In-depth PEEREA Review of Energy Efficiency Policies and Programmes of Poland

Energy Charter Secretariat

Executive summary

With a population of 38.7 million and a surface of approx. 312 000 km^2, Poland is the largest country in process of accession to the European Union. It is also one of the first countries in Central/Eastern Europe that started a process of democratic reform and transition from a centrally planned to a market economy. In the energy field, Poland has traditionally been a supply-oriented country with important coal and gas sectors. Since 1986, Poland has become a net energy importer, and over the last few years import dependency has increased, notably due to oil imports.

During the last decade, Poland has made important progress in the process of adapting its energy economy to market principles. The 1997 Energy Law represents a major milestone in this process. The Energy Law provides the necessary legal conditions for economic activity in the areas of energy production, transmission, distribution and trade, introduces third party access and sets the general framework for gradual market opening. An independent Energy Regulatory Authority (ERA) was established. The Law defines the responsibilities of the Government, the ERA, energy companies, provinces, municipalities and manufacturers, including specific mandates and duties to promote energy efficiency and renewable energies.

The Government's energy policy is laid down in the *"Assumptions for Poland's Energy Policy until the year 2020"*, adopted by the Council of Ministers on February 22, 2000. Main objectives of Polish energy policy are:

- To secure energy supply, by promoting supply diversification and substitution;
- To achieve efficiency in the production, distribution and use of energy; and
- To develop competitive conditions in the energy industries.

Energy price reforms have been carried out in Poland since 1990. Since 1999, following the Energy Law, electricity and heat prices have been regulated by the ERA. Recovery of justified cost by energy companies, the gradual elimination of cross-subsidies and the protection of consumer interests are among the principle concerns of the ERA. Considerable obstacles, mainly related to stranded investments and long-term contracts, still have to be overcome in order to achieve a fully competitive market.

Industry is the largest user of final energy (36%), followed by the residential sector (31%), transport (15%) and services (7%), (1998). Although the energy intensity per GDP decreased by approximately 30% (mainly due to the stagnation of the energy conversion and industry sectors), energy efficiency is still substantially lagging behind Western European countries.

Measures to improve energy efficiency have so far focussed in particular on the residential sector. The Thermomodernisation Programme and Fund, which have been in operation since 1999, provide technical and financial support for energy end-use improvements in residential buildings, reduction of energy losses in heat distribution networks and substitution of conventional energy by non-conventional sources, including renewables. Investors are entitled to receive a premium of 25% of the loan used for implementing eligible projects. Although considerable budget reserves have been allocated for the Fund, first experiences – in terms of the number of applications – have been rather disappointing, and suggest the need for possible modifications with regard to its operational characteristics.

Other important actions supported by the Government concern (i) improved energy efficiency standards for buildings and (ii) energy efficiency standards and labelling for household appliances, in accordance with EU requirements.

While the restructuring of the industrial sector has resulted in gains in energy efficiency since 1990, the energy intensity of many industries is still above world standards and considerable potentials (13% - 28%) of highly profitable energy conservation measures still exist. The *"Master Plan Study for Energy Conservation in the Republic of Poland"* (1999) provides concrete recommendations for programmes and instruments to promote energy efficiency in industry, which should be pursued by both the Government and industry.

Energy efficiency potentials and measures to promote energy efficiency in the tertiary and transport sectors still need to be addressed. Demand-side management and increased de-central electricity and heat generation seem to be interesting options, subject to the effective implementation of the respective instruments stipulated in the Energy Law and pertinent regulations.

The Ministry of Economy assumes the main responsibility for energy policy, including energy efficiency policy. The governmental institution responsible for the operational implementation of energy efficiency policies is the Polish National Energy Conservation Agency (KAPE), a joint stock company, established in 1994. Other important actors are the National Energy Conservation Agency (NAPE), the Foundation for Energy Effective Utilisation (FEWE) and various Regional Energy Conservation Agencies (RAPE). Local authorities are required to prepare local energy development plans; this will result in new challenges and a major need to further develop institutional capabilities. There is also a need to define responsibilities and to ensure effective co-ordination between actors.

Poland has made major progress towards an environmentally more sustainable energy system, both in terms of more stringent regulations concerning emissions from fossil fuelled generating plants, as well as with regard to the gradual substitution of coal to natural gas. Environmental levies and penalties are assigned to environmental projects via the National Fund for Environmental Protection and Water Management and Provincial Funds for Environmental Protection. Poland also plays an active role in the present pilot phase for Actions Implemented Jointly, as a host country.

In summary, Poland has made substantial progress in improving the environmental protection and in increasing energy efficiency, in line with the provisions of PEEREA. There is still a need to develop an energy efficiency strategy and action plan, which should include well-defined objectives and targets. Both the 'Assumptions' and the Energy Law, provide some important lines of action, which should be translated into concrete measures or further developed respectively.

Based on the findings of the review team, the report provides a series of recommendations to the Government of Poland, which – in addition to general recommendations referring to overall energy efficiency policies and strategies – relate to areas like: the institutional framework for energy efficiency, energy pricing, energy efficiency funding and fiscal policies, the implementation of specific programmes and instruments, the promotion of renewable energy, data collection and monitoring, education and information, and the participation of the private sector in energy efficiency and related activities.

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1. Introduction to the PEEREA Review

In September 2000, a team of representatives from the Working Group of the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects reviewed the energy efficiency policies and programmes of Poland.

The role of the in-depth energy efficiency review undertaken on a peer basis by the Working Group is to enhance the level of co-operation amongst contracting parties (Article 3.1). The in-depth review is also being used to assess progress, promote continuous dialogue and transfer information.

The review team comprised Mr. W. Stinglwagner of Germany who chaired the review, Mr. P. Ahtila of Finland, Mr. V. Hakobyan of Armenia and Mr. M. Konstantinoff of Bulgaria. Mr. T. Constantinescu of the Charter Secretariat and Mr. W. Lutz, consultant to the Secretariat, supported the review team.

Organisations visited are included in Annex 3.

The review team wishes to express its thanks to everyone in Poland who were met by the team. Special thanks go to officials of the Ministry of Economy and the Polish National Energy Conservation Agency (KAPE), who undertook all the preparation of the mission, completing the PEEREA questionnaire and providing background papers and other information as requested.

The report is based on material provided by Poland as well as data and analyses from various other sources, including the International Energy Agency, OECD, UNFCCC and other related materials.

2. Overview

With a population of 38.7 million and a surface of about 312 000 km^2 Poland is the largest country in process of accession to the European Union. About 90% of the territory is situated lower than 300 meters above sea level. The capital is Warsaw, with 1.6 million inhabitants. Poland borders Lithuania, Russia (Kaliningrad), Belarus, Ukraine, Slovak Republic, Czech Republic and Germany. Its northern frontier on the Baltic Sea provides easy access to Scandinavian and North Sea ports.

Figure 1 - Poland

Poland is one of the first countries from Central/Eastern Europe who started a process of democratic reform and transition from a centrally planned to a market economy. In 1990-1991 the country passed through a period of deep economic crisis, when GDP dropped with 14 percent and inflation reached 250 percent. The country managed to resume the crisis quite fast, liberalising prices, changing ownership structure, setting up the capital market and opening the economy to foreign investors. As a result, ten years after starting the reform process, Poland is considered to be a successful example.

In the context of the Russian crisis in 1998 the economy has suffered, but started already to recover in 1999. This continuous growing path is supported by: deregulation and privatisation, increasing number of small and medium sized enterprises, well established foreign investors who started to export on other markets. In 1998 the GDP was 77.9 billion USD, and is estimated to come 60% from services, 35% from industry and 5% from agriculture. There is still a significant budget deficit, imports exceeding exports. After 1990 the geographical structure of foreign trade changed, the turnover with Western Europe growing from 27.9% to 70%. The main import-exports partners are Germany, Italy, Russia and the Netherlands. Poland exports mainly chemicals, coal, electricity, machinery and equipment.

Accession to the European Union is certainly a priority for the Government. Poland has signed a Europe Agreement with EU already in 1991 and applied for membership in 1994. Negotiations for accession started in September 1998. The Government has established as target date for being ready for accession 31 December 2002, and has defined a national programme for adoption of the *acquis communautaire*. Poland has already made significant progress in the accession process, but attention is still required by the EU Commission in the areas of industrial restructuring, control of state aid, preparation for the internal market and promotion and compliance with European environmental standards.

The energy sector has a high relevance for the country. Poland is, traditionally, a supply oriented country with tradition in the coal and gas industries. Since 1986 Poland became a net energy importer, and in last years import dependency increased, notably due to oil imports. Security of supply and diversification of fuels started to be even more of a concern in the last years. Details about the energy situation are provided in Annex 1.

