, with the IFC as executing agency. The proposal was confirmed at a GEF council meeting in April 1996. This is a $5 million fund supporting the energy efficiency financing activities of qualified financial intermediaries (FIs). The three target sub-sectors are lighting, district heating, and industrial motors in processes. The goal of HEECF is to facilitate and leverage private sector capital. The intention is to leverage at least $25 to $30 million through direct project financing support (credit guarantee and medium to long-term co-financing loans) and some modest technical assistance support. The fund is a response to the crowding out of local medium-term credit which is funding government budget deficits offered at attractive rates.

The World Bank - Global Environment Facility (GEF)

The GEF was established to address four main environmental problems: global warming, the pollution of international waters, destruction of biodiversity and depletion of stratospheric ozone, although the latter is funded separately through the Montreal protocol. It addresses only those incremental costs attributable to these objectives and hence is available only for projects that would not go ahead or those that would go ahead without consideration for the environment. The size of the core trust fund is over $2 billion, pledged from 73 countries. Of this, around $1 billion is available for energy-related projects which can reduce global warming. In addition to the trust fund itself, there are other monies set aside by donors for co-financing.[131] It is run jointly with the UNDP and UNEP, though, in practice, the World Bank generally takes the leading role with major projects. Free-standing GEF projects are limited to $10 million for the pilot phase, with a few exceptions. Currently, funds are available only for grant financing, though a policy paper due was submitted to the GEF Governing Council in April 1996 which proposed variations to this, including soft loans and contingent financing. This would greatly extend the impact of GEF by involving the private sector more. The GEF has made its greatest impact from demonstration projects that can be replicated and this is now a priority.[132] The draft proposal will be reworked and presented again in September/October 1996.

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129 Francis Nyirjesy, DRAFT of the 'Feasibility Study for a Renewable Energy and Energy Efficiency Fund', prepared for the IFC, Washington DC, April 1995.

130 Op. Cit..

131 Global Environmental Facility, 'The Restructured GEF, Questions and Answers', Washington DC, July 1995.

132 Senior Environmental Economist, the Global Environmental Facility, personal communication, January 1996.

GEF Polish Efficient Lighting Project (PELP)

To date, some of the greatest interest and activity in IRP and DSM throughout the region has been in Poland. In response to a sluggish market for energy efficiency products, an IFC/GEF project was started in Poland in June 1995. This had the goal of transforming the market for compact fluorescent light bulbs (CFLs). Poland manufactures CFLs mainly through Philips Poland (partially funded by the IFC). If utilised in Poland itself, annual CFLs sales would constitute an 800MW demand-side resource.[133] However, 98 per cent of CFL production is exported, due to the high costs of the bulbs, lack of information and the poor availability of CFLs to Polish consumers. This $5 million GEF project will focus on a lighting manufacturers subsidy over two lighting seasons (September to March), targeted information, education and marketing programme, and a range of utility DSM programmes. Analysis provided to GEF projects the CFL market being moved forward by at least 5 years, 200 000 tonnes of carbon being saved directly at a cost of $21/tonne (and 2 000 000 tonnes indirectly at $2/tonne[134]). The cost of saving energy is estimated at $0.01/kWh. The $5 million project is expected to produce net benefits of $29 million, and may lead to similar programmes in other countries. It started in June 1995, and initial results are very promising.

(Source: IIEC, FEWE, IFC, 1995).

The European Bank for Reconstruction and Development (EBRD)

The overall EBRD policy is to 1) focus on private sector development; 2) be active in all countries of operations; 3) reach local private enterprise, especially SMEs; 4) enhance the use of financial intermediaries; and, 5) increase equity investment. Operations are guided by the need to promote environmentally sound and sustainable development, emphasising the benefits of energy efficiency.[135] As part of its Energy Operations Policy, the EBRD states that "energy efficiency improvement will be a general concern, for energy production, transformation, transportation and overall utilisation. In addition to the institutional encouragement to energy efficiency, the EBRD will invest directly to reduce the energy intensity of demand, develop local production of energy efficiency related equipment, develop local financial intermediaries, energy savings companies (ESCOs), and third-party financing instruments".[136]

Figure 14 illustrates the range of EBRD investments by type in the energy sector, from 1992 to 1994. The total sum invested over this time period was $3.6 billion.[137] Of the energy investments actually made, less than 2 per cent of the EBRD total energy investments between 1992-94 went to industrial and residential demand-side energy efficiency projects, though the trend was significantly upwards after early 1995 (7.5 per cent in 1995).

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133 Stewart Boyle, Marc Ledbetter and Russell Sturm, 'Efficient Lighting in Poland: An Innovative IFC/GEF Project', International Institute for Energy Conservation, London, presented in the Right Light Three Conference Proceedings, Newcastle-upon-Tyne, 18-21 June 1995.

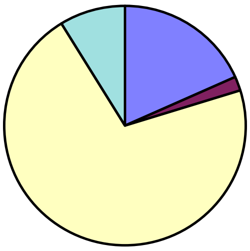
134 Op. Cit..

135 European Bank for Reconstruction and Development, 'EBRD Annual Report 1994', London.

136 Op. Cit..

137 Op. Cit..

Figure 13. Energy Sector Investments by EBRD (1992-94 totalling $3.6 billion) [138]



Source: EBRD Project Summaries

The EBRD established an Energy Efficiency Department (EED) in October 1994. By early 1996, it had around $125 million of energy efficiency financing in the pipeline at varying stages of completion, and it has set itself a target for financing between $125 and $250 million of energy efficiency projects per year. The EED signed what is thought to be the first major performance contract made by an international financial institution to an ESCO in the region in December 1995. The $6.2 million loan is to an ESCO called Prometheus, and will serve to finance several performance contracts. Prometheus will be responsible for the purchase of fuel, installation of efficiency equipment, and the operation and maintenance of energy services of mainly industrial facilities throughout the contract life. The recent increased emphasis on energy efficiency in EBRD energy lending is shown by the increase in demand-side loans from 2 per cent to 7.5 per cent of total energy sector lending in 1995.

Negotiations are also underway for the EBRD to establish a special-purpose ESCO in Bulgaria with the EBRD as a minority shareholder. The majority shareholder would be one or several local investors who will manage the ESCO. The capital injection and support from the EBRD, if successfully implemented, will give more value to the ESCOs performance guarantee to the customer, providing additional comfort to the project owner and any local co-financing partner. Other recent EBRD projects include multi-facility lending to several private sector companies, and support for a range of revolving funds in the region.

The European Commission (EC)

Grant funding to the region from the EC is mainly through the PHARE, TACIS and THERMIE programmes. These programmes are among the most significant of the regional efforts underway to address energy activities in the CEE/CIS region, with the 13 EC Energy Centres acting as a focal point to these and related activities.

PHARE funding is directed specifically at the countries of central and eastern Europe and the Baltics. The objective is to help these countries achieve membership of the European Union. The total commitments to infrastructure made through the PHARE programme from 1990-1995 was $1.24 billion.

138 Op. Cit..

Infrastructure includes energy, transport and telecommunications. This is out of total commitments during that period of $6.7 billion. PHARE, together with the EBRD, is negotiating the details of a revolving fund in the Czech Republic. PHARE's grant contribution will revert to the Czech Ministry of Industry and Trade after the eight-year life of the fund. There will also be a small guarantee facility available for PHARE to support projects with insufficient collateral for local commercial banking terms. A similar facility is being considered for Hungary. Though a detailed breakdown of PHARE energy sector support was not readily available, energy efficiency (supply and demand-side) is around 20-30 per cent of total PHARE monies on energy for most CEE countries. Hungary is the exception, with over 70 per cent of energy sector support in the period 1991-95. A large number of energy audits have been carried out in the CEE region. However, only a small number of these have actually led to projects and investments.

TACIS is targeted at countries from the CIS. The breakdown for TACIS funding over the period 1991-1995, for energy expenditure alone, (Annex I countries only) is $281 million out of total commitments of $2.7 billion, or roughly 10 per cent. TACIS activities cover a wide range, including quick industrial plant energy audits, district heating improvements, and establishing regional Energy Centres that advise government and industry on energy savings plans and institutions. The IEA reported $61 million of support from TACIS and THERMIE in the CIS for energy efficiency between 1992-94.

THERMIE is the European Community's programme for the promotion of innovative energy technologies throughout Europe and the CEE/CIS. It has established fourteen Energy Centres in the EIT countries which co-ordinate the THERMIE programmes locally. The main aim of these Centres is to stimulate market penetration of EU energy efficient technologies. It is unable to finance actual hardware, however, and hence the Energy Centres work closely with the MDBs for financial support. Financial support for the Energy Centres in the CEE countries is now mainly from the PHARE and Synergy programmes.

Substantial support for EIT countries through the EC's PHARE, TACIS and THERMIE programmes has already been given and the partnership approach of PHARE and TACIS seems a good model. However, the development of local technical and managerial capacity has not always gone as well as expected and reflects the variable quality of the management of the EC Energy Centres. Too much money is still flowing to Western consultants. This is in contrast to the network of Energy Efficiency Centres which are largely staffed by local experts. A consistent problem in most countries, and one which inhibits the very private sector involvement most Energy Centres are supposed to promote, is the poor information strategy. Access to the wide range of studies, programmes, audits and conference/workshop reports, is difficult and time-consuming.

The European Investment Bank (EIB)

The EIB is a major financial institution in Europe, funding projects in Western Europe and, since 1992, Eastern Europe. The objective of the EIB is to support capital investment projects that further European integration. In 1995, the EIB provided loans totalling $26.5 billion, of which $1.24 billion was for projects in Central and Eastern Europe[139]. The total investment ceiling for ten CEE states between 1994 and 1996 is $3.7 billion. Of this 80 per cent is targeted for infrastructure. Typically the minimum project size for the EIB is $25 million, with a maximum funding proportion of 50 per cent. For a few very small economies such as the Baltic states, lesser amounts are considered. EIB offers long-term financing of up

139 Op. Cit..

to 15 years and at a margin above its own cost of funds. As an AAA-rated bank, these costs are quite low. An evaluation of the EIB projects in CEE and the Baltic States between 1993 and 1995 shows that little investment went toward environmental and energy efficiency projects. Of the total EIB energy portfolio Financial Flows for this region in 1993 and 1994 ($952 million), less than 3 per cent was spent on end-use efficiency projects.

Table 17. European Investment Bank - Energy Sector Lending 1993-1995

	Total Energy Lending, all CEE ($ million)	Energy Supply Loans ($ million)	Supply-side efficiency loans ($ million)	Demand-side efficiency loans[1] ($ million)
Total 1993-1995	951	626	299	26
Percent of total	100%	66%	31%	3%

[1]Demand-side efficiency has been assumed to be 15% of Supply-side efficiency. Percent figures were rounded up

One surprising element of the EIB's project appraisal is that the environmental appraisal is included in the technical report prepared by a supervising engineer. The EIB is not responsible for carrying out any detailed environmental assessments and has no specialised environmental unit.[140] In contrast to the EBRD and some World Bank projects, for example, the EIB merely follows rather vague criteria on adhering to EC Directives on the environment.[141] Many EIB-funded projects are arranged in combination with the PHARE programme. PHARE often provides grant aid and technical assistance, while EIB provides the long-term financing. The energy sector is one of three priority areas. Within this sector the priorities are restructuring, technological modernisation, saving energy and improving the environment[142] The EIB has made global loans to local intermediaries for on-lending to SMEs in Bulgaria, the Czech Republic, Poland and Slovakia. Examples of energy-related loans in the region in 1995 were: the completion of a power station in Bulgaria, the upgrading of a lignite power station in the Czech Republic, electricity generation and distribution improvements in Hungary, the rehabilitation of two power stations in Romania, and the upgrading of a district heating system in Bucharest[143.]

Other Multilateral Institutions

The Energy Charter

Set up as a two-way partnership between Western and Eastern Europe - Russian gas for Western efficiency technology know-how - the Charter has evolved into a major multinational legal instrument. Ratified in late 1995, it has an Energy Efficiency and Related Environmental Issues Protocol which has not yet been ratified. The essence of the Charter is to provide a stable legal environment, thus allowing energy investment, trade and technology exchange to take place. Most of the focus is on oil and gas

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140 James N. Barnes, 'Some Notes on the European Investment Bank and Its Role in the CEE', Les Amis de la Terre, Paris, February 1995.

141 European Bank for Reconstruction and Development Corporate Officer, personal communication, London, January 1996.

142 European Investment Bank Information Officer (central and eastern Europe), Luxembourg, January 1996.

143 European Investment Bank, 'Financing in Central and Eastern Europe', Luxembourg, 18 December 1995.

development. Membership includes most western and eastern European countries, as well as the United States and Japan.

Energy Efficiency 2000 (UNECE)

This initiative grew out of the UN ECE Energy Working Groups, which were one of the few East-West forums pre-1989. Based in Geneva, the project seeks to encourage energy efficiency. Its main activities to date have been in developing workshops, conferences and attending trade fairs. It has provided a forum for the exchange of ideas, and helped develop a manual for energy efficiency financing. Its main goal is to develop 'Energy Efficiency Demonstration Zones' in several countries, including St. Petersburg and Sofia. The intention is to try to stimulate private sector focus and activities in a region through dialogue and co-operation. Funded mainly by the UNDP and the Nordic countries, it has clarified many of the problems of energy efficiency financing, but progress on making the Demonstration Zones a reality has been slow to date.