Environmental considerations have also started to play an increasing role in Poland since 1991. The share of environmental investment expenditures in the GDP increased almost by three times in 1995 compared to 1989. The priorities were to reduce river pollution and to decrease air pollutant emissions. SO_2 emissions decreased actually by more than 50% compared with 1989. Poland is also committed to reduce the CO_2 emissions by 6% in 2008-2012 compared with the reference year 1988.

The restructuring of the energy sector has been very much pushed forward by the 1997 Energy Law. The Law which is presented in some details in the following section, has the purpose to create "the conditions to provide for sustainable development of the country, energy security, efficient and rational use of energy, development of competition, counteracting negative consequences of existence of natural monopolies, consideration of natural environment protection requirements and obligations stemming from international agreements and protection of consumer's interest and minimisation of costs." Despite the fact that there is no specific energy efficiency law, framework conditions for energy efficiency have been created. At the same time, the Government started to be more concerned about competitiveness of the Polish economy, and this facilitated penetration and development of energy efficient technologies. In this context it is considered that more attention could be paid by R&D programmes to end use technologies. Actually 0.4% of GDP is invested in scientific research (out of which 15% from the State budget) and in the area of energy about 60% of the funds cover supply side issues.

Combined with the concern about security of supply and the status of the environment, the increased role of the private sector in the economy and the liberalisation initiated in the power sector through the 1997 Energy Law have led to new conditions for promotion of energy efficiency initiatives. So far, utilities have not been very operational in implementing DSM programmes, and liberalisation may not be a catalytic factor in this direction. But, at the same time several actors started to play an important role both at national and local level in promoting energy efficiency measures. The Government has been notably active in promoting private initiatives and in identifying international (bilateral and multilateral) support programmes and funds.

3. Main energy policy highlights

Polish energy policy has continuously evolved since the beginning of the nineties, reflecting the transition of the country from a centrally planned to a market economy. The restructuring process started with the coal industry in 1990, when the State Hard Coal Agency was established, unprofitable mines started to be closed down and the restructuring process of the hard coal sector began.

In the beginning of the 1990s, under the framework of the national economy transformation programme, the Polish Government approved a radical programme of reconstruction and modernisation of the energy sector – one of the largest segments of the Polish economy, with

as core components: (i) price adjustment – to phase out budget subsidies and reach economically justified market prices, (ii) commercialisation – as the first step to the privatisation of the generation, distribution and transmission sectors, and (iii) the establishment of a new legal and regulatory framework to introduce competitive and regulated energy markets. Unbundling of the electricity sector and ownership transformation (establishment of joint stock companies) were part of this process.

An important step in the development of the energy policy was represented by the adoption in 1995 of the *"Assumptions for Poland's energy policy until the year 2010"*. The document established priority actions in the areas of natural gas consumption, of the pricing policy, of the reduction of energy intensity, and in the area of economic reform and development of new regulatory mechanisms. In 1995, also *the "Assumptions for state policy in the field of rationalisation of energy consumption in the municipal sector"* were adopted. These Assumptions include elements regarding the upgrading of the heat systems, improvement of efficiency in public buildings and establish the basis for the creation of the *Thermomodernisation Fund* (section 6).

Recent milestones have been the adoption of the new Energy Law (further referred to as the 'Energy Law') in 1997 and the *"Assumptions for Poland's Energy Policy until the year 2020"*, (further referred to as the "Assumptions") adopted by the Council of Ministers on February 22, 2000.

The main objectives of the Polish energy policy, according to the Energy Law, are:

- to secure supply of energy and fuel, by promoting supply diversification and substitution;
- to achieve efficiency in the production, distribution and use of energy and fuels;
- to develop competitive conditions in the energy industries.

In order to improve energy efficiency the following measures are recommended by the Government:

- upgrading product quality;
- changing the structure of industry;
- changing the structure of the national fuel and energy balance by optimising energy use for certain purposes (supply diversification enabling the choice of the most efficient energy carrier);
- using modern, energy-efficient devices and technologies, both in production and housing sectors, especially in households.

The 1997 Energy Law (most recently amended in May 2000) provides the legal base for liberalisation of the Polish energy market and should be considered as an important step towards full compliance of Polish with EU energy legislation, in particular with the Directives concerning Rules for the Internal Market in Electricity (96/92/EC) and Natural Gas (98/30/EC), but also with other legislation, e.g. the Directives on Labelling and Standards of Appliances.

In particular, the Energy Law provides the necessary legal conditions for economic activity (subject to license) in the areas of energy production, transmission, distribution and trade, introduces third party access and sets the general framework for gradual market opening. The

Energy Law also includes a public service obligation for transmission and distribution companies. The Energy Law requires accounting separation for energy production, transmission and distribution. Energy transmission and distribution companies are required to prepare (least cost) 'development plans' for their territory of operation and co-ordinate these with local development plans of provinces ('voivodships') and municipalities. Municipalities are required, under the Energy Law, to prepare an energy supply plan for their territory.

Concerning electricity market access, since 1998 eligible consumers were those with a consumption higher than 500 GWh. In 2000 the threshold is 40 GWh only, 43% of the market being opened. The opening of the market for natural gas is planned for December 2001 with a view to be accomplished by December 2005.

The Energy Law defines the principle responsibility of the Minister of Economy for energy policy issues, including the right and obligation to propose the 'state energy policy assumptions' and co-ordination of their implementation.

The Energy Law defines the mandate of the independent Energy Regulatory Authority (ERA), which is represented by its president. The President of ERA is appointed by the Prime Minister and assumes wide authorities. His main task is to regulate "activities of energy enterprises according to state energy policy guidelines and the Act, aiming at balancing of interests of energy enterprises and customers of fuels and energy". Specific tasks include, i.a.: the issuing of licences, approval and control of tariffs and the approval of 'development plans' of energy enterprises.

With regard to energy efficiency and renewable energies, the Energy Law includes the following provisions:

- The obligation of the Government to impose on the energy companies dealing with trade, transmission and distribution of power and heat the obligation to purchase energy from renewable energy and cogeneration (Art. 9,3);

- The option to include in tariffs for gas, electricity and heat the cost of projects and services to reduce end-use energy consumption and to develop non-conventional energy sources (Art. 45,2 and 3);

- The 'development plans' of both energy enterprises and municipalities must include measures "rationalising the consumption of fuels and energy by customers" (Art. 16,3; Art. 19,3);

- The duty of the President of ERA of "publishing information with a view to improve energy efficiency and fuels utilisation" (Art. 23,2);

- The duty of manufacturers and importers to specify the energy efficiency of equipment, including labelling (Art. 52).

The Minister of Economy has issued several ordinances and decrees pursuant to the Energy Law. Such ordinances include provisions relating to the efficiency of domestic and imported equipment and to the purchase of energy from unconventional sources (including the way in which such purchases are to be introduced in the tariff calculation).

Following his obligation defined in Art. 15 of the Energy Law, the Minister of Economy prepared the ***"Assumptions for Poland's Energy Policy until the year 2020"***, which were adopted by the Council of Ministers on February 22, 2000.

The 'Assumptions' define the basic elements of the Polish energy policy, based on an analysis of the present state and expected future development of the energy sector. The 'Assumptions' consist of five main parts:

- main goals and strategic directions of activities;
- the present state of the energy economy;
- forecast of the national demand for fuels and energy;
- assessment of the energy safety of the state; and
- programme of activities of the state.

Main goals and strategic directions of activities are (similar to EU energy policy objectives): (i) security of supply ('energy safety'), (ii) competitivity and (iii) protection of the environment. Various strategic directions/issues were formulated in order to achieve these goals: (i) integrated management of power generation and the environment, (ii) the organisation and technical decentralisation of power systems, (iii) network power markets, (iv) energy efficiency improvement, focussing on the promotion of efficient equipment, and (v) the transition period, resulting from the ongoing restructuring and privatisation of the Polish energy sector. Key problems to be solved during the transitional period include the restructuring of hard coal mines, long-term contracts in the power sector, the restructuring of the Polish Oil and Gas Company, as well as the development of the system of co-operation of municipal 'self-governments' with power generation enterprises.

The *present state of the energy economy* of Poland is characterised, according to the 'Assumptions', by high rates of economic growth, problems regarding lowering the social costs of the reforms, progress in the field of creating legal conditions for implementing market mechanisms and the integration with EU structures and a gradual increase of the participation of renewable energy sources. Energy efficiency is still substantially lower than in Western Europe.

The *forecast of the national demand for fuel and energy* – in accordance with three scenarios (SURVIVAL, REFERENCE and PROGRESS-PLUS) shows, for all three scenarios, a drop in the consumption of primary energy during the first eight years covered by the analysis (2005-2013), as a result of rationalisation of energy consumption and supply. Demand for hard coal is predicted to decline, while demand for natural gas and oil are predicted to increase. Electricity demand is predicted to considerably increase in all three scenarios (between 41% and 66% until 2020).

Finally, the *programme of activities of the state* builds upon the following policies:

Investment policy: Future investments in the energy sector will be the responsibility of market actors, who will be required to prepare individual 'development plans', as stipulated in the Energy Law.

Price policy: While the realisation of a competitive market is the aim of the Government, existing long-term contracts and 'stranded cost' call for a transitory regime of compensation fees. The creation of an electric power exchange is seen as an important element of the

liberalisation of the electricity market. The Warsaw Power Exchange has been in operation since July 2000. For the time being it is covering only about 1% of the total trade of electricity, but this volume is expected to increase. During the transitory period, price increases slightly above the inflation rate are intended.

Ownership transformation policy in the power generation sector: The focus during the coming years preceding the accession to the European Union will be on giving the power generation companies the possibility to adjust themselves to the requirements of international competition and to increase their market value. In addition to the generating companies, also all 33 electric power distribution companies shall be privatised. The privatisation of the gas and oil sector will be preceded by the restructuring of the Polish Oil and Gas Company.

Activities in the field of environmental protection: According to the 'Assumptions', national regulations concerning SO_2, NO_x and dust emissions comply with respective EU standards and complying standards regarding the sulphur content in engine fuels will be introduced.

'Rationalisation policy': the improvement of energy efficiency indexes since 1990 is mainly due to restructuring of the economy and reduction of energy waste. Further improvements will require the application of more specific instruments like:

- Direct regulations (standards);
- Market stimulation (economic and fiscal); and
- Supporting instruments (information, education, research and development).

Scope and goals of international co-operation: A major concern of the Government is to achieve further compliance of the national energy policies with EU legislation, with a view of Poland's accession to the European Union and the *acquis communitaire* in the energy field in particular. In this context, the Government intends to fully harmonise the Energy Law with EU requirements during the coming years.

Poland will maintain its interest to participate in the co-operation programmes of the European Union, including the Fifth Framework Programme for Research, Technological development and Demonstration Activities, SYNERGY (international co-operation in the energy sector) and SAVE (improvement of energy efficiency). It shall also strive for a possibility to take advantage of assistance funds of the European Union supporting the international co-operation; the most important ones are included in the PHARE programme at present.

Poland has completed the internal ratification procedure of the Energy Charter Treaty and the Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) on the 29th of July 2000. Poland also intends to participate in the further development of Trans-European networks. Further priorities are to achieve Poland's commitment under the Kyoto Protocol and to obtain membership in the International Energy Agency and the International Atomic Energy Agency.

4. Energy Pricing and Taxation

Restructuring the energy sector is naturally linked to the process of reforming energy prices in all the countries that are in a transition period towards a market economy. After an initial increase of energy prices on January 1, 1990 by 300% - 600%, the Government of Poland and

the World Bank agreed further short-term price adjustments, as part of an agreement of energy sector modernisation financing.

Due to political and social pressures, however, price increases developed much slower than planned. Price increase of electricity in the period 1991-93 reflected mainly the inflation rate, not the economic costs of generation and delivery and as a result the electricity prices covered only 50%-60% of the costs in 1993. Heat prices were adjusted to reduce subsidies, which were reduced from 78% in 1991 to 27% in 1994. Between 1995 and 1997, subsidies were almost completely removed. The level of end use energy prices is indicated in table 1.

Table 1: Energy prices for end use sectors 1999 (USD per Unit)

	Un-leaded gasoline Premium (litre)	Light fuel oil (1000 litres)	Diesel (litre)	Heavy fuel oil (tonne)	Natural Gas (10^7 kcal GCV*)	Steam Coal (tonne)	Electricity (kWh)
Industry		180.18	0.37	74.8	121.80	29.98	0.04
Households	0.62	252.54	0.46		240.90	93.57	0.0680

* Gross calorific value
Source: IEA

In the period 1989 –1998, the Ministry of Finance controlled the energy prices. Since 1999, following the Energy Law, electricity and heat prices have been calculated by the energy companies and regulated by the Energy Regulatory Authority (ERA) if not subject to a competitive market. ERA has developed guidelines on how to calculate proposals for tariffs. Since 2000, also natural gas prices have been under the authority of the ERA.

Energy tariffs should meet three conditions according to the ERA guidelines:

a) to allow energy companies to cover their justified costs of production, storage, transmission and distribution as well as trade of electricity, heat and gas;
b) to protect the customers interests against an unjustified price level;
c) to enable elimination of cross-subsidies.

Modernisation, development and environmental protection costs are considered justified costs. In addition, energy tariffs may include costs of co-financing by energy companies DSM projects and development of non-conventional energy sources. The last amendment of the Energy Law has broadened the definition of justified costs by the costs of those generators who carried out an intensive reconstruction and modernisation programme of investments targeted at improvement of environment and increase of power generation efficiency. However, the extent to which these costs will be allowed to be treated as justified is to be determined by the President of ERA. There is a significant problem with the stranded investments. ERA has proposed a so-called system of compensation payments. The Ministry of Economy has prepared a draft ordinance that assumes that stranded costs will be allocated to all final customers through the transmission tariffs.

The first round of tariff approval for electricity took place at the beginning of 1999 when the Council of Ministers decided to remove the price setting power of the Minister of Finance and transferring the price control powers to the ERA President. For social reasons (households spending 8-16% of income on energy), the Ministry has set out a one year cap

for electricity price increase – maximum 13% for households. The similar transitional arrangements were introduced in the case of heat prices (15%) and gas price regulation that started in the beginning of 2000 with the cap of 12.5%.

These transitional arrangements allow for maintaining cross-subsidies. Complete elimination of cross-subsidies would lead to 50-60 % higher electricity prices for households.

In 2000 there were no more binding constraints on price increase. Some companies requested more than 35% of price increase, due to increase of fuel price (including 17% increase of coal price). ERA did however not accept such big increases and limited price increases to 8-14%.

The process of tariff approval for heat has turned out to be much more challenging task for ERA due to the large number of licensed heat companies (around 1000). By the end of 1999 only 500 companies submitted tariff applications and the average price increase of heat in the approved tariffs was 5.5%. In 2000 the approved increase of heat prices was higher and in average it is slightly above 10%. New tariffs for the Polish Oil & Gas Company (PGNiG) approved for the first time by the President of ERA in March 2000 will result in increase of gas prices by around 10%. The price increase of imported gas may lead to new increases.

Regarding fiscal and taxation policies, between 1993 and 1998, VAT and excise taxes were introduced and gradually increased (see Annex 2) for various energy carriers, including automotive fuels. VAT for energy increased from a preferential rate of 7% in 1995 to 22% in 1998. As part of the "New Economic Strategy" of Poland, the Polish Government suggested a major reform of the tax system, called 'Package 2000'. Basic aspects of this tax reform were a general reduction of tax burdens, while drastically reducing tax allowances. The corporate income tax was reduced from 40% in 1996 to 30% in 2000 and is planned to be 22% in 2004.

5. End-Use Sectors

Figure 2 shows the sectoral structure of final energy consumption in Poland in 1998. This shows that industry is the largest user (36%), followed by the residential sector (31%), transport (15%) and services (7%).