Project Preparation Committee (PPC)

The Project Preparation Committee (PPC) was established following the second 'Environment for Europe' Conference in April 1993 in response to the Environmental Action Programme.[144] Its objective is to match projects with financing. While it is difficult to prove that projects implemented through PPC would not have gone ahead otherwise, there are indications that this project has had an impact in the areas in which it has worked. Membership of the PPC includes individual countries, the European Commission, EBRD, EIB, IFC and NEFCO. The PPC has strengthened or established several environmental funds: the National Pollution Abatement Fund in Russiathe Slovak Environmental Revolving Fund, which is currently under preparation, and the Slovenia Environmental Infrastructure Investment Fund, also under preparation. To date, energy efficiency has not comprised a large percentage of total projects. Two projects with energy efficiency components are underway in Estonia and Romania. Five projects that include energy efficiency components were under preparation as of August 1995. The PPC can overcome the problem of projects in the assessment phase not finding funding for implementation, and the problem of projects with a potential lender not finding the grant money to prepare the technical assessment. The PPC officers' role is to review their member banks' environmental project portfolio in order to identify those which would both comply with the Environmental Action Programme (EAP) criteria and would benefit from funding. If a project satisfies the criteria, it is then brought to the attention of PPC members and to other banks. This selection procedure allows the PPC to exert an influence on member banks' energy financing policy - to the extent that a member bank requires matching funds through the PPC, this will be available only for those projects that comply with the EAP criteria.

Nordic Environmental Finance Corporation (NEFCO)

The five Nordic countries established NEFCO in 1990 as a multi-lateral institution to support environmental investments in central and eastern Europe. NEFCO is required to invest in projects that have a positive environmental effect in Nordic countries as well as in central and eastern Europe, and so works exclusively with projects in near-by regions - mainly Poland, the Baltic states, and Northwest Russia. NEFCO will also finance one-off projects in the Czech Republic, Slovakia, Hungary, Belarus, and

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144 Project Preparation Committee, PPC Factsheet, EBRD, London.

Ukraine. NEFCO is managed according to prudent venture capital fund principles, seeking viable investments. The Corporation provides financing in the form of equity, subordinated debt, and non-recourse loans. NEFCO is currently preparing an AIJ simulation study as directed by the Nordic Council of Ministers.

Nordic Investment Bank (NIB)

The NIB was established in 1975 with the aim of lending to investment projects of Nordic interest, both in Nordic countries and outside the Nordic region. The NIB is owned by the five Nordic countries: Denmark, Finland, Norway, Sweden, and Iceland. The Bank provides medium and long term loans for investment projects of Nordic interest, mainly in the Nordic region. For central and eastern Europe, loans are provided within a special lending scheme with a partial back-up guarantee by the Bank's member countries. The loan maturities are up to 20 years. Loans are granted to credit-worthy countries, usually to the recipient government or against a government guarantee. The use of loan funds provided by NIB to an eligible project is not tied. For the three Baltic states, the NIB has a special lending facility for small and medium sized projects, whereby loans are fully guaranteed by the five Nordic countries. The NIB's first efficiency loan was to the Turow power plant in Poland, and it is also financing half of the $5 million project cost to convert a district heating system in Galanta, Slovakia to geothermal heating.

Bilateral Institutions

Total commitments (in millions of US$), including both grant support and loans for Environmental Assistance, to EIT countries between 1990 and 1995 from bilateral institutions were as shown in Table 18[145:]

145 Integrated Report on Environmental Financing submitted by the ECE working group of senior government officials 'Environment for Europe', UN, Sofia, 23-25 October 1995.

Table 18. Financial Flows to Environmental Projects (including energy efficiency) from Bilateral Aid (1990-95)

Country	$m	
Germany	486	(including loans from the German Development Bank)
EC	435	
US	286	
Denmark	146	(grant only and not including loans)
Netherlands	89	
Austria	74	
Sweden	64	
Switzerland	51	
Finland	45	
Norway	36	
Japan	16	
France	14	
UK	12	(technical assistance only)

It is not possible to separate out energy efficiency projects from this source. However, an IEA database exists for energy efficiency to the CEE/CIS region. Though incomplete, it suggests that over a four-year period, (1990-1995) around $240 million was provided for energy efficiency projects and support, though not all was disbursed. Around $100 million was approved or first reported in 1994 and 1995.

US Agency for International Development (US AID)

US AID provides grants, guarantees, equity loans, and other financial services to support IMF and World Bank programmes in developing regions with specific focus on United States involvement. It had not yet had its budget approved for the fiscal year 1996 when the research for this study was undertaken, though there is likely to be a new series of contract work for 1996-8. In many countries of the CIS and CEE, US AID has funded the initial consulting work on power sector restructuring. Though these are at varying stages of development, the typical pattern seen in the Ukraine, the North Caucuses and Kaliningrad, is for a two-stage project. The first is to analyse the potential for demand side management (DSM) and energy supply options, and, where possible, to promote legislative change to allow utilities to recover the costs of investment in DSM. The second stage is to implement a pilot DSM programme between a local utility and its largest industrial customers.[146]

US AID facilitated a Czech Housing Guarantee scheme for residential infrastructure, including the insulation of residential buildings. US AID provided a US Government guarantee for 30 years, with payments deferred for ten years at minimal interest rates. This programme has since been discontinued.[147] In Krakow, US AID part funded an efficiency demonstration scheme centred on four large high-rise flats. Though some of the efficiency measures were not cost effective at that time (e.g. external wall insulation), some measures have been replicated in co-operatively owned flats throughout the city.

146 Consultant to the USAID programme, personal communication, Washington DC, January 1996.

147 Representative of SEVEn in the Czech Republic, personal communication, Prague, January 1996.

The Capital Development Initiative was originated during the Bush Administration, and energy efficiency was not a prime objective. It has, however, helped to train local engineers to do energy audits and has resulted in successful efficiency audits and the joint venture production of insulation between a United States and a local firm.[148] The Energy and Infrastructure Division of US AID also has established a training programme for local managers to set up independent advice centres for energy savings, with some positive results in Bulgaria[149] where some of the managers have established successful businesses in the field.

US AID, sometimes jointly with the US DOE and EPA, has supported the setting up of a network of energy efficiency centres in Poland, the Czech Republic, Russia, Bulgaria, and the Ukraine. These are almost entirely staffed by local experts, and carry out research, projects, and policy development.

Export Credit Banks - US ExIm Bank

Most countries provide supplied credits through their export financing agencies or banks. One example here is the ExIm Bank of the United States. The objective of this government agency is to create jobs in the United States through exports. It provides guarantees of working capital loans for American exporters, guarantees the repayment of loans, or makes loans to foreign purchasers of American goods and services. The ExIm Bank also provides credit insurance that protects American exporters against the risks of non-payment by foreign buyers for political or commercial reasons.[150.] In 1995, the ExIm Bank had a budget of $800 million to support $13 billion of business. This amount was down to around $15 billion in 1994, due to the impact of the Mexican devaluation on all developing countries and EIT countries.[151] The minimum amount of project finance usually covered is $50 million.[152] In Bogatynia, Poland, for example, a $36.5 million guarantee was made available for the rehabilitation of two boilers for the Turow Power Station. The commercial financing was arranged in March 1995 by Citibank, covering the export of services, some local costs, capitalised interest during the construction phase, and an exposure fee. Other participants included the NIB and Swiss Bank. Also in Poland, a memorandum of understanding has established a co-operative financing arrangement that will allow Poland's National Fund for Environmental Protection and Water Management and Bos Bank to leverage financial resources to support more environmental projects. This is done by using ExIm Bank's guarantee to reduce the risk to commercial banks for their participation. ExIm Bank's guarantee is available for American goods and services to Poland.[153]

The Environmental Exports Programmes of the ExIm Bank were established in 1995 to support environmental exporters and service contractors. Unlike in the Bank itself, there is no minimum project size in this programme. There are two components to the programme: a short-term insurance policy for small business environmental exporters, with 95 per cent commercial and 100 per cent political coverage

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148 Representative of the Alliance to Save Energy, personal communication, Washington DC, January 1996.

149 International Bank for Reconstruction and Development, Officer for Bulgaria, personal communication, January 1996.

150 Export Import Bank, General Fact sheet, Washington DC, August 1995.

151 Op cit 150

152 Integrated Report on Environmental Financing submitted by the ECE working group of senior government officials 'Environment for Europe', UN, Sofia, 23-25 October 1995.

153 Export Import Bank, Press Release, 1 December 1995, Washington DC.

and no deductible, and medium- and long-term support as direct loan or loan guarantee for environmental projects, products and services.[154] For energy service companies (ESCOs), this includes loans for feasibility studies, energy service contracts, and environmental remediation, monitoring and assessment. The maximum cover for the medium-term policy is $10 million, although larger amounts may be financed under general ExIm Bank terms.

German Coal Aid Fund (GCAF) and PHARE Revolving Fund

Germany provided Hungary with a quantity of German hard coal in 1991. The Hungarian Central Bank, MNB, sold the coal and transferred the proceeds to the Magyar Hitel Bank RT to set up a Revolving Fund mainly to finance efficiency projects. The operations policy of the Fund indicates that 60 per cent is to be used for funding and 40 per cent for guarantees. The proceeds from the sale of coal amounted to HUF 1138 million, roughly $8 million, and with interest and repayments, the fund had grown to HUF 2732.9 million, $19 million, by early 1995. The lending rate has been on average about 14 per cent, or just under half the normal commercial rate. The maximum loan size is HUF 50 million, with an average payback of 2.5 years[155.] By the end of 1994, 313 applications for efficiency projects had been made and 158 had been accepted and contracted.[156] Municipalities have accounted for 25 per cent of loans, mainly for lighting and district heating projects.[157]

The PHARE programme has set aside indicative funding of $25 million over five years, to energy efficiency projects in Hungary. The fund would be to co-finance projects together with commercial funds to leverage the amounts available and achieve a “blended” interest rate substantially below current market levels. Co-financing is anticipated to come from dedicated credit lines, such as that planned by EBRD, existing general MDB credit lines, and local bank funds.[158] The recent setting up of the IFC’s Hungarian Energy Efficiency Co-Financing Fund (HEECF) will also support the GCAF and PHARE’s revolving fund.

Dutch Bilateral Aid

The total bilateral assistance to the CEE from the Netherlands has remained constant for three years at approximately $36 million per year. Of this, about 25 per cent has been spent on energy and environment projects. The money has been spent through a variety of projects and initiatives, involving research institutes such as the Netherlands Energy Research Foundation (ECN), the private sector, the Dutch energy and environment agency (NOVEM), and environmental NGOs. Since 1994, the funds have been increasingly directed at supporting the exports of Dutch companies. Energy efficiency in the various end-use sectors has only recently been addressed in a significant way through Dutch bilateral aid. NOVEM’s proposals for a separate, coherent Dutch assistance programme focusing explicitly on energy efficiency in the CEE countries was accepted by the Ministry of Foreign Affairs in late 1995. This will focus on small-scale demonstration projects, institutional development and the creation of a positive environment for

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154 Export Import Bank, ‘Environmental Exports Programs, Fact Sheet’, Washington DC, September 1995.

155 Alliance to Save Energy, ‘A World of Opportunity: Expanding the market for Energy Efficiency and Environmental Technologies in Eastern Europe’, Washington DC, August 1995.

156 Managing director, Magyar Hitel Bank RT, personal communication, Budapest, 3 February 1995.

157 Op. Cit..

158 Ibid.

energy efficiency.[159] It was initially pilot tested in Hungary, working with NGOs, municipalities and other groups to build capacity, and carry out demonstration efficiency projects in municipal buildings and several AIJ monitoring/pre-pilot schemes. It will be extended to Poland and possibly the Czech Republic. The programme has proved very cost-effective, with clear signs of increasing capability of NGOs and other institutions to have an impact at an energy policy level and to develop and manage efficiency schemes. The Dutch government announced in October 1995 an annual reserve fund of $7.8 million to co-finance AIJ pilot projects in EIT countries.

The Swedish "Programme for an Environmentally Adapted Energy System"

For financial year 1993-4, Sweden invested $12.5 million for the Baltic Sea region on projects promoting both renewable energy and energy efficiency.[160] This programme is funded from the Swedish climate mitigation budget, and was not conceived as an aid programme. In 1993, three fossil fuel conversion projects were assessed and put into operation. Oil and coal boilers were converted to wood chip fuel from local sources. The emphasis was on technology and skills transfer, with one-third of project costs going to domestic, civil and buildings works. Sixteen further fossil fuel conversions are now underway in the Baltic States, Poland and Russia, as well as a number of projects addressing energy inefficiency in buildings and district heating distribution losses.[161] NUTEK, the Swedish Agency which has managed the projects, has developed some innovative approaches in developing local technical, managerial and financial capacity, as well as reducing project risks. The overall goals of the Baltic energy programmes are to develop simple, affordable, quick and reliable technology based projects. Project management support is given as a grant to NUTEK, but all contracting for projects is open to full competition, with a strong bias in favour of developing partnerships between local and Swedish companies. By early 1995 the project investments were roughly two-thirds imported equipment and one-third domestic work. The latter proportion is growing. The financing terms are favourable, but equal to the terms by the World Bank (8 per cent real rate of return, a grace period of 2 years, and a maturity period of 10 years). Security for the loans is required either as a mortgage on the plant or a State guarantee.