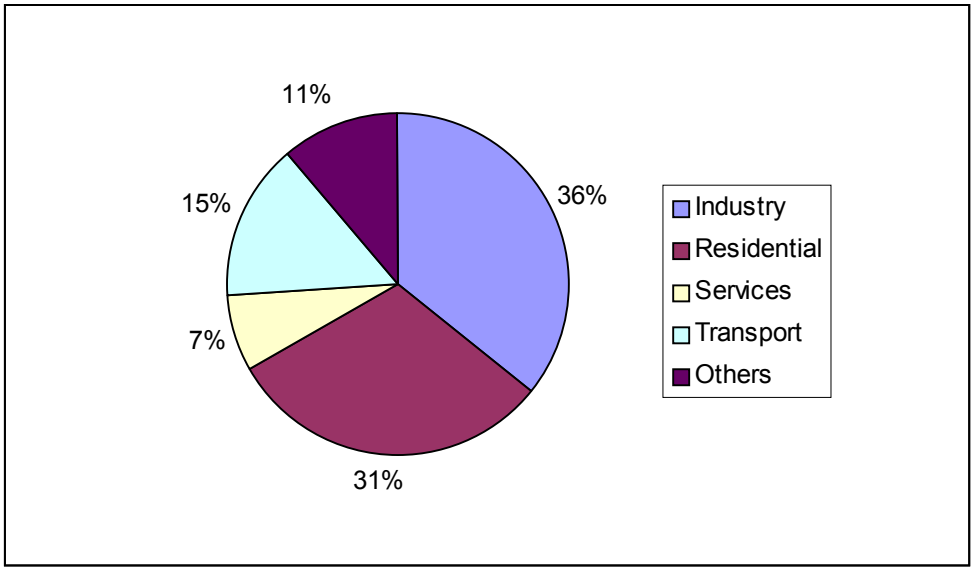


Figure 2: Structure of final energy consumption in Poland, 1998

Since 1990, the energy intensity per GDP decreased by approximately 30%, which was mainly due to the stagnation of the production in the energy conversion and industry sectors (Figure 3).

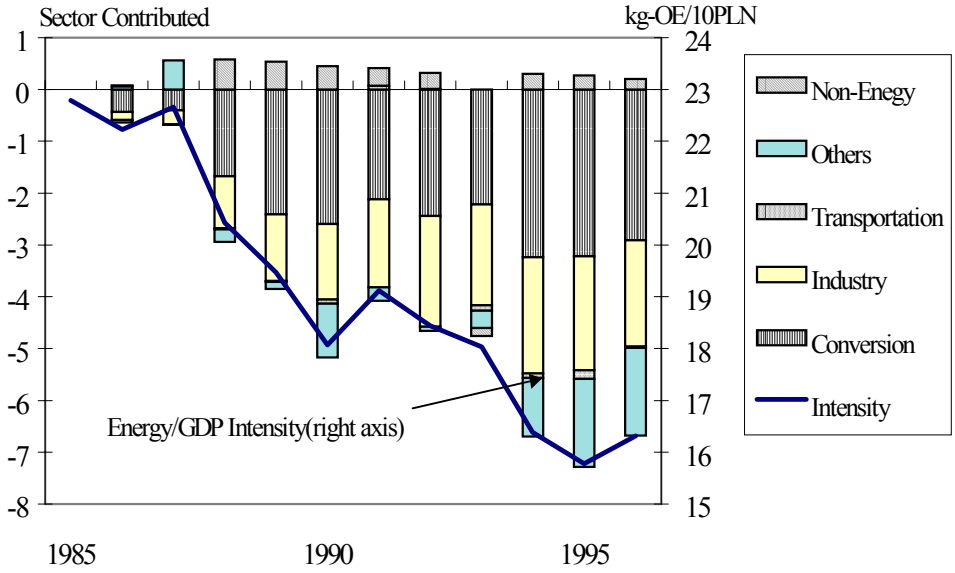


Figure 3: Improvement of energy/GDP intensity and its contribution by sector

Residential

According to official statistical data from 1998, Poland has approximately 11.8 million housing units, of which 3.72 million (32%) have been constructed before 1945, 3.41 million (30%) between 1945 and 1970 and 4.4 million (38%) between 1971 and 1996. The total usable area is about 700 million m^2. Almost 42% of the housing units are privately owned,

23% are owned by housing co-operatives, 14% by housing communities and 17% by municipalities, enterprises and the state treasury. Table 2 shows the structure of the housing stock.

Table 2: Structure of housing stock in Poland

	Urban areas		Rural areas		Total	
	Number of buildings	Number of flats	Number of buildings	Number of flats	Number of buildings	Number of flats
Family buildings)*	1 767 083	1 767 083	3 082 691	3 082 691	4 849 774	4 849 774
Residential buildings	315 658	6 229 217	34 878	767 309	350 536	6 996 526
Prefabricated residential buildings	146 654	*4 850 000* **	21 450	548 626	168 104	5 398 626
Traditional built residential buildings	169 004	*1 380 000***	13 428	218 683	182 432	1 598 683

)* - in 95% traditional built houses
)** - number has been estimated according to the non official data from The State Office for Housing and Town Development
Source: PEEREA regular review 2000

The average energy consumption of a residential building is according to the following structure:

- Heating and ventilation: 71%
- Hot water preparation: 13%
- Cooking: 9%
- Lighting and electrical appliances: 7%

The most important sources of heat are combined heat and power plants (36%), municipal heating plants (28%), as well as individual boilers and coal fired stoves (25%).

Traditionally, regulations for thermal performance of the building envelope have been focussed on permissible values of heat transfer coefficient for walls, roofs, windows etc. In 1997, the Ministry of Internal Affairs and Administration published a Decree concerning energy consumption requirements for new and modernised buildings, which is based on energy standards for buildings, expressed in kWh/(m^3*a). Two performance indicators have been introduced:

- E_0: seasonal heat demand for space heating during a standard heating season related to usable space of heated parts of the building;
- E_s: seasonal heat demand for space heating during a standard heating season – including efficiency of the heating system - related to usable space of heated parts of the building.

The method of calculation of the indicator E_0 has been standardised as Polish Standard PN-99/B-02025, developed on the basis of the European pre-standard prEN 832. According to critics, the standard includes some shortcomings, which suggests its revision.

In general, the energy consumption in the residential sector in Poland is excessive, reaching 2-3 times higher levels than in Western countries with a similar climate. The fact that the residential sector consumes about 40% of the primary energy consumption of the country, underlines the urgency to improve this situation.

Poor efficiency and gradually rising energy prices also result in an important social problem, since energy cost may rise to 20 – 25% of family budget expenditures.

The most common technical reasons for this excessive energy consumption are:

- Insuffient insulation of external walls, roofs, windows and doors;
- Shapes and locations of buildings, which do not take into account energy losses and potential energy gains;
- Low efficiency of heat sources;
- Significant heat losses between heat sources and consumers;
- Lack or low level of control systems in heating installations;
- Lack of individual heat meters.

In addition to the in general poor thermal condition of residential buildings, an important part of the inefficiencies in the residential sector is due to losses in heat distribution networks of district heating systems. District heating networks provide 75% of the residential heating needs in urban areas. About half of the heat supplied by district heating comes from CHP plants.

Tertiary

In the tertiary sector (commercial and public buildings) heat for space heating and electricity are the predominant energy carriers. Problems in the tertiary sector are similar to those in the residential sector.

Industry

The Polish industrial sector has been subject of restructuring and privatisation since 1989. Structural changes have in particular taken place from heavy to consumer industries. While privatisation has been successful in particular in consumer industries, heavy industries like metallurgical, chemical and machine-building industries, as well as the mining and energy sector enterprises, still are in the process of privatisation.

Industry is a major energy user, accounting for approx. 36% of final energy consumption in Poland in 1998. Since 1989, two subsequent tendencies can be observed: (i) a strong decline in industrial energy consumption until 1992, mainly due to the stagnation of the production level of the basic materials sector, followed by a stagnation of energy consumption until 1994, and (ii) an increase in consumption since 1995. This increase, which is due to economic recovery, has been accompanied by a number of negative factors, among them the low technological level of several industry sectors, continued high energy intensity and high consumption of raw materials. The energy intensity of some of the most energy consuming sectors, like: metallurgy, chemical industry, building materials, pulp & paper, is approx. 38% higher than best world results.

In the period 1997 – 1999, the Japan International Cooperation Agency (JICA), assisted by KAPE and Polish university experts, prepared the *"Master Plan Study for Energy Conservation in the Republic of Poland"*(further referred to as the 'Master Plan Study'). The study targeted five most energy consuming industrial sub-sectors in Poland, determined the energy conservation potentials in these industries and submitted proposals for the implementation of these potentials.

The main results of the study can be summarised as follows:

- Improvement of energy management and improvement of equipment with payback periods within 3 years can lead to energy conservation of 13 – 28%, depending on the sub-sector;

- Two policy scenarios were applied: the energy conservation scenario (EC) and the accelerated energy conservation scenario (AEC). An extrapolation of the results obtained for both scenarios to the entire Polish industry shows energy conservation potentials in the year 2003 of 5.72 Mtoe and 6.95 Mtoe respectively, compared to a reference scenario (REF), which assumes an icrease of 10.87 Mtoe until 2003. The reduction in emission levels achieved by the AEC scenario, as compared the REF scenario, are: 24 million tons of CO_2 (27%), 195 000 tons of SO_2 (28%) and 81 000 tons of NO_x (28%).

Other studies confirm these potentials or even indicate economic potentials of 25 – 30%.