Danish Bilateral Aid

In 1994, Denmark's bilateral support to CEE countries amounted to £230 million. Of this, about 21 per cent was for environment-related projects. The Danish energy sector programmes aim to develop a climate of 'environment-friendly use and production of energy'. Projects cover the following four areas:

- improvement of energy efficiency (end use);
- reduction of dependence on unsafe nuclear power stations;
- cleaner energy sources and technologies;
- organisational development through training, etc.

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159 International Institute for Energy Conservation - Europe, 'Pollution in Eastern Europe: Submission to the Environment Committee in the House of Commons, UK Parliament', London, 10 March, 1995.

160 Ibid.

161 Op. Cit..

Some of the projects that Denmark have been funding include waste water treatment plants, air pollution reduction schemes, hazardous waste treatment facilities and other environment projects. Cogeneration, biofuel power plants, and improved building efficiency have featured strongly in the programme.[162]

The UK Know-How Fund (KHF)

The majority of the United Kingdom's bilateral assistance to the CEE and CIS is channelled through the KHF. A cumulative total of $235 million was granted in the five years between 1989-1994. In 1993/4, the United Kingdom submitted $54 million to projects in the CEE and $42 million to those in the CIS. The budget for 1994/5 was expanded to $110 million.[163] It has been estimated that KHF projects that directly or indirectly support energy efficiency total just under $9 million, or 8 per cent of the total, and for these, there is a strong emphasis upon energy audits, information, training and policy advice. Projects have included work in Moscow training Russian technical people on energy efficiency, which has led to several setting up companies delivering energy efficiency services, and a Polish programme identifying and preparing a wide range of energy efficiency projects for funding by the EBRD and other financial institutions. The KHF have recently been seeking greater emphasis on energy saving projects. The Environmental Know-How Fund was established in April 1992 as a component of the KHF, funded by the United Kingdom Department of the Environment at $7.5 million per annum, but no direct support for energy efficiency has been given through this fund, to date.

Debt for Environment Swaps

Switzerland - Bulgaria. The Swiss and Bulgarian Governments have negotiated a bilateral debt-for-environment swap agreement for Sfr 20 million (currently equivalent to $16.6 million) or 20 per cent of the official Bulgarian debt to Switzerland. The developing country debt is purchased at a discount and redeemed in exchange for increased environmental spending in the debtor country.[164.] The World Bank is supporting the establishment of an earmarked environmental fund for managing and developing the initial portfolio. Spending priorities have been established in the context of the EAP: objectives correspond to national environmental priorities, particularly addressing pollution with severe impacts on public health.[165] The Swiss have indicated that energy efficiency should be one of these priorities.

Poland's EcoFund. This fund was established from the forgiven foreign debts by the United States - $360 million, Switzerland $52 million, and France - $48 million. If all 17 lender countries agreed, the total fund size would be $3 billion over 18 years. The total annual size of the EcoFund currently stands at $27 million equivalent, and more of the above debt-relief funds will be available in tranches through 2009. The objective of the fund is to promote technology innovative to the domestic economy which they feel they are able to do[166.] Grants vary from $2000 to $10 million equivalent, though the tendency is at the lower end. Small-scale projects are difficult and time-consuming, but Fund managers try to cope with this, as they want a range of project sizes of this scale in order to have a

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162 Op. Cit..

163 Op. Cit..

164 The World Bank, 'The World Bank and the Environment in Central and Eastern Europe: 1990-1995', Washington DC, 1995.

165 Ibid.

166 Deputy President of Ecofund, Poland, personal communication, Warsaw, January 1996.

diversified portfolio. Grant funding is limited to 30 per cent for commercial projects and 50 per cent for municipalities. They look for long-term projects beyond five years, that are not otherwise fully commercial. Companies that have arranged funding through this source have been satisfied with its operation.[167] All funds have been committed for 1996, with no further availability until 1997.[168]

Local Environmental Funds

There are a wide range of local funds which have been supporting or could support energy efficiency projects. These include:

- ***Czech Energy Agency*** **-** manages a small fund to finance demonstration projects to reduce fuel and energy consumption in apartments, schools, hospitals and other municipal buildings.
- ***Czech State Environmental Fund*** **-** This fund recycles monies raised from pollution fees and fines. It finances 2000 projects per year, but few efficiency projects.
- ***Poland's EcoFund*** **-** Capital from the forgiven loans becomes available over 18 years. The fund actively looks for long-term projects that otherwise are not commercial, with the objective of promoting innovative technology.[169] Few efficiency projects have been supported to date, but the number is increasing.
- ***Poland's National Agency for Energy Conservation (PKT)*** **-** PKT has an initial budget of $75 million for efficiency projects and can offer grants and loans and a blending of the two. Initially, the PKT will look for projects with a payback of less than 1.5 years, but if successful, this period may be extended.
- ***Poland's National Fund for Environmental Protection (NEF)*** **-** Total amount available in 1995 was $255 million, some of which is available for efficiency projects. It can offer loans with interest rates of between 20-80 per cent of the National Bank rate.
- ***Slovak Environmental Funds*** **-** There are no efficiency projects to date, though funds are available for this purpose.[170]
- ***Bos Bank, Poland's Environmental Protection Bank*** **-** Bos Bank lends for environmental improvement projects and distributes monies from the National Environmental Fund. In the area of energy efficiency, it is working together with the IIEC and the EBRD to structure limited recourse financing facilities for energy savings investments. It financed an energy efficient lighting programme for the municipality of Wroclaw that was originally identified as a candidate for a municipal bond issue.

The Private Sector

Multinational Corporations (MNCs) have the size and resources to overcome many of the risks of doing business in the EIT countries. They have the financial strength to withstand the initial high risk of doing energy efficient business in an environment where it is not yet an established practice. For example, the multinational energy controls company Honeywell chose to contribute $1 million in 1992 (one-third of the

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167 Partner, Polish equity fund, personal communication, Warsaw, January 1996.

168 A Polish energy service company (ESCO), personal communication, Warsaw, January 1996.

169 Op. Cit..

170 Official in the Ministry for the Environment, Poland, personal communication, Warsaw, January 1996.

total project cost) to a demonstration project in the Moscow district of Tushino. This involved an upgrade and renovation of the controls on a 200 MW combined heat and power station. This project is replicable both in Russia and other countries using similar technology.[171] That money is an investment which, if energy prices rise in the region as expected, will earn a return on future contracts introduced to replicate the efficiency savings in other district heating plants. It was a high-risk investment, however, with a relatively long payback (10-12 years) at the energy prices then in place (at Western European market prices the payback would be 2-3 years), and best suited to a large, financially strong company rather than a small or local company without grants or highly subsidised loans. This project was in Tushino 3 sub-district and the configurations of Tushino 1, 2, and 4 are identical. The project is completely replicable but is not being pursued. Without Honeywell's financial assistance (they and joint venture partners contributed as a grant $2 million of the $3 million), no one could adequately benefit from the efficiency savings.

Another example of a large multinational whose financial strength has allowed it to self-finance the initial high risk of doing business, is Landis & Gyr. For some of their initial energy service contracts in the region, Landis & Gyr took the financial, as well as technical, risks of the venture.[172] This is typically not necessary in developed countries, where political risks are lower and where the commercial banking sector is highly competitive. Multinationals can also bring the benefit of financial scale to their projects. ABB, the Swedish-Swiss engineering combine, is very active in the region. It began making local acquisitions in Poland in 1990, it now has 30 000 staff and orders of $1.65 billion as of the end of 1994.[173] “ABB has controlled the financial risks by keeping acquisition costs low. It rarely spends more then $20 million on a single acquisition, and its whole eastern network costs only an estimated $300 million to buy.”[174] Landis & Gyr has also been successful in winning energy service contracts in the region, in part due the overall financing strength of the company. They are now in the process of establishing an overall banking facility for these types of contracts, from which each individual project would draw. While the multi-project facility would initially be to Landis & Gyr, who will continue to guarantee the technical performance of the contract to the customer, the debt will be assigned to the customer who will in turn repay the financial institution.

In addition to the financial resources that MNCs contribute are the technical and management resources to provide training and to effect complex business negotiations. According to ABB, one of the biggest challenges has been training thousands of eastern managers and technicians in management and marketing. “Managers at newly acquired factories were paired individually with western counterparts...The approach has been so successful that the group is now able to use its Polish and Czech managers to train Russians and Ukrainians.”[175] MNCs are able to act in the roles of consultant advisors to specific ventures until there is an indigenous business community able to provide these skills locally.[176]

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171 Transcript of an interview with Benoit Bo, Honeywell Europe, interview conducted by the International Institute for Energy Conservation, Washington, DC, 1995.

172 Landis & Gyr representative, personal communication, Zug, January, 1996.

173 The Financial Times, Daily Paper, London, 10 January, 1996.

174 Ibid.

175 Ibid.

176 Honeywell Europe representative, personal communication, Vienna, January 1996.

They can also fulfil the role of financial advisor to their local venture partner. This may take the form of preparing business plans[177] or locating loan and grant financing.[178]

The Alliance to Save Energy, an American-based NGO, has put together a coalition of interested parties, including MNCs such as Honeywell, Landis & Gyr, and Enron Corporation in an industrial advisory group. This group, along with ABB, is attempting to arrange a DSM programme to save between 8 to 10 TWh of electricity per year from the St Petersburg region of Russia.[179] A project of this magnitude requires consensus-building among a wide variety of diverse end users, local, regional and central government, and suppliers. The demands placed on high-level management time within the participating companies are immense. Its work has been supported by United States Department of Energy grants.

Energy Service Companies (ESCOs)

Intesco CZ is an ESCO which has been established for over two years in the Czech Republic. Its parent company is active worldwide. In 1994 they were awarded a sole-source contract for a municipal lighting project. This was taken away in favour of a competitive bidding process which Intesco subsequently won. Local bank financing was to be for Kr18 million out of a total project cost of Kr24 million, but the banks would not fund without specific guarantees from the municipality, which the municipality was unwilling or unable to give. Eventually, after negotiations lasting over more than a year, the project was abandoned. Intesco was unable to complete one project due to inadequate security, which meant they were unable to raise bank financing for this contract. As a result, they are now looking for other investors to increase their capital base.[180]

The more successful ESCOs in the region have been the more highly capitalised companies. EPS (CR) has been established in the Czech Republic for three years and has implemented $11 million worth of projects financed through a combination of Czech banks and an international lender. Their success where other ESCOs have sometimes failed is attributed to 1) the greater financial strength of the parent company, a large American utility, and 2) the experience and strong references of the parent company in the energy efficiency services market.[181] When the customer has requested, they have been able to offer a parent company guarantee. No investor has been willing to consider project financing only.[182] EPS CR is able to put in its own working capital for the technical assessment phase of the project in order to demonstrate potential savings. EPS CR signed a contract in November 1994 with SETUZA, a northern Bohemian company. This contract is to provide 1) a cogeneration facility for electricity and process steam; 2) an efficient cooling tower using recirculated water; and, 3) an energy management and control system to control and monitor the new process cooling water loop. The total project cost is $7 million, with an expected first year return of $1 859 000. The payback, if this is extrapolated, should be short, but EPS will remain *in situ* for a further eight years to measure actual savings achieved and to uphold its savings guarantee to the customer. Such a commitment on the part of the ESCO reduces the risk of the project to the owner company.[183] EPS CR has also signed energy service projects with two Czech

177 Enron Corporation representative, personal communication, London, January 1996.

178 Op. Cit..

179 Op. Cit..

180 Intesco CZ representative, personal communication, Prague, January 1996.

181 Energy Performance Systems (EPS) representative, Czech Republic, January 1996.

182 Ibid.

183 Energy Performance Systems (EPS) Press Release, Czech Republic, 1995.

hospitals. The Bulovka Hospital is one of the largest in the Czech Republic, with 19 buildings totalling approximately 80 000 square meters and 1640 beds. Four agreed energy conservation measures will be installed at a cost of about $2.7 million. The complete amortisation of the project will take place over eight years, including construction time and again. The second hospital is a regional one, with a capacity of 250 beds. There are approximately 50 hospitals of similar size with similar energy needs in the Czech Republic.

Leasing and municipal bond financing

These are two incipient structures in the region that hold a great deal of promise because they address the problem of insufficient collateral preventing the local banking sector from financing efficiency projects. Leasing allows financing to be secured against equipment, thought to be in sufficient demand in the region to hold some value on resale if necessary. Municipal bond financing allows another source of competition to the local banks to encourage more aggressive lending practices.