Transport

Consumption in the transport sector has been relatively stable since 1990, with a slight increase in the last 2 years. The share in total final consumption was about 14% in 1998. Increased use of LPG for private vehicles is an established trend.

In the period from 1994 – 1998, energy consumption in the transport sector has increased by 15.7% from 8 329.7 ktoe to 9 634.1 ktoe. In the same period, energy consumption of road transport has increased by 23.9% from 7 078.7 to 8 771.5 ktoe, while energy consumption of other transport modes has decreased, e.g. rail transport from 685.4 ktoe to 597.7 ktoe (see Annex 2).

6. Energy Efficiency Policies and Programmes

Policy Development

Energy efficiency has been formulated as a strategic task in the Government document *"Assumptions for Poland's Energy Policy until the year 2010"*, approved on 17th October 1995 and the *"Framework Plan for Implementation of the Energy Policy Assumptions"* approved on 15th July 1996. The documents call for lowering the energy consumption in the national economy by increasing efficiency of energy use in industry, municipalities, transport and buildings.

Already in 1991, the Polish Parliament had voted in favour of establishing a national energy efficiency agency, which was founded in 1994 as the "Polish National Energy Conservation Agency – KAPE" (see Section 7).

In July 1995, the Ministry of Physical Planning and Construction submitted the document *"Energy Use Rationalisation Policy in Municipal-living Sector"*, which paved the way for the *"Act of 18th December 1998 on Support for Thermo-Modernisation Investment in Buildings"*.

As mentioned in Section 3, energy efficiency is also part of the Government strategy presented in the *"Assumptions for Poland's Energy Policy until the year 2020"* ('rationalisation strategy'). In the chapter "Strategy for Improvement of Energy Efficiency" the Government states that lowering energy intensity of the Polish economy requires a comprehensive action in all sectors of the economy, public services and households, which is expected to have an effect in:

- Improvement of energy and ecological security, mainly due to elimination of huge energy losses in most ineffective, harmful for environment, processes of energy and fuels production;

- Increase of competitiveness by domestic companies, due to lowering of the energy component in final prices of products and services;

- Increase the overall economy management efficiency and improvement of quality of life of the Polish society as a permanent basis of sustainable development.

The promotion of energy efficient technologies, machinery and equipment is considered as a basic tool for achieving the a.m. objectives.

As mentioned in Section 3, the Governments strategy to promote energy efficiency concentrates on three types of instruments:

- Direct regulation (standards);
- Market stimulation (economic and fiscal); and
- Supporting instruments (information, education, research and development).

Box 1 shows the proposed actions and instruments.

Box 1: Proposed Government instruments to promote energy efficiency (1)

Direct regulations (legal standards)

1. The Minister of Economy in co-operation with competent other ministers will overview legal regulations in order to identify and eliminate barriers for modernisation of energy systems (district heating, power production, etc.) in utilities financed from the state budget or the local self-government budget, with regard to introduce effectively financing of energy investments and exploitation of equipment by ESCO-type companies; the Minister of Economy will issue regulations allowing re-financing of energy efficiency investments from achieved energy savings and will elaborate legal, financial and organisational instruments to enable rationalisation of energy use in entities financed from the central or self-government budgets.
2. The President of the State Office of Housing and Town Development based on results of the monitoring the Thermomodernisation Fund will take appropriate steps in order to increase thermomodernisation investment volume and assure financial support from the state budget of 2001.
3. The Minister of Economy will review the Energy Law with respect to development of renewable energy use, namely implementation of purchase obligation of energy from renewable resources.
4. The Minister of Economy will start works upon a draft of an act determining governmental policy on rational use of energy, combined heat and power units and renewable resources.
5. The Minister of Economy together with the President of the Energy Regulatory Authority (ERA) will determine uniform principles enabling to include into energy tariff policy obligation to use the Least Cost Planning Method by energy utilities.
6. The Minister of Transportation and Maritime Economy will develop a programme aimed at lowering of energy consumption in forwarding of persons and goods, by the end of year 2000.

Market stimulation (economic and fiscal)

1. The Minister of Economy will elaborate comprehensive governmental programmes on introduction of selected products on the domestic market and on support to research programmes.
   The *Assumptions for Poland's energy policy until the year 2020* define technologies of special meaning for implementation of energy efficiency strategy, i.e.:
   - Variable speed electric motors and energy efficient equipment;
   - Energy efficient lighting systems;
   - Low-energy consuming household, office and telecommunication equipment;
   - Renewable energy installations for buildings;
   - Combined heat and power sources of different power capacity.
2. The Office of the European Integration Committee will inform about possibilities for financing of energy efficiency investments from EU structural budget.
3. The Minister of Economy together with the President of the Energy Regulatory Authority will undertake steps oriented towards increase of contribution of the renewable energy in the overall country energy balance, namely through effective application of the Articles 9 and 45, Paragraph 3 of the Energy Law.

Box 1 (cont.): Proposed Government instruments to promote energy efficiency (2)

Support (information, education, research, and development)

1. The Minister of Environment will take into consideration putting forward to the State Committee for Scientific Research launching of so called "ordered" research programmes (topics and order formulated by the ministries) aimed at:
   - determination of influence on the environment (decrease of loads to environment and emissions to air) of effects connected to intensification of energy efficient processes;
   - evaluation of SO_2 and CO_2 emissions market (domestically and internationally).
2. The State Committee for Scientific Research will give a priority for research programmes connected to rational energy use.
3. The State Committee for Scientific Research will analyse compliance of projects implemented within the EU programmes (mainly, 5th Framework Programme) with the national energy efficiency policy and will publish a list of priorities in order to attract research environment to apply with energy efficiency-related research projects.
4. The Minister of Economy will propose to the State Committee for Scientific Research launching of "ordered" research programmes aimed at:
   - improvement of the energy productivity in the national economy;
   - elaboration of energy audit standard for industry;
   - adaptation of market mechanisms supporting energy efficiency undertakings in EU countries to Polish conditions, including elaboration of an action plan until 2002.
5. The Minister of Interior and Administration will propose to the State Committee for Scientific Research launching of "ordered" research programmes aimed at:
   - evaluation methods of technical and energy efficiency status of buildings;
   - methodology and energy standards for tertiary sector buildings.
6. The Minister of Education will introduce into school programmes at all levels topics on rational energy use and ecological aspects of power production.
7. The Minister of Economy together with the Minister of Interior and Administration will launch a nation-wide promotion campaign for energy conscious behaviour and use of energy efficient equipment.
8. The Minister of Interior and Administration, based on actual experience with the Thermomodernisation Fund, will introduce an effective promotion programme in order to increase public interest and volume of thermomodernisation investments.
9. The Minister of Economy together with the Minister of Interior and Administration and the President of the Energy Regulatory Authority will organise a nation-wide training programme for local government administration and self-government authorities on application of the Energy Law provisions and implementation of the national energy policy.
10. The Polish Standardisation Committee will give a priority for adaptation of the Polish standards to EU energy efficiency standards.

Measures

- *Residential*

Before 1997, the Government provided assistance for cooperative housing in the form of financing projects for buildings mainly from the years sixties and seventies.

The *"Act on Support for Thermo-Modernisation Investment in Buildings"* (1998) defines (i) the principles of support for thermo-modernisation investment projects as well as (ii) the principles for establishing the Thermo-Modernisation Fund and its application. Projects eligible for support include end-use improvements in residential buildings, reduction of energy losses in heat distribution networks and the substitution of conventional energy sources by non–conventional sources, including renewables.

Under the "Thermo-Modernisation Programme", investors receive a premium of 25% of the loan used for implementing an eligible project upon completion of the project and after payment of 75% of the loan. To be eligible, projects should fulfil technical (minimum energy savings in physical terms) and financial criteria (positive net present value – NPV; payment in less than 7 years and no less than 10% of the savings per year; the loan should not exceed 80% of the value of the project). Loan agreements are concluded between the investor and a commercial bank, which submits the project to the National Economy Bank (*Bank Gospodarstwa Krajowego*) for approval of the premium, based on an obligatory energy audit report[1]. The "Thermo-Modernisation Fund" is established at the National Economy Bank.

The Thermo-Modernisation Fund has been in operation since July 1999. The following allocations from the state budget to the Thermomodernisation Fund have been foreseen:

Table 3:
State budget reserves for thermo-modernisation premiums from the Thermomodernisation Fund

Year	1999	2000	2001	2002	2003
Allocated state budget (million PLN*)	5.0	30.0	60.0	85.0	110.0

*1 PLN = 0.24 €

Actually, the first experiences with the Thermomodernisation scheme were rather disappointing. During the first year of its existence, only 200 applications have qualified, most of them concerning single family houses. Annual energy savings cumulated 4 million PLN, and the scale of projects was not significant at national level. Reasons might include the relative complexity of application procedures, the deferred assistance towards the end of the project, problems in the process of decision making in housing co-operatives and communities and probably problems to provide the required collaterals.

The Ministry of Interior and Administration and the State Office of Housing and Town Development, who are in charge of the administration of the Thermomodernisation Fund are analysing the situation and are expected to suggest to the Government some modifications to

[1] Guidelines for energy audits are defined by Ordinance of the Ministry of Internal Affairs and Administration of April 30,1999.

the Fund regulations. The Bank of National Economy has taken several promotional steps like a free info-line, poster and press campaigns.

Energy efficiency standards and labelling

The Ministry of Regional Development and Buildings has introduced new standards for buildings in 1997. The minimal thermal insulation requirements for new buildings are more tightened for new than for old buildings. There are also discussions on the possibility to introduce energy labelling of new buildings.

Following Art. 52 of the Energy Law, Ordinance 145 of February 18, 1999 establishes obligatory minimum efficiency standards for a large number of equipment and appliances (including: central heating boilers, air conditioning equipment, electrical welding and bonding equipment, household appliances, gas ovens, radiators etc, asynchronic electric motors, light bulbs and fluorescent lamps etc). It also establishes the labelling requirements for imported equipment. The ordinance is under discussion and will probably be modified, in accordance with EU standards and labelling requirements in this field.

- *Tertiary*

Support from the Thermomodernisation Fund will be available for public buildings from January 1, 2001 onwards. At the moment, no specific programmes for the tertiary sector are in place.

- *Industry*

The *"Master Plan Study for Energy Conservation in the Republic of Poland"* (see Section 5) provides very useful recommendations for programmes and instruments to promote energy efficiency in industry, in particular:

(i) to establish energy management and auditing systems at factory level;
(ii) to provide publicity and information, providing incentives and establish an Energy Conservation Technological Centre; and
(iii) to create adequate legal, financial and institutional conditions in order to effectivley implement the approved Government policies with regard to energy efficiency.

It is not clear to what extent these recommendations have been taken into consideration for implementation so far.

- *Transport*

Transport policies of the Government are in general market oriented, both on the State Government and territorial Self-Governments level. The essence of the policy is searching the balance between needs and possibilities for satisfying them on the base of reconciling technical, spatial, economic, social and ecological factors.

Key actions are directed at: (i) management of transport demand as the actions leading to rationalisation of the use of transport, (ii) moving transport works towards less polluting transport modes and (iii) using the best available techniques. Guiding premises of the Governments transport policy are: (i) for the rationalisation of freight carriage, market factors react most efficiently; (ii) for the rationalisation of individual passenger traffic: promotion of alternative transport modes and behaviour patterns as well as fiscal factors.

In 1995, a document was elaborated, titled *'Transport Policy',* which is under review.

Taxation of transportation fuels and regular technical control of vehicles are specific measures which indirectly influence fuel efficiency of cars. Another instrument is the stimulation of LPG as road transportation fuel.

A project of the Polish National Railway company (PKP) should be mentioned, which carried out a study on energy efficiency improvements in railway transport. Savings potentials identified are in the order of few percent-points, which however would make an impact since PKP is the largest consumer of electric energy in the country.

- *Demand-side management and integrated resource planning*

According to the Energy Law, development plans prepared by energy companies have to include non-conventional energy and demand-side energy efficiency projects. In addition to environmental costs, energy tariffs (which have to be approved by ERA) may include costs of co-financing by energy companies of DSM projects and development of non-conventional energy sources.

The Polish Power Grid Company (PSE) has performed several DSM and IRP studies. It is not clear, however, to which extent PSE and distribution companies are actually making progress in integrating end-use energy efficiency in their development plans.

- *Decentral electricity and heat generation*

Decentral generation of electricity and heat is basically stimulated by two provisions of the Energy Law: (i) the obligation of energy companies to purchase part of their energy requirements from non-conventional, including renewable, sources and (ii) the obligation to include non-conventional generation in their development plans. Also the regulation "concerning specification of particular types and scope of business activities which shall not require any concession" (Decree 621 of July 17, 1998), which excludes electricity producers up to 50 MW (recently reduced to 5 MW) and heat producers up to 5.8 MW from the obligation to obtain a license is assumed to have a positive effect on the development of a decentralised generation market.[2]

According to PSE, the potentials of the most promising decentral technologies are as follows:

- Wind power plants: 15 – 24 TWh/year (according to EU experts: 10 TWh/year);

[2] However, the exemption from licence does not concern renewable energy sources for which the energy purchase is obligatory.

- Small hydro power plants: 650 possible locations with a total capacity of approx. 80 MW;
- Biomass: 12 TWh/year from wood, 5 TWh from straw and 7 TWh from biogas, bio ethanol, rape seed oil, sewerage sediments and solid waste, including landfill gas.

It is expected, that the above mentioned regulations, combined with market demonopolisation and privatisation in general, will result in favourable conditions for small scale, local energy sources. Factors quoted include:

- Decrease of load in transmission and distribution networks will improve operating conditions of these networks and reduce transmission and distribution costs;
- High efficiency of decentral CHP plants, short construction times and lower investment risks;
- Large centralised heating networks are not required.

KAPE estimates the potential for micro-cogeneration to about 400-600 MW_e.

According to the *"Assumptions for Poland's Energy Policy until the year 2020"*, renewables will play an important role in fostering security of supply and help to achieve Kyoto targets. The implementation of renewable energies is also beneficial for energy diversity and for the development of local markets, energy infrastructure and employment. Renewables also play a role in the environmental policy of the country (Section 8). In it's Resolution of July 8, 1999, the Polish Parliament requested the Government to prepare a national strategy for development of renewable energy and to formulate a Law on Renewable Energy Utilisation.

7. Organisation of Energy Efficiency Activities

The Ministry of Economy is responsible for energy policy, including energy efficiency policies. There is one Secretary of State and seven Deputy Secretaries of State co-ordinating the various economic, trade, legislation, tourism and research departments. One Deputy Secretary of State co-ordinates the Energy Department (figure 4) and the Industry Restructuring Department.

There are also other Ministries responsible for elements of energy efficiency policy. The Minister of Regional Development and Buildings has under his authority the Office of Housing and Town Development, responsible for the operation of the Thermomodernisation Fund, as explained in section 6. The Energy Regulatory Authority established under the 1997 Energy Law has also attributes in the area of promoting energy efficiency in energy and fuel consumption (see section 4).

The Governmental institution responsible for the operational implementation of energy efficiency policies is the Polish National Energy Conservation Agency (KAPE). KAPE, established in 1994 with an initial capital of 1 million USD (figure 5) has the status of a joint stock company. The Supervisory Board has eight seats for the stakeholders, out of which three representatives of various Ministries; the members nominated for a three years period are remunerated for their activities. The Supervisory Board approves the balance sheet, the income statements, the reports of the Management Board and nominates the President of the Management Board. The Management Board is formed by a President and two Vice-Presidents. The *Proxy* is a person who operates on behalf of the Management Board in case of their absence.

With a permanent staff of 20 persons, KAPE has as main function to create a market for energy efficiency. KAPE cooperates with industry, research institutes, develops information programmes and keeps a national register for auditors. KAPE acts sometimes on a commercial basis in order to cover the necessary budget. There is a bit of ambiguity to what extent KAPE has to be seen as a governmental body and to what extent it can develop commercial projects. In the absence of sufficient governmental funding, clear procedures and responsibilities should help avoiding unclearities and suspicion of unfair competition. At the same time attention should be paid that commercial activities don't take over the main objective of the agency, which is to support building a market for energy efficiency.

KAPE has participated in SAVE (with a project for energy labelling). KAPE, on behalf of the Polish government has co-operated in many bilateral programmes from governments of Denmark, Sweden, Japan, the Netherlands, the UK, etc. One of the most prominent programmes is SCORE (Supporting Co-operating Organisation of Rational Energy Use), with the Netherlands, which supports development of a network of regional energy conservation agencies and NGOs, the future partners in implementation of national and local energy efficiency policies. The programme co-ordinated by NOVEM and KAPE runs actually into its fourth year and involves more than 15 Polish organisations in the field of energy efficiency.