Other Investment Sources

- ***Global Environmental Fund*** **-** This is a group of venture capital funds seeking competitive commercial returns in environmental investments. One fund in the group is the Global Emerging Markets Fund, which specialises in developing countries. It has found the EIT countries the most difficult region in which to find acceptable projects. The company has managed to structure two ESCO-type projects one in a non-EIT country, the other in Slovenia, with adequate returns and sufficient risk reduction to be acceptable to commercial equity investors. In Indonesia, the project owner arranged the leaseback of efficiency equipment, agreed to a fixed cost per kilowatt on a long-term contractual basis, and has made a commitment to the project equal in length to that of the fund. In Slovenia the long-term risk reduction measure came from the government, which agreed to a schedule of rates for fuel. This established positive project economics for the investors.
- ***CARESBAC*** **-** This is a Washington-based not-for-profit development organisation that provides technical assistance and financing to SMEs in CEE countries and other emerging economies. Financing can be for a combination of debt and equity or equity alone, but never debt alone. The fund size in Poland is $15.5 million[184] and in Bulgaria $1.6 million,[185] the two countries in which it operates. CARESBAC has recently been awarded $600 000 from the SME programme of the Global Environmental Facility for environmental efficiency and global warming in Poland.[186]

184 CARESBAC Poland fund representative, personal communication, Warsaw, January 1996.

185 CARESBAC Bulgaria fund representative, personal communication, Sofia, January 1996.

186 Manager of the SME programme, personal communication, Toronto, January 1996.

5. BARRIERS TO FINANCING ENERGY EFFICIENCY AND POSSIBLE SOLUTIONS

> "There is a strong belief that there are many profitable and no-regret measures that can be identified in the economies in transition, particularly in the energy and transport sectors. The most important barrier, however, is expected to be the financing necessary investments. With environmental issues as a low political priority, even economically profitable measures will be difficult to finance."
>
> Workshop on Greenhouse Gas Emissions and
> Response Policies in Central and Eastern Europe
> Budapest, Hungary 11-14 May 1995

There is a very wide range of impediments which inhibit the uptake of cost-effective energy efficiency opportunities. These are often described as "barriers to energy efficiency". Even in OECD Member countries, levels of energy efficiency are below the optimum for economic efficiency because of such barriers, but these barriers are even more formidable in EIT countries, and they face additional barriers that OECD Member countries do not experience. If the barriers can be overcome or reduced, there are large and highly cost-effective energy savings that can be exploited. Section 3 of this study indicates that most EIT countries could reduce energy consumption by 10 per cent with little or no investment and achieve a level 2 to 3 times this with investments generally providing less than three to five year paybacks. Many of these investments deliver CO_2 abatement at negative cost - the investment would be more than paid for by the value of the energy savings. The EBRD conservatively estimates a greater than $52 billion market for energy efficiency opportunities, with less than a 3.5 year payback period at current energy prices, implying an annual $6 billion per annum investment level to capture this.[187] Normally such economic opportunities would be regarded as extremely attractive. The lack of investment given the size of the opportunities that exists gives an indication of the magnitude of the barriers that exist.

The main barriers to financing energy efficiency are grouped in six main areas in Table 18 below and the discussion that follows:

1. Macro-economic conditions
2. Lack of information and experience
3. Lack of credit history
4. Weak institutions/unclear or common ownership
5. Small-scale nature of efficiency projects
6. Low and uncertain energy prices

Table 18 lists the barriers under each of these main areas and notes the consequences of the barriers, possible solutions, and their estimated magnitude in selected countries.

187 Peter Hobson, Energy Efficiency Unit, EBRD, London, personal communication, January 1995.

Table 19. Financing Barriers to Energy Efficiency in EIT countries

Barriers:	Consequence	Possible Solution(s)	Presence of Barriers xxx=high xx=medium x=low				
			Poland	Czech	Bulgaria	Ukraine	Russia
<u>1. Macro-economic climate</u> **(i) High inflation, unstable currency**	• Deters inward investment • Limited supply of capital • High interest rates which favour investments with short payback periods	• Improve economic performance • Project guarantees • Longer term loans by MDBs to local banks to facilitate long term finance	XX	X	XX	XXX	XXX
(ii) Political and policy uncertainty		• Establish criteria for AIJ pilot projects (e.g. monitoring, verification)	X	X	XX	XXX	XXX
(iii) High incidence of debt, defaults, barter trading	• Discourages investments in non-core businesses	• Blend grant aid or soft loans with credit at market rates to lower average rates • Establish energy efficiency funds	XX	X	XX	XXX	XXX
<u>2. Lack of information & experience</u> **(i) General information on energy efficiency poor**	• Consumers unaware of value of energy efficiency • Low level awareness of energy saving tech & options	• Information programmes, advertising campaigns, appliance labelling.	XX	XX	XXX	XXX	XXX
(ii) Lack of metering	• Energy billing does not reflect consumption levels	• Provision of meters and improved energy billing	XX	X	XX	XX	XXX
(iii) no standard measurement protocol for measuring savings	• Difficult to confirm energy savings e.g. for ESCOs	• Acceptance of standard protocol for measuring efficiency savings	XX	X	XX	XX	XXX
(iv) Lack of experience in business and risk management	• Lack of access to international financing. • Efficiency projects more expensive, or delayed.	• Training for technicians, managers, and financiers, e.g. using the energy efficiency or EC energy centres, or joint ventures with multinational cos.	XX	XX	XXX	XXX	XXX
(v) Donors and developers unaware of opportunities	• Projects not undertaken	• Expand activities of PPC in matching projects and donors	XX	X	XX	XXX	XXX

Barriers:	Consequence	Possible Solution(s)	Presence of Barriers xxx=high xx=medium x=low				
			Poland	Czech	Bulgaria	Ukraine	Russia
3. <u>Lack of credit history, credit-worthiness</u> **(i) enterprises, municipalities and other borrowers have not yet developed credit history**	• Limited access to capital • High transaction costs • Enterprises which are good candidates for energy investment may close	• Finance through leasing; municipal bond finance; performance contracting through ESCOs; joint ventures	XX	X	XX	XXX	XX
(ii) poor cash flow		• MDB financing and government rationalisation of banking sector	XX	X	XX	XXX	XX
(iii) lack of collateral		• Link energy efficiency investments to other modernising investments	XX	X	XX	XXX	XX
<u>4. Institutions/ownership</u> **(i) Historical legacy of central planning policies**	• Policy geared to energy supply rather than energy services. • Low priority for energy efficiency. • Economically marginal plant may be kept open	• Define and implement an explicit energy efficiency strategy in national policy. • Create utility regulatory structure that favours DSM e.g. make energy savings potential an explicit planning requirement when privatising utilities	XX	XX	XXX	XXX	XXX
(ii) State-owned energy monopolies	• Lack of competition and lck of incentives to save energy	• Government policy to facilitate creation and involvement of ESCOs	XX	X	XXX	XX	XXX
(iii) Split incentives for building tenants and owners; multi-ownership of buildings	• No incentive or responsibility to upgrade the energy efficiency of buildings as the benefits not clear	• provide renovation package deal when privatising apartment blocks; and • allow building owners to increase rents where efficiency upgrade reduces energy costs of tenants	XX	XX	XX	XXX	XXX
(iv) weak institutional frameworks	• Easy to 'cheat' standards • No capacity to implement policy	• Build capacity and resources of standards setting institutions	XX	XX	XX	XXX	XXX

Barriers:	Consequence	Possible Solution(s)	Presence of Barriers xxx=high xx=medium x=low				
			Poland	Czech	Bulgaria	Ukraine	Russia
5. **<u>Small scale of efficiency projects</u>**	• Not of interest to MDBs • High transaction costs	• MDB lending policies e.g. on-lend to local institutions who disperse to smaller projects directly, greater use of revolving funds • Bundle projects together • Establish and capitalise ESCOs	XX	XX	XX	XXX	XXX
6. <u>Energy prices</u>		• Develop approach and timetable for price increases to reflect full costs of supply and distribution; recognising social and political constraints on the rate of adjustment.					
(iii) Low energy prices	• Undermines cost-effectiveness of efficiency investments		XX	X	XXX	XX	XXX
(iv) Pricing uncertainties	• Delays implementation of efficiency projects • Creates uncertainty over future value of energy savings		XX	X	XXX	XX	XXX
(v) Energy subsidies	• Unnecessary or inefficient capacity may be constructed or rehabilitated.	• Make subsidies transparent/explicit, and develop an approach and timetable for gradual removal of subsidies • Use energy efficiency investments to reduce the need for subsidies.	XX	X	XXX	XX	XXX
(vi) Externalities not internalised (- this problem is widespread world-wide)	• Financial *costs* of environmental projects given full weighting, while *benefits* reduced or excluded	• MDBs and governments to incorporate externalities in financial assessment of projects. • Tax pollution emissions or establish emissions (or abatement) trading	X	X	XXX	XXX	XXX

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Macro-economic conditions

The general macroeconomic climate may deter investment. This barrier applies more strongly to the EIT countries than many other countries in the developing world, because some of the uncertainty in EIT economies relates to the process of transition to a market economy. Often there is a lack of affordable capital, because capital markets in the region are not yet well-developed. The weakness of the local banking sector hinders access to capital by all but the most financially secure Western and local counterparts, who are able to access funding from the multilateral development banks (MDBs) or foreign commercial banks. There is strong competition for scarce capital. Government issued securities have absorbed a disproportionate amount of the available investment funds from banks and industry at the time. The extremely high cost of capital due to high government borrowing requirements makes otherwise profitable investments look unprofitable. Uncertainty about future policies and prices increases both the perceived and actual high risks involved in investing in energy efficiency in EIT countries. Because of these concerns, investors require higher returns, shorter payback periods, and take a more conservative view of the creditworthiness of the end-user. New ventures with more uncertain benefit streams, such as energy efficiency projects, are disproportionately affected.

Macro-economic climate: Possible solutions[188]

a) Improve economic performance

Energy efficiency investment relies on rewarding capital investment through a stream of energy savings. Even if large energy savings are possible or expected, for the investor to have confidence that the savings will be available to recover the upfront investment, there needs to be some economic stability, so that the value of energy saved is sufficient to cover the cost of investment. To improve economic stability, EIT countries need to cut budget deficits and reduce inflation levels. Energy conservation could be used in a proactive manner to help stabilise the energy sector, for example, by modernising equipment and reducing the need for energy imports. Macro-economic reforms should be a condition of lending by all MDBs, a practice already common with the EBRD and World Bank.

Many policy national actions have been assessed and proposed for EIT countries through the World Bank, the European Commission and bilateral agencies among others. They range from the restructuring and privatisation of the electricity and gas utilities and state owned industries, to the legislative changes necessary for utilities to recover the costs of any demand-side management measures and consumers to have a real incentive to save energy. MDBs have the influence to require these policies to be implemented as a pre-requisite for further lending, and it is important that they make that requirement. It obviously requires the recipient country to request efficiency project funding as well as the Western agency, and that has not always been at the top of their priorities. However, donor agencies have a major opportunity to influence such priorities, as they do and continue to do for overall economic policy (for example, as pre-requisites for joining the OECD and the European Union). The Western financing institutions have not always exerted such influence in a positive way in favour of energy efficiency investment opportunities.

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188 The possible solution “Establishing criteria for AIJ projects” is discussed in section 5.7.2.

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b) Project guarantees

The role of limited EC and bilateral aid resources in providing project guarantees, and hence dramatically increasing the scale of potential efficiency funding, should be assessed. Project guarantees are available for insurance against some risks. Such programmes exist in, among others, the World Bank - MIGA, ExImBank, and NIB. The GEF is proposing such an expansion to their traditional grant financing, as one of a range of options to more significantly involve the private sector, in a paper due to be discussed in October 1996 by the GEF Council. Sovereign guarantees help to attract foreign investors. Annex I Governments could consider providing guarantees to investors from their countries who invest in soundly-based projects in EIT countries.

c) Increasing the availability of long-term finance

Local currency has generally only been available for very short-term loans in most EIT countries, for example, up to one year. A one-year term does not generally cover the payback period of many efficiency projects. The funds made available by the MDBs through local commercial banks, however, can be much longer in term, allowing the local bank to then on-lend also for longer terms. Long-term financing to a project developer can mean lower annual finance payments, and it can also finance longer payback projects. Energy efficiency projects may become more attractive to the end-user by allowing the investment to be financed exclusively through cost savings, and therefore not increasing their outgoings. For other commercial investors, long-term financing from MDBs can allow the commercial investor to shorten the term of their participation thus making their participation more likely.

d) Soft loans or blended grant and debt financing

Soft loans are a rather controversial option, as projects that are not commercial in their own right are perhaps not the ones that central decision-makers should be supporting. Markets do not yet work efficiently in EIT countries, however, and pollution externalities are not included in prices. Soft financing can compensate for such market failures. Two of the many successful examples of this type of financing are the German Coal-Aid Revolving Fund (GCAF) in Hungary and the Podhale geothermal project in Poland. The GCAF had supported 158 efficiency projects by the end of 1994, but there is currently no further capital available until the Fund turns over. A geothermal project in Podhale, Poland, has utilised the funds of the World Bank, bilateral grant agencies and programmes, and local funds. The result has been a 75-80 per cent decrease in local emissions and the development of geothermal resources sufficient to last for 100 years.

One danger of highly subsidised funding is that if commercial or near commercial projects can access the funds, they will drive out other less remunerative projects which may nonetheless be environmentally beneficial. Those projects that are less commercial may then not qualify for alternative sources of funding where the rates are not so highly subsidised. The GCAF is thought to have had this effect. For example: “It is the considered view of the World Bank that the advantage of cheap finance from the GCAF has meant that no potential borrower has even sought finance from its existing credit line since 1991-92”.[189] A better approach may be to blend grant aid or soft loans with credit at market rates to lower average interest rates for loans.

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189 Coopers & Lybrand, ‘Feasibility Study for the Establishment of a Revolving Fund for Energy Efficiency Investment in Hungary’, Interim Report, Budapest, December 1995.