Another important actor is the National Energy Conservation Agency – NAPE. Created in 1992 by the Polish Development Bank with a capital of 1.7 million USD, NAPE acts exclusively on a commercial basis. With a staff of 15 the main areas of activity are: audits for buildings and industry, energy plans for enterprises, studies and contribution to the development of specific legislation. NAPE has published several books and developed software for energy auditing. NAPE organises courses for energy auditors (1 200 auditors in 2 years) and pays a small fee to KAPE who supervises the programme. NAPE has three branch offices in the country and a turnover of 3 million Zt/year. It took part in SAVE and USAID programmes.

The Foundation for Energy Effective Utilisation (FEWE) was created in 1990 by three private persons and was supported by US funds. It carries out projects on energy efficiency labelling and on the promotion of energy efficiency equipment; it has also organised training programmes.

According to the Energy Law local authorities should develop energy efficiency plans, but out of 2500 gminas (smallest administrative units) only a few of them have in practice the institutional capability to do it. The Danish Energy Agency has approved a project aiming to a national training scheme for local authorities. There are 13 Regional Energy Conservation Agencies (RAPE) established by local authorities in the period 1995-1998 which are active in developing heat supply plans for municipalities and in training auditors. The demand for auditors is generated by a banking procedure requesting auditing for providing loans.

An agency operating at national level is also the Energy Market Agency, organised as a company with main shareholders including the Ministry of State Treasury, Ministry of Economy, Polish Power Grid, Association for Restructuring Coal Mining. Established in 1995 it has 100 employees and has as a first function to collect energy data, including on consumption in the industrial sector where the large companies are under obligation to provide such information. In addition, the Agency is also undertaking analytical research,

supports the Ministry of Economy in elaborating energy policy guidelines and provides, on a commercial basis, services such as consultancy for energy companies, training, organises exhibitions and publishes energy related information. The Energy Market Agency prepares information for Eurostat and OECD. It estimates that data are in a proportion of 90% compatible with IEA statistics.

There are also other bodies involved in the promotion and implementation of energy efficiency measures. The *Polish Heat Chamber* of C*ommerce – Cieplownictwo Polskie* takes an active role in promoting efficiency in the district heating systems. There is an association for promotion of cogeneration *KOGEN Polska*. There are several non-governmental organisations (such as the Polish Ecological Club) concerned mainly with the protection of the environment. They promote activities that reduce greenhouse gas emissions by an efficient use of energy and by disseminating best practices and technologies in various areas, including public transport, efficient lighting and renewable energies.

Figure 4

Ministry of Economy - Energy Department

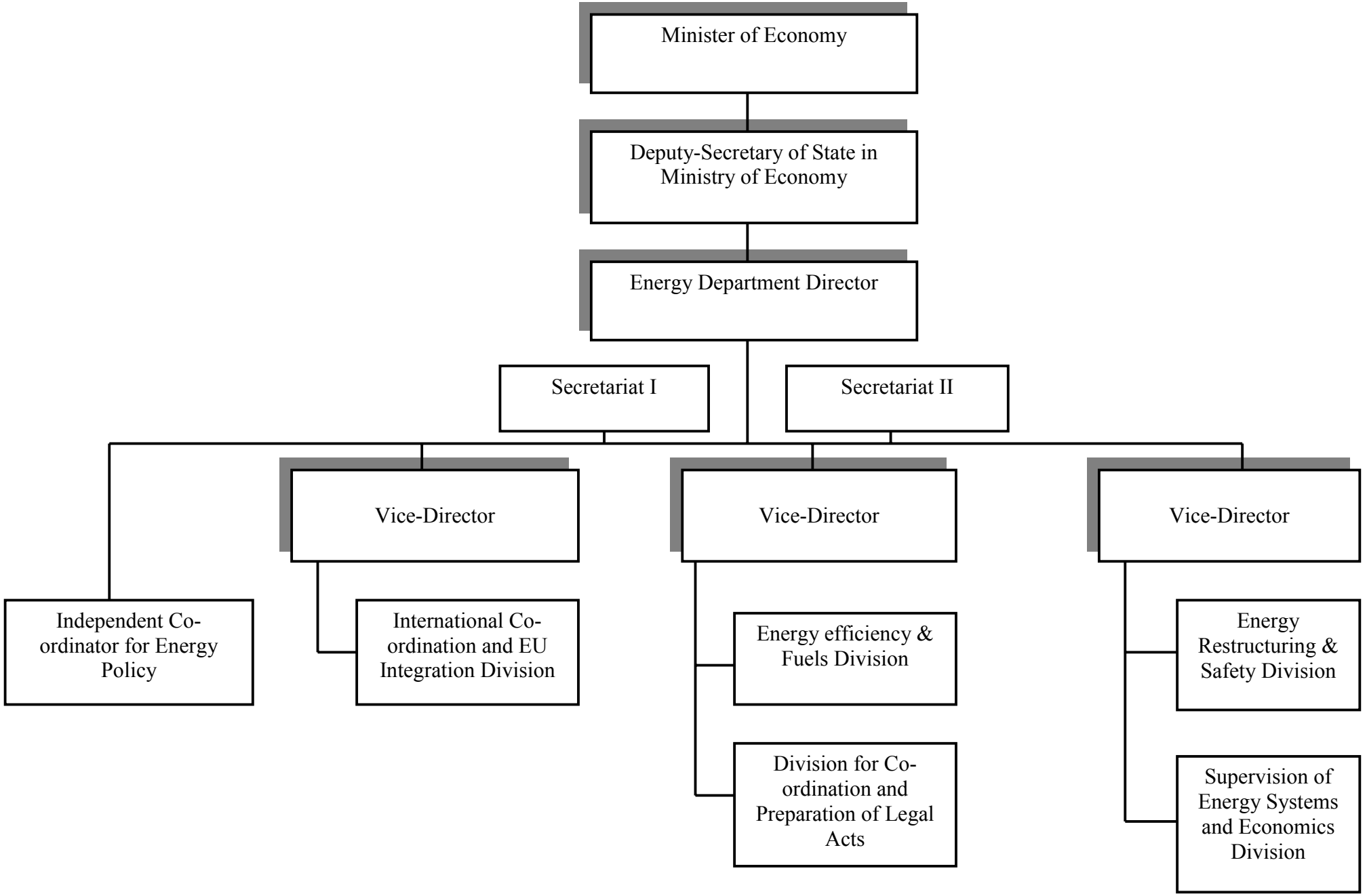
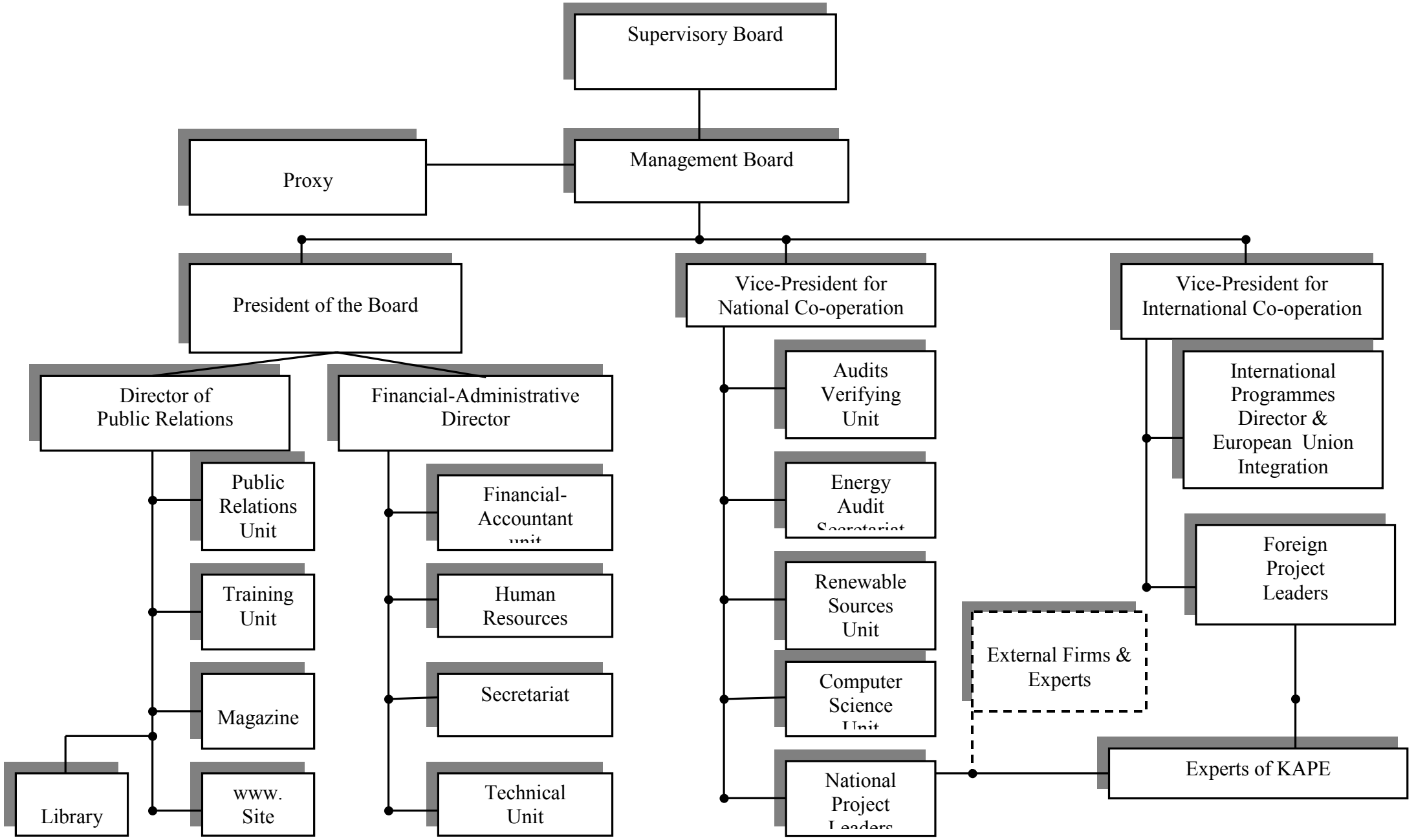