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d) Establish funds dedicated to energy efficiency

Even when the barriers to financing projects in the EIT countries due to uncertain economic trends and macroeconomic policy are overcome, there remain barriers specific to the energy efficiency projects themselves. Establishing funds dedicated to energy efficiency could be a way to channel more of existing funding flows to energy efficiency projects. Some MDB funds are targeted at efficiency projects to avoid the problem of having them reinvested in government securities. Where these funds are targeted, however, in some instances, they are not even disbursed. Such is the case with some World Bank credit lines to local commercial banks in Hungary.[190] "Primary reasons why the funds were not used were: 1) high, market level interest rates; 2) credits were for foreign exchange lending with all devaluation risk borne by the borrower or participating bank (whereas most project costs require financing in domestic currency); 3) a requirement of full recourse assumed by the participating financial institution; and in addition, there was a crowding out of World Bank funds due to the availability of loans from the German Coal Aid Fund (a Revolving Fund) at around half commercial lending rates,[191] 4) failure to market and connect these funds with project developers and prospective borrowers."[192]

Lack of information and experience

There is a lack of managerial experience in EIT countries. Both local and foreign developers looking for local partners are constrained by this factor. In the industrial sector, managers may ignore energy efficiency because it is not their core business (this is a problem in all countries). In EIT countries, the very uncertain economic future makes it difficult to plan for the long term. Industrial managers may also lack the experience needed to turn the technical results of an energy audit into a financial proposal suitable for a financial institution.

Small consumers can never have the same access to information or the skills to measure and make sound investment decisions as a few large energy utilities. Information on energy use to most energy consumers is usually very limited. Consumer unfamiliarity with more efficient boilers, radiator valves and CFLs may act as a barrier even where cost-benefit analysis suggests an attractive investment. The lack of heat metering for individual households and parts of an industrial operation, and sometimes inadequate or absent energy billing for consumers, are major disincentives to energy efficiency. Although gas and electricity meters are becoming common in some EIT countries, utility bills provide very limited information for consumers.

Most EIT countries are unable to finance investment even in widely available, basic technology. In addition, there may be a lack of technical capacity to market, install and maintain such equipment in some countries. While technical training and expertise is often extremely high in this region, business skills are still deficient. EIT countries currently lack a pool of technically and financially qualified and experienced personnel who can identify, develop and manage energy efficiency projects, though this is improving. The EBRD identifies the inadequate availability of suitably qualified counterparts, with experience in managing projects involving foreign banks and suppliers, as the main constraint to its new activities in the

190 Hungary Energy Efficiency Co-Financing Facility, Proposal for Review, IFC, Washington , DC, 1996.

191 Coopers & Lybrand, 'Feasibility Study for the Establishment of a Revolving Fund for Energy Efficiency Investment in Hungary', Interim Report, Budapest, December 1995.

192 International Finance Corporation, 'Proposal for Review: Hungary Energy Efficiency Co-financing Facility', Washington DC, 1996.

region.[193] The consequences are that efficiency projects may not get developed due to the lack of expertise, and the costs of the project may rise. Educational qualification for energy auditing, overall energy management, and financial appraisal not quite widely available. The consequences are that projects may not be developed, even where they are extremely cost-effective. In addition, without local manufacture or maintenance, there is no impetus to continue with or replicate even with proven success. The consequence of this is felt both by foreign companies looking to work together with local management through licensing and joint ventures, and also by international financial institutions trying to make financing decisions on local projects. A further consequence is that local developers cannot easily access the capital that is available for efficiency projects. Competing projects may not be compared on a comparable basis and so the best projects may not be selected.

Lack of Information: Possible solutions

a) Information programmes

In many OECD Member countries, the impact of a series of marketing, information and education programmes has made many consumers at least aware of the opportunities for energy conservation. There is some empirical evidence that improving the quality of information can reduce consumption by 5-10 per cent in OECD Member countries (Kempton and Layne, 1994). In Australia, the introduction of appliance efficiency labelling was estimated to shift 13 per cent of consumers towards more efficient refrigerators over the first two years of the programme's duration. While it is difficult to conclude that similar savings would occur in EIT countries, there is some evidence from Poland, Hungary and Estonia to suggest that where energy efficiency information has been provided, consumers have responded well. Labelling appliances also helps improve information for consumers. Information programmes in isolation rarely have a major impact. However, combined with other measures, they can be very important. Such programmes also need to be sustained over time, as the impact of 'media' campaigns can quickly fade. Information tends to be more effective if it is delivered as advice tailored to the specific circumstances of an enterprise group of residential consumers or public sector body. This function, delivered as an audit linked to implementation actions, can be undertaken by ESCOs or through utility DSM programmes.

b) Provision of meters and improved billing

Installing meters facilitates the implementation of future measures to improve the efficiency of energy use, such as charging per unit of energy consumed rather than a flat rate based on floor space, installing equipment for modulating heat in flats, and introducing building insulation. Meters are essential for the provision of data which identifies energy consumption for each consumer and energy trends over time. More regular and informative customer billing would reinforce consumers awareness of the cost of their energy use (and the value of saving energy).

193 European Reconstruction and Development Bank, 'Energy Operations Policy', London, 7 March 1995, p. 11.

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c) Standard protocol for measuring energy savings

There is a the need to provide consistent methods of measuring and verification of energy savings so that, for example, ESCOs are able to measure the effects of their work for contractual purposes. The North American Energy Measurement and Verification Protocol (NEMVP) provides such a method.

d) Targeted training

Training and education programmes over a number of years are needed to change the skill-base and culture in this area. These could include targeted information programmes, the training of technicians, and developing demonstration projects via GEF, AIJ projects, joint ventures, and bilateral funding. The role of bilateral energy and aid agencies and multinational companies in encouraging the exchange of technological expertise as they train local staff, is also important. Both large multinational companies (MNCs) and small ESCOs have experience in the sector to introduce effective efficiency measures and to reduce the perception of technical risk. Large MNCs also have the experience of arranging financing, particularly with foreign commercial banks and MDBs. They can therefore reduce the problem of skills shortage and provide access to available capital. They should be encouraged to act as mentors to less experienced local project developers.

The role of the network of independent energy efficiency centres (e.g. SEVEn, FEWE, EnEffect etc.) and some of the more effective EC Energy Centres, could be important in building up local capacity. The former have already demonstrated a high level of expertise utilising local staff. The Swedish agency NUTEK, has been working with local energy and engineering companies in the Baltics for a number of years on boiler conversions and building efficiency upgrades. By softening the cost of projects through covering NUTEK's project management costs via a Swedish government grant, local capacity has been built up through close co-operation and the transfer of skills. A key element is building a corps of professional energy managers, engineers, financiers and architects skilled in the ideas and techniques of energy efficiency investment. Training programmes within the technical universities within Central and Eastern Europe are often strong, but very few are orientated to energy efficiency.

f) Matching projects and donors

The Project Preparation Committee (PPC), which was established following the 'Environment for Europe' Conference in April 1993 in response to the Environmental Action Programme[194] provides a project/donor matching service. The PPC's activities can overcome the problem of projects in the assessment phase not finding funding for implementation, and the problem of projects with a potential lender not finding the grant money to prepare the technical assessment. It appears to have more than exceeded its goals and has the capacity to work with a wider range of partners and a greater level of resources than at present. There is a clear lesson for bilateral and multilateral donors in avoiding duplication of effort. The work of the PPC should be extended, with a higher emphasis upon energy efficiency than at present.

Lack of credit history

Many local private sector companies have little in the way of credit records and hence are often viewed as risky ventures. This, combined with the general lack of availability of credit, means that newer firms with

194 Project Preparation Committee, PPC Factsheet, EBRD, London.

no established track record find it impossible or very expensive to access credit. Some of the constraint on lending comes from the governments' attempts to increase the strength of local banks by raising capital adequacy requirements. In the Czech Republic, for example, many banks cannot meet the existing requirements and hence have no capital available to lend. In other cases, conservatism on conditions of guarantees or collateral is due to crowding out or the lack of competition.

Small consumers are unlikely to have sufficient collateral to access local financing. Many firms are not creditworthy due to a lack of cash flows and lack of collateral. Private sector-run energy efficiency projects often only have weak sponsors who lack loan guarantees. Even municipalities are rarely creditworthy in the eyes of local banks in some countries. As mentioned above, without long-term local currency capital available for project developers, project risks and investor uncertainties are higher.

Lack of credit history: possible solutions

a) Finance through leasing and/or municipal bond finance

Widely-dispersed decision-makers are common for district heating and other residential sector projects, which provides difficulties in relaying adequate information and achieving consensus and making decisions. Access to capital is limited, if available at all, for small consumers As they are considered a higher credit risk than large corporations, the cost of borrowing is higher. When they are brought together collectively, such as through a municipality-owned housing development, then they can represent a viable funding unit. Municipalities carry financing barriers of their own, however, and have not yet become an optimum solution. In Poland, many municipalities are creditworthy and there is a fledgling municipal bond market in that country with possibilities for energy efficiency financing. Other options are performance contracts through ESCOs (where they exist), leasing arrangements, joint ventures, or AIJ pilot projects.

One manager of an IFC fund in Poland which invests in Poland, Hungary, the Czech Republic and the Slovak Republic, has indicated that equity may not be the right strategy for these countries because of the reluctance on the part of entrepreneurs to have an outside shareholder. This reluctance may also be cultural[195]. Clauses in the shareholders' agreements designed to protect the minority shareholder in particular, frighten owners.[196] Between $500-600 million of equity is available to be invested in Poland, but the fund managers are having difficulty in locating investments. As a result, the three biggest funds in Poland, managed by CS First Boston, Invesco and Barings, respectively, are largely invested in listed securities; there is very little private equity.[197] Convertible loans, legally available in Poland since 1995, or a combination of equity and convertible loan, might be a better structure.

195 Advent Fund Officer, personal communication, London, February 1996.

196 Partner of the Renaissance Fund, personal communication, January 1996.

197 Investment Officer, Barings Emerging Markets Department, personal communication, London, January 1996.

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b) Expand local banking

The development of the banking sector varies widely from country to country within the region. All of the development banks, the World Bank, the European Bank for Reconstruction and Development (EBRD), the Nordic Investment Bank (NIB) and the European Investment Bank (EIB) are actively financing and developing local financial institutions. An increase in locally available capital is needed to mitigate the problem of crowding out and to increase the availability of local currency funding which can reduce the exchange rate risks to the borrower. In several countries of the region, the government, and occasionally banks and local industry, are now able to access the international financial markets, notably Hungary, Poland and the Czech Republic. This not only improves liquidity, but also increases competition within the banking sector, which in turn drives down margins and spurs on innovation.

Institutions and ownership

Because state-owned enterprises are monopolies, they usually have no experience or incentives to invest in energy efficiency. This often includes utilities, which are accustomed to being judged on how much energy they sell, not how much they save. They often, but not always, have a direct profit incentive to sell as much energy as possible, even though DSM options might allow the closure of expensive peaking or even less efficient and polluting base-load plants, and reduce overall system costs. Other institutional problems include the level of inter-enterprise debit between state-owned enterprises. This is a particular problem in Russia and the Ukraine. In this instance, any semblance of market economics is obscured by large levels of indebtedness, supported by State subsidies. In this case, there is little incentive to reduce costs. Privatisation will clearly force major changes within these organisations, and the rate of such developments will have an impact on future energy efficiency investment levels.

Prior to 1989, countries of CEE and CIS paid lip-service to the role of energy efficiency in their centrally-planned economies. Low energy prices, extensive subsidies throughout the energy system, and a quota system of energy allocation provided clear disincentives to save energy. High energy intensity levels were viewed as a sign of economic development and progress, and hence high energy use was to be encouraged. Some of this legacy remains both in cultural attitudes and the inefficient infrastructures still in place today. Since 1989, most of the EIT countries have introduced, or are in the process of introducing, new energy policies. These are often very general statements of policy, many of which refer to the importance of energy efficiency. Few of these policy statements are yet backed up by specific legislation, obligations and resources. Many of the energy policies adopted and/or applied to date give little priority to energy efficiency, provide disincentives to investment in energy efficiency projects, or provide misleading or contrary economic signals. In other cases, energy laws have either not been implemented through specific operational policy or contain no incentives for energy efficiency. In the Czech Republic, the 1995 enabling Energy Law has not, to date, been followed up with specific energy management regulations.

Some EIT countries have initiated a number of promising policy measures, however. In the Czech Republic, a State energy conservation programme spent US$36 million on subsidies and interest free loans for efficiency options between 1991 and 1993, mainly in the residential sector. A new programme was started in 1994, and is run by the Czech Energy Agency. A specific energy efficiency fund has been proposed. In Poland, a new Energy Law (being considered by Parliament in 1996), proposes appliance efficiency standards. However, little beyond this specifically encourages energy efficiency in the legislation. The government also set up KAPE, an energy conservation agency with the responsibility of developing ESCOs in Poland. In the Ukraine, a law on 'Energy Saving' was adopted in July 1995, and the

State Committee for Energy Conservation was established (currently with over 110 staff). The budget implications of this initiative have not yet been agreed. In Russia, a progressive energy conservation decree was passed by President Yeltsin in March 1996. Unfortunately, only $4 million has been budgeted for implementation for the entire country.

Lack of emphasis on energy efficiency when utilities are privatised is a problem for both EIT countries and OECD Member countries. The need to maximise privatisation income has usually been the dominant objective. In the absence of strong incentives to save energy, utilities and governments may end up either building unnecessary new energy supply capacity, importing more fuel than necessary, or keeping dirty and expensive plants operating.

One of the legacies of the Communist era has been a wide range of ownership issues relating to buildings, companies and district heating systems. Ownership-related complications, such as landlord/tenant split incentives and multiple ownership of district heating systems, and the inability of municipalities to provide satisfactory loan guarantees for financial institutions hinder potentially profitable investments. Where ownership is unclear, it will usually prove impossible to secure a commercial loan, due to the lack of loan guarantees. Where ownership is multifaceted, for example, including the municipality, private sector and also the consumers, it will prove difficult to develop and manage efficiency projects and secure loans for investment. In the case of a building 'owner and tenant' relationship, there is a particular barrier identified as 'split incentives'. This indicates the lack of any incentive to invest in energy efficiency for a building owner, who pays for the capital cost of a building's heating and lighting system, but usually not for its running costs. The incentive in this case is to opt for low capital costs (and often low efficiency) equipment. The tenant meanwhile does pay for the running costs, but has little incentive to invest in new equipment as he/she will not own this, and may leave the building within a few years, letting someone else take the benefit.

Institutions and ownership: possible solutions[198]

a) Define and implement energy efficiency policy

There is a wide body of empirical data and research outlining the importance of energy policy initiatives for capturing energy efficiency. Such initiatives include setting minimum efficiency standards for buildings, appliances and lighting, providing grants and other incentives for consumers, running informational campaigns, and setting up effective energy efficiency centres and agencies for implementation. The OECD Member countries who have been the most successful in improving the energy efficiency of their economies (e.g. Japan, the Netherlands, Denmark and Germany) have made a clear linkage between energy efficiency and economic efficiency through governmental policies and programmes.

Section 3 has indicated that while significant progress has been made in addressing some of the serious inefficiencies in the energy infrastructure and energy usage in EIT countries, much remains to be done. Despite a number of positive initiatives in countries such as Poland, Hungary, Russia, the Ukraine, and the Czech Republic, energy policies in each country are still evolving, and detailed implementation strategies and programmes are the exception rather than the norm. Energy efficiency still has a relatively low overall priority among governmental institutions and policies. There is a need for energy policy legislation which places a high priority on energy efficiency investments, develops a range of financing

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[198] The possible solution "Facilitate creation of ESCOs" is discussed in section 5.7.1.

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measures for such investments, and sets up a well co-ordinated programme of activities through an Energy Efficiency Agency which has adequate resources and authority. Energy policy goals need to be clear, established over a period sufficient to cover investment decisions, and fully implemented in order to support, rather than hinder, investment. Such an approach would give a clear signal to the market about the importance of energy efficiency, while leaving the market to find explicit ways of achieving these goals.

b) Create utility regulatory structure that favours DSM

The privatisation programmes in many of the countries of the CEE/CIS provide 'one-off' opportunities to integrate a DSM element to the utility sector. Few have taken the opportunity to date, with the exception of Hungary, in a limited sense. The World Bank, sometimes in partnership with USAID, is taking some important initiatives in Russia and the Ukraine, where DSM opportunities are given a prominent role. Unfortunately, there is one downside with World Bank involvement in utility privatisation. Under World Bank rules for the privatisation process, the highest bid must be accepted. There may be other bids with higher social benefits, for example, if a DSM programme is included, but if the strictly monetary bid price is not as high, it will not succeed. The World Bank has implemented major new efficiency programmes, but its lending policies could further support DSM if a DSM element were factored in the decision rule according to which projects are accepted. Alternatively, a DSM programme could be a pre-requisite for bidding.

Privatising state-owned enterprises, developing incentives to cut energy costs, and removing subsidies are three options for improving both institutional capability and providing efficiency incentives for energy utilities. For utilities, making the overall system and the varied distribution and transmission costs of supplying energy throughout the system fully transparent, is an important step in the process, as this helps to clarify the benefits of energy saving. All Annex I countries undergoing utility privatisations should agree to fully factor in incentives for DSM as an element of the bidding process. This will mean some modifications to the World Bank's own rules regarding bidding, which at present can be detrimental to DSM.

c) Rationalise ownership and improve incentives

Resolving ownership, for example by forming a joint stock company, can allow commercial investments to take place. Another solution is to develop ESCOs, who manage the energy services of a building (i.e. paying the energy bills, investing in energy efficiency improvements and charging the tenants), and thus have a real incentive to save energy. Renovation package deals including an energy efficiency component could be offered when privatising blocks of buildings. Another solution could be to provide soft loans or grants to tenants to offsetting the risks and costs of efficiency investments. Building owners should be allowed to raise rents gradually once efficiency investments are made.

Small scale nature of energy efficiency projects

MDBs and other financing institutions do not favour smaller-scale efficiency projects, because small projects incur higher transaction costs in proportion to the revenue streams generated. There are three problems associated with the small-scale of many efficiency projects:

1) they are too small to attract the interest of major financial institutions;

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2) transaction costs are disproportionately high; and

3) project decision-makers are highly decentralised making it difficult to develop the project.

Most MDBs and project lending departments of commercial banks have minimum lending guidelines, particularly for EIT countries: many MDBs and IFI s have minimum lending levels of $5-10 million, resulting in projects which are smaller than $12-25 million being much less likely to be supported. Other minimum limits are $50-75 million for commercial banks,[199] $6 million for the EBRD, $10 million for the IFC and $25 million for the EIB.[200] The total project costs implied are very much bigger as the IFI maximum participation is often less than half the total project costs.[201] Many efficiency projects will fall below this threshold. There is also institutional inertia in favour of larger supply-side projects. Though local resources currently dominate expenditure on energy projects, the development institutions are key actors in securing the economic and environmental benefits of energy efficiency in the EIT countries. As such, their policies and innovations are critical in overcoming barriers such as investor uncertainty, the lack of experience in developing projects, and to provide finance for the development of energy savings measures.

Small scale of efficiency projects: possible solutions

a) MDB lending policies

There are two generic problems with MDB lending. The first is organisational inertia, which drives the Banks towards projects that fit into traditional lending practices such as large, infrastructural projects. The second is that where they lend for environmental projects, they are likely to be biased towards their own well-developed environmental priorities, or those of the developed-country governments sponsors, rather than for local, often ill-defined, environmental priorities. Despite the positive evolution of energy policies and, in some instances, climate policies within the major MDBs, the operational impact of these on actual energy lending to date has been modest. End-use efficiency project financing makes up a tiny proportion of the MDB energy project portfolios. There is a need to improve the operational impact of policies supportive to energy efficiency, as well as work with loan recipient countries to promote the case for energy efficiency being an integral element of sustainable economic development.

Intermediary options between large scale sources of funds, such as from the MDBs, and the many relatively small-scale projects that exist in the region are needed. One measure that could be considered is to factor environmental externalities into the project appraisal criteria of MDBs, IFIs, and regional and bilateral agencies. Although making energy efficiency and other environmental pricing criteria explicit poses significant technical and data problems, in the short-term, some form of shadow-pricing to simulate a modest externality cost could be included in project appraisal criteria, or 'life cycle' least-cost analysis could be required to ensure that demand side options are evaluated on a proper cash flow basis. At a

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199 Citibank and Deutsch Morgan Grenfell, two leading project financing banks in London have used this range.

200 Lending Office Representatives, Citibank and Deutsch Morgan Grenfell, personal communication, January 1996.

201 Information Officer for central and eastern Europe, European Investment Bank, personal communication, January 1996. International Finance Corporation, 'Annual Report 1995', Washington DC, 1995. European Bank for Reconstruction and Development, 'Annual Report 1995', London, 1995.

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minimum, energy efficiency assessments could be made a formal requirement of all energy project appraisals.

A promising approach could be on-lending to local banks who disperse funds to smaller projects, while ensuring that local bank staff have the technical and marketing capacity to utilise these effectively. Energy efficiency assessments could be made a formal requirement for all MDB energy project appraisals. MDBs could include ‘life-cycle’ analysis in all ‘least cost’ criteria for their energy projects, ensuring that DSM options are not prejudiced in view of possible higher initial capital costs.

b) Bundle small projects together, or link them to supply side projects

It may often be feasible to bundle together efficiency projects to make one larger financial transaction from which country projects or companies can draw on for smaller individual efficiency projects. Such is the case with the EBRD multi-project facilities. Another option is to attach efficiency projects to larger supply-side infrastructural projects. The only danger with the latter is that the efficiency project will not go ahead on its own if the supply-side project does not go ahead. Such is the case with an EBRD energy sector loan in Bulgaria.

c) Establish and capitalise ESCOs

Another option could be to encourage the development of ESCOs. The World Bank and EBRD regard ESCOs as a solution to a number of the barriers to energy efficiency. MDBs will not contribute equity unless they can match other partners’ equity, for example, the EBRD generally expects ESCOs to bring 25-30 per cent of project finance to the table to add to the EBRD’s 35-45 per cent contribution. It is unlikely that local companies would be large enough or have a long enough credit history to provide finance by mortgaging their equity. One solution is for international institutions to capitalise ESCOs and then provide project finance (this mechanism has been used by the World Bank in China and is being considered by the EBRD in Bulgaria). The ESCOs could then take on smaller performance contracting projects and disburse loans to a large number of smaller projects. ESCOs can thus utilise large amounts of capital in a number of smaller projects.

d) Set up funds targeted to small projects

Several programmes of the MDBs are being established to target small and medium sized enterprises. The IFC and GEF have many such programmes either established, or in the process of being established. For example, the IFC’s Renewable Energy and Energy Efficiency Fund, the GEF small grants programme and the World Bank’s Environmental Enterprise Assistance fund, and the Small and Medium Sized Enterprise programme. The World Bank programmes in Russia target small projects, while the United States ExIm bank provides environmental funds with no minimum lending requirement. Revolving funds provide a mechanism for MDBs or multilaterals to transfer large resources for subsequent disbursement to small-scale projects at a local level.

e) Require demand side energy efficiency assessments

Where new or upgraded supply-side projects are being proposed, a criteria requiring the simultaneous assessment of demand-side efficiency investments could be included as part of the project evaluation. In many instances this could reduce supply costs.

Low or uncertain energy prices

Low and unstable energy prices undermine the cost effectiveness of most energy projects, but energy efficiency projects tend to suffer more than energy supply projects, due to their unfamiliarity (from a project financier's perspective), and often a more uncertain revenue stream. Energy prices in many EIT countries (except, very often, in the residential sector) are rapidly converging with market levels, but there are many cases of scheduled energy price increases being delayed or ignored, for example, in Hungary and the Czech Republic, or vetoed by the political process, such as in Bulgaria. Uncertainties over future pricing levels also undermine confidence in energy efficiency investments. A project may find its cost-effectiveness reduced if price increases fail to keep pace with inflation (as they have in some EIT countries over the past few years). This may in many instances be more critical for the viability of an energy efficiency project than low energy prices *per se*. A simple index of real energy prices relative to inflation by governments can avoid this problem.

Significant progress has been made in reducing energy subsidies in many of the countries, particularly in the industrial sector. Subsidies still remain, however, particularly in the residential heating and electricity sectors, and few utilities are pricing energy close to the long-run marginal cost (LRMC), or factoring in sufficient maintenance and depreciation of capital stock in pricing calculations. Even more than the actual level of energy prices, the unstable nature of government policy in raising prices undermines the cost-effectiveness of all energy projects, but especially energy efficiency due to greater unfamiliarity of such projects.

The externalities of energy consumption - such as CO_2, SO_2, NO_x and CH_4 emissions - are generally not included in EIT energy prices. A number of exceptions include Poland, where SO_2, and NO_x emissions are heavily taxed to incorporate that social cost in private sector decision-making. Omitting externalities from the price is a problem that is not unique to the EIT countries, as few OECD Member countries have so far introduced such externality pricing measures. A study on the Polish electricity sector for the World Bank found that, whereas an energy conservation supply curve in Poland based on the strict avoided energy cost of US $0.027/kWh suggests potential efficiency savings of around 10 TWh, when an environmental externality component is added, taking the cost of saved energy up to US $0.045/kWh, the potential savings increase to nearly 25 TWh (around 20 per cent of current consumption).

Low and unstable energy prices: possible solutions

a) Develop plan for raising prices

For many EIT countries, it may be difficult in the short term to increase energy prices quickly up to market levels for residential consumers, due to the serious burden this would place on most people. Where energy costs make up 10-20 per cent of household income (as they do in Hungary, Poland, Romania and Bulgaria), rapid increases in prices are highly unpopular, they cause real social hardship and lead to a high degree of non-payment, and so are politically difficult. It may be more feasible in the short term to develop a clear timetable for gradually increasing prices.

Where the energy prices are low *but the pricing structure is explicit and predictable*, private funds are more likely to be invested in efficiency projects. For example, though Slovenia is not an Annex I signatory to the UNFCCC, economic conditions are comparable to countries such as the Czech Republic. The government has banned the use of heavy residual oil in domestic heating and cooking and stated that gas will not be more expensive on a comparable basis than the alternatives of coal and wood. An ESCO-type structure is, as a result, working relatively well with the participation of a profit-maximising equity fund (the Global Environment Emerging Markets Fund). Despite energy prices being below market levels, the government was able to provide some certainty, allowing consumers and investors to plan with a degree of confidence.

b) Remove subsidies

Full explicit transparency of energy subsidies should be required, with a timetable for reducing these subsidies as quickly as is feasible. Making government subsidies to the consumer explicit would enable full costs to be used for government and MDB investment decisions. For example, if an energy savings scheme were proposed to a local industry, then, regardless of the price that industry paid for energy, the savings could be allocated proportionately between that industry and the government. To the energy service company or other project developer, the revenue stream of savings would be equal in value to those that would be received at full market prices. This alternative is now being proposed by several Western energy service companies (ESCOs) seeking projects in the region.[202]

Where extensive subsidies are in place, the impact of increasing prices can be mitigated by investing in energy efficiency. In Russia, for example, a large housing privatisation programme likely to be funded by up to $300 million by the World Bank (see Section 4) has built in energy efficiency upgrades to the buildings, in order to reduce the impact on new tenants and owners when they move away from highly subsidised energy tariff structures. For example, a DM 1 billion housing loan from the German government to Hungary includes a large proportion of energy efficiency.[203] Another option is for the government Ministry currently paying subsidies to reduce these through energy efficiency investments.

c) Factoring in pollution externalities in project appraisals

If MDBs or bilateral agencies were to incorporate pollution externalities in project appraisals, this could become part of the lending criteria of these funding organisations when deciding which projects to support. Including externalities in a World Bank study on DSM in Poland more than doubled the cost-effective resource available. In the case of Ukraine, there is a major study underway by the World Bank of the 'least cost' options for power sector development. This study will inform the choice of technologies to be used to replace the two operating units at Chernobyl by the year 2000. Such a study should compare all the supply-side options and demand-side investment option using common investment appraisal. It should also include the costs of externalities for the various options, such as CO_2, NO_x and acid emissions from thermal plants, and nuclear waste and safety risks arising from proposed nuclear plants. It is accepted that it will be difficult to find accurate empirical underpinning for externalities

202 Representative of Landis and Gyr, personal communication, Zug, January 1996.

203 Ian Brown, Director, EC Energy Centre, personal communication, Budapest, January 1996.

pricing. It may be that some form of shadow-pricing initially, or at least a modest assumption for the level of externalities, would be pragmatic first steps.

d) Developing a Pollution Tax/Fees Regime

Progress has been made on pollution taxes or fees, particularly in Poland and the Czech Republic, and to a lesser extent in Hungary and the Baltics, though not for CO_2 emissions. A tax penalty on emissions internalises the cost of emissions in corporate decisions, affects the cost of energy consumption and penalises inefficient consumption and is also a means of raising revenue for local efficiency financing. The SO_2 fee in Poland is a good example of such an approach in this region. Sulphur emissions are charged at about $90 per tonne[204] and the fee is the single most important source of revenues for environmental funds (for a discussion of local environmental funds, their sources and uses see Appendix 3.4 and 5). Environmental investment expenditure in Poland in the early 1990's amounted to $1.3 billion or 1 per cent of GDP, a level maintained to date and commensurate with what is spent per unit of GDP in the OECD Member countries.[205] The financial penalty must be sufficiently large to give a strong signal to producers to re-direct energy investments, and compliance must be thorough to prevent the system falling into disrepute. Even in Poland, which probably has the most advanced pollution fee regime among the EIT countries, the non-payment of pollution fines is over 25 per cent.

General solutions

ESCOS

One promising approach to overcoming the barriers to energy efficiency would be to establish energy services companies (ESCOs) with the Region. There are a number of successful examples of this in Poland, Hungary and Czech Republic. These organisations would typically be private sector specialists who offer 'turn-key' energy saving contracts. They provide auditing, project management, implementation, and finance expertise, and take their profits from the energy saved.

There are many ESCOs in the OECD specialising in auditing and implementing cost-effective demand side investments with a view to reducing overall energy costs. Existing ESCOs or other businesses with the necessary mix of financial engineering and technical implementation skills could be part-financed by an MDB. The creation of an ESCO allows risks to be pooled and shared, and facilitates direct involvement in projects. The creation of an ESCO able to offer finance on sufficiently attractive terms, and the resulting CO_2 savings, could be considered as an activity implemented jointly (AIJ) under the UNFCCC. The establishment of an ESCO should factor in the following:

- The financial and commercial structure of the operation to be developed by one or more MDB;

- Grant or 'soft' loan finance, for example from GEF or development agencies, could be

204 Pollution and Natural Resource Taxes in Poland, Tomasz Zylicz, prepared for a Harvard International Institute for Development seminar on the use of economic instruments for natural resource and environmental protection in the Baltic States, Tallin, April 26-7, 1993.

205 Tomasz Zylicz, 'Pollution and Natural Resource Taxes in Poland', Harvard International Institute for Development Seminar, Tallin, April 26-27, 1993.

blended with credit at commercial rates to reduce the cost of capital and compensate for the riskiness of the investment. This could be a commitment of the Parties to the UNFCCC.

– The private sector business chosen to operate the ESCO will be a beneficiary of such an enterprise and should be considered as a further source of finance and be expected to share the risks. Competitive tendering could be used to secure the most attractive package of private sector involvement.

– The EIT Governments should play a vital role in ensuring that the structure of the energy sector and regulatory framework is conducive to ESCO activity and that appropriate resources are made available. The Governments can also ensure that payments are made and contracts honoured, and that the State itself is a major customer for ESCO services.

– Competition between several ESCOs in the same country would reduce costs and improve project quality.

The basic role of an ESCO is to provide comprehensive energy efficiency services to customers, including engineering, project management, equipment maintenance and monitoring. ESCOs can package their services using a variety of finance schemes including shared-savings, whereby the ESCO finances capital improvements for the customer in exchange for a portion of the savings generated. This means the ESCOs are effectively able to turn the cost savings from efficiency measures into a revenue stream that can be used to repay debt and provide a profit.[206]

Energy Service Companies (ESCOs) can help overcome the constraint on capital in the EIT countries. By providing for the repayment of a loan through revenues, those borrowers that do not have realisable capital (municipalities) or that do not have access to capital on their own balance sheet (small investors) can service a loan through revenues. Three problems have slowed the growth of ESCOs in the EIT countries. First, in most countries of the region, interest rates are high due to lack of access to capital by the banks, and returns on efficiency projects are low, due to subsidised prices. Therefore, the return on a project is not sufficiently high. Second, the scale of the project falls below the minimum lending limits of most international financial institutions. Third, local bank lending is still heavily reliant on asset-backed finance. If banks are unwilling to take commercial risk (as discussed in Chapter 5 with regard to Polish banks, though it applies more generally) then the debt capacity of the private sector is limited to the amount that can be covered by collateral. This amount is much less than the likely value of future business. This has negative implications for the development of ESCOs. Local commercial banks are still not willing in many instances to lend on the basis of proposed energy savings, even though the technical risks are low. Energy efficiency loans get treated like any other corporate loan where collateral is required.[207]

ESCOs themselves are adapting their structure to suit the needs of project owners in developing countries. Successful ESCOs are not the typically low-capital, highly-geared arrangements found in their American form. They tend to be larger, more highly capitalised, with longer-term commitments sharing more of the risks beyond the initial technical risks. In Hungary, the EBRD structured a loan to an energy service company for several projects based on overall security covenants. In the possible ‘super-ESCO’ under debate for the St Petersburg region of Russia, the financial strength and negotiating skills of the MNCs

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206 Peter Hobson, ‘Structuring Efficient Investment by the Multilateral Banks’, presentation to the Royal Institute for International Affairs, IIEC-Europe, London, December 1995.

207 IIEC-Europe, ‘Finance for Energy Efficiency in Poland’, DRAFT report, January 1996.

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make possible the unification of the many parties necessary to complete a region-wide efficiency programme.

In general, ESCOs take the technical risk of a project by 1) benefiting only from the cost savings resulting from the project, and 2) providing a corporate guarantee. Energy efficiency projects are only one of many projects a customer may undertake, which, unlike revenue-enhancing projects, is not part of their core business. For an ESCO, efficiency projects are the core business. The greatest hurdle to energy efficiency contracting is the typical under-capitalisation of ESCOs. In the United States, and to a lesser extent Europe, where ESCOs are quite active, the projects are highly leveraged and the equity of the company's own balance sheet is minimal. This presents a particular problem for those foreign ESCOs seeking to do business in developing countries. In most cases, the legal system is still developing and litigation under the guarantee would be difficult and protracted. In any case, the guarantee provides little comfort, because the ESCO itself is only minimally capitalised.[208]

The more successful ESCOs in the region have been the more highly capitalised companies. EPS (CR) has been established in the Czech Republic for three years and has implemented $11 million worth of projects financed through a combination of Czech banks and an international lender. Their success where other ESCOs have sometimes failed is attributed to 1) the greater financial strength of the parent company, a large American utility, and 2) the experience and strong references of the parent company in the energy efficiency services market.[209] When the customer has requested, they have been able to offer a parent company guarantee. No investor has been willing to consider project financing only.[210] EPS CR is able to put in its own working capital for the technical assessment phase of the project in order to demonstrate potential savings.

Activities Implemented Jointly (AIJ)

AIJ pilot projects can also provide solutions for a range of barriers, including lack of managerial and technical capacity, and the scarcity and high cost of capital. The current pilot phase was agreed at COPI in Berlin in March 1995. It does not allow formal CO_2 credits for the countries concerned. The lack of CO_2 credits threatens to undermine any real incentive for project developers.

Four AIJ simulation projects have been set up by the Dutch, two of which are energy efficiency focused. The NORDIC Council is supporting AIJ simulation projects. Six of its current eleven projects are energy efficiency projects. Reference has already been made to the USAID AIJ project in Decin, Czech Republic. The Bynov brown coal heating plant in Decin was replaced and the system upgraded with a 10.6 MW natural gas plant. The estimated CO_2 savings are estimated at 26 thousand tonnes of CO_2 per year, at an average cost of $5.48 per tonne of CO_2 over the life of the plant. The project was funded by three American utilities and the Danish and Czech governments.

In Poland, several GEF supported projects have been set up or are under construction. A project in Krakow focused on the district heating boilers, cost $44 million, financed by GEF ($25 million), Poland ($18 million) and Norway ($1 million). In Bulgaria, a AIJ conference held in late 1995 highlighted

208 Environmental Assistance Fund, January 1996.

209 Energy Performance Systems (EPS) representative, Czech Republic, January 1996.

210 Ibid.

13 potential energy efficiency projects. These had payback periods ranging from two months to a few years.

Many western governments have exerted pressure on their domestic industry to cut back emissions of CO_2. Relative to industry in the CEE/CIS, these companies are quite efficient. They have shown interest, therefore, in making further reductions in industries outside their own countries, since the relative costs of doing so should be lower. Activities Implemented Jointly (AIJ) is a concept that allows countries who are party to the Framework Convention on Climate Change (UNFCCC) to implement greenhouse gas reduction policies outside their national boundaries. In the final text of the Framework Convention on Climate Change (UNFCCC), a passage was included in which the Parties to the Convention were permitted to implement their stabilisation policies jointly with other Parties (Article 4.2(a)). Shortly after the Rio Summit, however, a wave of criticism was raised on this concept of Joint Implementation (JI), as mostly developing countries feared that JI would permit industrialised countries (OECD + countries with economies in transition, as listed in Annex I to the UNFCCC) to get away from their commitments in a cheap way. Taking into consideration that the industrialised countries are responsible for roughly 80 per cent of the current amount of CO_2 in the atmosphere would make JI, in the view of developing countries, an unfair concept.

At the several meetings of the Intergovernmental Negotiating Committee for a UNFCCC (INC), this criticism was often put forward in official statements by the G-77+China and by several environmental NGOs. In general, with respect to JI, the G-77+China took the position that if a pilot phase for JI would be decided upon by the first Conference of the Parties, only Annex I Parties should be involved. Joint activities between industrialised countries and developing countries should only take place in the framework of Article 4.3 of the UNFCCC. In other words, financial and technological transfers between North and South should not be linked (i.e., no crediting) with the industrialised countries' greenhouse gas stabilisation commitment under the UNFCCC.

Despite the difficulties with developing the JI concept between Rio 1992 and the first meeting of the Conference of the Parties (COP 1) in Berlin, JI never disappeared from the drawing table. Although the developing countries had strongly expressed their disagreement with JI at COP 1, some of these countries showed appreciation for the concept because of the local benefits that can accompany JI. Because of the latter reason, EIT countries had already expressed their positive attitude towards JI. This resulted in an agreement at COP 1 to start a pilot phase on JI (or Activities Implemented Jointly, AIJ, as JI was officially named in the Berlin Decision) among Annex I Parties and, on a voluntary basis, with non-Annex I Parties. This pilot phase, during which crediting against national emission targets of Annex I Parties is not allowed, will last until 2000, unless the COP decides to take a new decision on JI earlier. During the pilot phase, industrialised country governments will (co-)finance JI pilot projects that will be used to gain experience with such issues as: baseline determination, infrastructural needs to carry out projects, monitoring and verification of the emission reductions achieved. The main purpose of the pilot phase is to inform the UNFCCC about experience gained and technical difficulties encountered.

Ongoing JI activities in EIT countries

Recently, a number of JI initiatives have been undertaken in the Central and Eastern European region. Although all being recognised as official JI initiatives during the pilot phase, these projects have been set up in several different ways. Some of the projects were initiated by United States utility companies that were looking for cost-effective, carbon offset opportunities abroad. Other initiatives are still under development, i.e. the host and investing country participants have received governmental approval for carrying out the project as a JI activity, but are still seeking funding.

The only JI initiatives in EIT countries that focus on energy efficiency at present are the ones that were set up earlier in the framework of other bilateral co-operation programmes and have had a JI component added to them, i.e. the investor provides the software and other techniques necessary for baseline determination, monitoring, verification, etc. In the Netherlands, for example, four so-called ‘JI simulation’ projects have been established. Two of these are energy efficiency projects already in operation in the framework of a programme with EIT countries. Another example of a programme which simulates existing energy efficiency projects as JI projects is the NORDIC council JI programme. Of the eleven projects simulated, six are energy efficiency projects.

A number of currently ongoing energy efficiency JI projects in EIT countries that have received official approval from the host and investing country government will be briefly discussed below. Furthermore, the JI pilot programmes of the Netherlands and the NORDIC council will be described.

Fuel-switching: Decin, Czech Republic

On 18 September 1995 the JI project in Decin, Czech Republic, officially started. Earlier in 1995, the project had already received approval during the first round of the US Initiative on Joint Implementation (USIJI). Decin is a heavily industrialised centre with 55 000 inhabitants located in Northern Bohemia in the Czech Republic. The extensive use of brown coal - as of 1992, 75 per cent of the square footage in the community was heated by coal - is the principle source of the high levels of air pollution suffered by the region.

While large power plants within Czech Republic have begun to receive assistance for abatement of pollutants, district heating plant projects are often too small to attract multilateral funding, despite their devastating effect on the surroundings. Through the assistance of the US Centre for Clean Air Policy (CCAP), additional funds were raised to finance the replacement of a brown coal heating plant for a natural gas plant in one of the City's five district heating plants. For this purpose, CCAP lined up three utility companies in the United States: Wisconsin Electric Power Company, NIPSCo Industries, and Edison Development, each contributing $300 000. In short, the activities undertaken under the project are:

- increasing supply-side efficiency via a fuel switch in a district heating plant;
- improving energy efficiency in district heating network;
- installing energy control equipment in energy supplying units; and
- cogeneration, instead of heat-only production.

The emission reductions achieved through the Decin-project are 26 000 t/yr CO_2 (6 000 due to fuel switching and the remainder due to cogeneration), and 96 t/yr of SO_2.

Coal-to-Gas Conversion, Poland

Under the auspices of the Global Environment Facility (GEF), several projects have been set up or are under construction. One of these is the Coal-to-Gas (CtG) project near Krakow, Poland, the proposal of which has been reported to the INC in 1994 as an ‘early JI experiment’. The CtG-project basically consists of two components: an investment programme to finance the conversion of district heating boilers from coal to gas; and a technical assistance programme, which includes training and monitoring of the project after completion. The total costs of the project, which will be carried out in two facilities, are estimated at $44 million and will be financed by GEF ($25 million), Poland ($18 million) and Norway ($1 million). The environmental benefits consist of a substantial reduction in CO_2 emissions and an important local air quality component (reducing sulphur, NO_x and particulate emissions). A positive side effect of the project may be the speeding up of the installation of new technology in Poland.

The Netherlands' Pilot Project Programme (PPP) and EIT countries

In 1994, the Netherlands presented its pilot programme for JI activities (PPP). At present, the programme includes three forestry projects (e.g. Krkonose, as described above), one hydropower project and four so-called JI simulation projects in EIT countries. The latter projects are mostly energy efficiency projects already in operation in the framework of a bilateral co-operation programme (PSO) between the Netherlands and some EIT countries. Since these projects often have strong similarities with JI projects, the Netherlands has added a ‘JI component’ to these in order to experiment with and investigate the various JI issues. In October 1995, the Netherlands' Government announced its intention to set up a reserve of NL 12 million (about $ 7.5 million) on an annual basis during 1997-1999 for the (co)financing of JI pilot initiatives in EIT countries. Besides eventual new JI pilot projects, this (co)financing might well be used for simulation projects. The results of the Netherlands' JI (simulation) projects will be reported periodically to COP and its subsidiary bodies.

NORDIC Council JI simulation programme

In February 1995, the Nordic Council of Ministers decided to continue the work on JI in a Nordic context. Shortly after that, the Council published a report on JI in which the possibilities for JI between Nordic countries and the states on the Baltic coast were reviewed. For 1996, the Group aims to carry out a JI simulation study on the basis of energy efficiency and fuel switch projects that are already underway. The study will be completed by the end of 1996. In October/November 1995, the Council agreed with the Nordic Environment Finance Corporation (NEFCO) to analyse six ongoing NEFCO-projects in the Baltic countries, the Russian Federation, Poland and the Slovak Republic. Of these projects, four are energy efficiency projects. The projects have been selected on the basis of their relevance to climate issues. In addition, the Group agreed with the Danish COWI consultancy that they will carry out JI simulation studies of five other projects that have been set up by the Baltic countries, the Russian Federation, the Slovak Republic, and the Nordic countries on a bilateral basis. Two of these projects are energy efficiency projects. The project implementation will take place in close contact with authorities and private actors in the Nordic countries and the neighbouring Eastern European countries. The Council aims to present a preliminary report of the JI simulation project in Spring 1996, so that it could be presented to COP 2.

Prospects for JI in EIT countries

Although it is (and will be in the near future) difficult to make cost calculations of CO_2 emission reductions in EIT countries, it is generally assumed that in these countries abatement costs are lower than in most Annex II countries. This assumption is mainly based on the relatively high energy intensity in most EIT countries, whereas the energy used is often dominated by carbon intensive fuels, such as oil shale, coal and solid fuels. Both the high energy intensity and the high carbon intensity would facilitate a switch towards cleaner sources of energy at relatively low costs. In general, the Central and Eastern European countries support the JI concept as an opportunity to help fulfil their commitments under the UNFCCC. However, it should be noted that, as many potential host countries did, the EIT countries stress that with respect to environmentally-sound measures their main priority is to solve their non-greenhouse,

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more locally-specific environmental problems, such as air, water and soil pollution, rather than to reduce the emissions of greenhouse gas. From this it could be concluded that as far as EIT countries would be ready to host JI (pilot) projects, these should be in accordance with their national economic and environmental priorities.

In spite of the general political acceptance in EIT countries for JI some methodological issues, such as baseline determination, project monitoring, measuring greenhouse gas emission reductions, crediting, etc., need to be addressed during the pilot phase. In several EIT countries there exist large difficulties with compiling a national inventory of (expected) greenhouse gas emission reductions. This makes it of course also very difficult to calculate greenhouse gas baseline scenarios at the national level. At the project level, however, such a baseline can be determined easier, as is currently being done with the JI pilot projects in EIT countries. It is in this respect that the JI pilot projects can also contribute to compiling the EIT countries national inventory on greenhouse gas emissions.

AIJ can mitigate some of the other financial barriers discussed in Financial Barriers to Energy Efficiency below. For example, local industry's lack of experience and lack of awareness of efficiency options will become less of a barrier if industry from developed countries contributes its experience and expertise. Also, typically, foreign industry will be able to raise commercial bank financing more easily, and hence the barriers within the local banking sector will be less significant. Though AIJ pilot projects are developing quite well in a number of EIT countries, the lack of formal CO_2 credits reduces the incentives for Annex I signatories to participate. In its current configuration, most utilities and utility organisations agree that AIJ will not encourage projects that would not go ahead otherwise in the energy sector. Two exceptions exist: 1) relatively small, one-off demonstration projects that have a public relations value to the utility developer; and, 2) also small-scale one-off projects that allow utilities who wish to begin to establish the human capital necessary for such a programme if it were put in place.[211]

The benefit that AIJ does bring in its current configuration is a reduction in transaction costs when a 'win/win' AIJ project is being compared with another that has no carbon reduction component.[212] Projects that a utility can undertake are forced to compete for scarce capital. AIJ projects are assisted by bilateral agreements between the project's host government and the utility's or other industry's home government, thus reducing the political transaction costs. In addition, AIJ projects are often given top priority in, for example, World Bank funding, thus shortening the financial lead time. For these reasons, 'win/win' projects that may not have been undertaken are more likely to go ahead.

Many observers interviewed in the research phase for this study have reported that without global and national emissions caps and penalties that apply to individual companies, an international AIJ programme with crediting will only have a small additional impact over the current pilot phase.[213] Without a long-term planning horizon for total global emissions and a ratcheting downwards of those limits, as well as a mechanism to transfer this to individual companies, it will still be easier for companies to do nothing.[214]

Negotiating a formal CO_2 credits scheme for AIJ projects involving Annex I signatories would

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211 Environmental Affairs Director, Enron Corporation, personal communication, London, February 1996.

212 Director, International Utility Efficiency Partnership, personal communication, Edison Electric, February 1996.

213 For example, the Dutch Electricity Generating Board, International Utility Efficiency Partnership, and several AIJ consultants.

214 Director, Enron Corporation, personal communication, February 1996.

significantly enhance incentives for investment in EIT countries. Alternatively, national governments could allow utilities and the private sector to receive CO_2 credits within national target reduction programmes, as several such as the Netherlands have done with SO_2 pollution.

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CONCLUSIONS

"We recognise that, in general, the financing of environmental expenditures should be based on the 'polluter pays principle'. Domestic financing by CEE countries is decisive . During the transition period it is insufficient, however, to tackle all of the serious environmental problems of the region and external financial resources will continue to be important as a catalyst...we call on individual donors and IFIs (MDBs) to further improve the efficiency of their assistance...we will focus our co-operation efforts on the priority needs established by the CEECs...and will promote the involvement of local consultants and procurement, promote and financially support twinning arrangements and consider other steps and mechanisms to improve our assistance. We also encourage the further commitment of donors to co-finance with IFIs (MDBs), under PPC the or other framework."

'Sofia Declaration' by Ministers of the Environment of the UN ECE,
25 October 1995.

Even though this study has made very conservative assumptions over the size of the energy efficiency potential practically available in EIT countries, the resource is enormous - equivalent to opening up vast new natural gas and oil reserves, at a fraction of the cost of extraction. In contrast to this large, cost-effective energy efficiency potential, the level of financing currently flowing to energy-efficiency projects is low. Private financial flows, as well as MDB and bilateral flows are, however, hampered by the wide range of financial and non-financial barriers discussed in Section 5. Despite this there has been a fair degree of activity among the financial institutions in the past few years. Some of these initiatives have tested out innovative financing and policy approaches which provide a good basis for replication, modification and change. This is true among both Western institutions (e.g. MDBs, bilateral aid agencies), and local institutions (e.g. Energy Agencies, environmental funds).

An initial assessment of the current financial flows to the energy sector in EIT countries suggests that substantial increases in finance from MDBs and OECD governments to EIT countries are needed. There is certainly a significant imbalance in the resources available for end-use efficiency projects compared the resources for energy supply projects. However, a phased approach might argue for a greater emphasis first of all upon re-directing current financial flows better towards energy efficiency, (both from the OECD and inside the EIT countries themselves), and to give a higher priority for integrating energy efficiency in energy and investment policies, privatisation and energy lending criteria by EIT governments, MDBs and OECD governments.

Many of the "possible solutions" outlined in Section 5 above could be targeted as possible measures for "common action" by Annex I Parties in capturing the CO_2 reduction potential of energy efficiency in EIT countries. However, these policy options require further study and development in order to be presented as specific options under the *"Study on Policies and Measures for Common Action"*. One area that warrants further attention is strengthening the emphasis of international institutions' funding policies on energy efficiency. There is a very important role for the MDBs and other regional and bilateral agencies in overcoming the significant remaining barriers to private investment which are likely to remain even where energy prices reach 'market' levels in all sectors in all EIT countries. Another important area is developing mechanisms to enhance private sector efficiency investment, and, particularly for areas where the largest cost-effective gains are evident. Private sector financial flows to developing countries and, to a much lesser extent EIT countries, now dwarf MDB lending. In EIT countries, local resources are the dominant source of finance for energy projects. It is thus crucial that the conditions necessary to unlock significant private sector support for energy efficiency projects are encouraged.

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LIST OF ACRONYMS

AIJ	Activities Implemented Jointly
CEE	Central and Eastern Europe
CIS	Commonwealth of Independent States
DSM	Demand Side Management
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EIT	Economy in Transition
ESCO	Energy Services Company
GDP	Gross Domestic Product
GEF	Global Environment Facility
IEA	International Energy Agency
IFI	International Finance Institution
IRP	Integrated Resource Planning
MDB	Multilateral Development Bank
MNC	Multinational Corporation
NIB	Nordic Investment Bank
PELP	Polish Efficient Lighting Project
OECD	Organisation of Economic Co-operation and Development
PHARE	EU Programme
PPC	Project Preparation Committee
PPGC	Polish Power Grid Company
PPP	Purchasing Power Parity
SMEs	Small and Medium Enterprises
TACIS	Transitional Aid to the CIS
UNFCCC	Framework Convention on Climate change
USAID	United States Agency for International Development

Currency

All $ figures are US dollars. The European Currency Unit (ECU) is also used. 1 ECU = 1.24 US$ (February 1996). Exchange rates for EIT currencies are given in Section 3.