Figure 5
POLISH NATIONAL ENERGY CONSERVATION AGENCY (KAPE)



8. Energy Efficiency and the Environment

The main legal foundation of environmental policy in Poland is the amended Act on Environmental Protection and Management of 29 August 1997. The aim of the Act is to implement, to the most comprehensive extent, the basic issues of the protection of the natural environment, and to assure a uniform policy in this respect.

The Act has imposed on the state administrative bodies, local self-government, business entities and their employees, and all citizens, the obligation to protect the environment, as well as the liability for the effects of environmental impact. The Act has also imposed on companies the obligation to obtain approvals for the use of the environment. The effects of an active environmental protection policy can be seen in the reduction of particulates and SO_2 emissions, which used to be major local environmental problems (figure 6).

Financial resources collected from fees and fines imposed for the use of the environment are allocated to the Provincial Funds for Environmental Protection, the National Fund for Environmental Protection and Water Management and – since 1993 – also municipal environmental protection funds.

On 26 October 1994 Poland became a party to the United Nations Framework Convention on Climate Change (UNFCCC, Annex I country). Under the Kyoto Protocol, signed on July 15, 1998) Poland has committed itself to reduce greenhouse gas emissions by 6% by 2008 – 2012, compared to 1988 levels.

Other international treaties signed by Poland include the Convention on long-range Transboundary Air Pollution ('Geneva Convention') of 1979 and pertinent protocols and the European Energy Charter (1991). The European Energy Charter Treaty with accompanying documents has been signed in 1994, although not yet ratified.

There are several international co-operation programmes and projects aimed at the mitigation of GHG emissions. Examples are:

- Bilateral co-operation projects with countries of the European Union and the USA concerning heat conversion from coal to other energy sources, methane utilisation, thermo insulation and energy savings, as well as renewable sources utilisation;

- Projects implemented under the PHARE Programme, including the production of electricity and heat from methane from hard coal mines;

- Two projects promoting energy-efficient lighting, financed by GEF and WWF.

Other important mechanisms are the EcoFund and Activities Implemented Jointly (see below).

The promotion of energy efficiency and renewable energies apparently assume an important role in GHG-emission abatement strategies.

Figure 6: Emissions of CO_2 [in Mt], SO_2, NO_x, particulates and VOCs [in kt] in Poland, 1988 - 1997

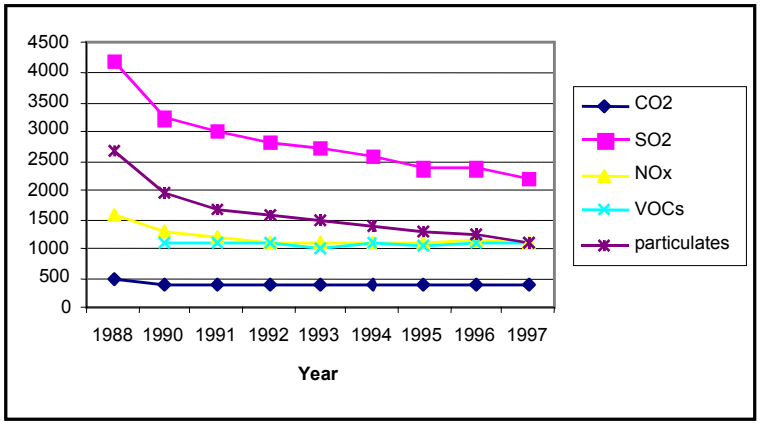
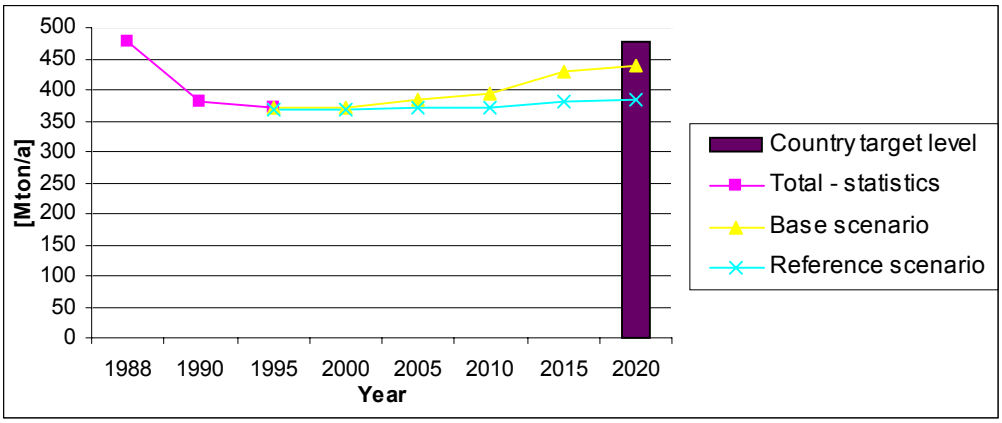


Table 4: Total greenhouse gas emissions in 1988-1997 in Poland [kton]

Year	1988	1990	1992	1994	1996	1997
CO_2	477 584	381 482	372 311	372 293	373 202	362 300
CH_4	3 141	2 801	2 474	2 467	2 252	2 279
NO_2	70	63	50	50	54	54

Source: Second National Report to the Conference of the Parties to the UNFCCC (1998), Ministry of Environmental Protection, Natural Resources and Forestry

Figure 7: Historic and expected CO_2 emissions for Poland (country target level according to Kyoto Convention), Source: KAPE



Environmental Funds

Besides the 'Thermo-Modernisation Fund', which focuses on energy efficiency improvements in the residential and heat distribution sectors, two major environmental funds are operational in Poland:

- The National Fund for Environmental Protection and Water Management ('NFOSiGW')
- The EcoFund

The *National Fund for Environmental Protection and Water Management* was established in 1991 and is financed from environmental pollution charges and penalties. The Fund provides preferential loans up to 50% of the costs of environmental projects in a wide range of areas, including: water and sewage treatment, waste management, forest protection, atmospheric emissions, manufacture of environmentally sound products, flue gas treatment, water management etc. Projects must be included in a list of priority projects, based on the document *"National Environmental Policy"*. Co-financing with the Provincial Funds for Environmental Protection and Water Management is possible.

In addition to the Fund, loans are also available from the Environmental Protection Bank, in which the Fund holds the majority of shares. Several credit lines for 'pre-ecological' projects are available, among them credit lines for replacing street lighting in municipalities by energy efficient lighting systems and for implementing energy saving solutions in central heating and hot water supply systems.

The *EcoFund* was established in 1992 as an independent non-profit foundation aimed at managing the financial resources from a so-called debt-for-environment swap, which was agreed between Poland and Western creditor countries (USA, Switzerland, France, Italy, Sweden and Norway)[3]. The EcoFund provides grants to projects which are consistent with the *"National Environmental Policy"*, adopted by Parliament in 1991 and which comply with the country's obligations arising from international conventions and agreements.

The statutes of the EcoFund Foundation define five areas of projects: (i) limiting the greenhouse gas emissions and phasing out of substances depleting the ozone layer, (ii) reducing the transboundary flow of SO_2 and NO_x, (iii) reducing the pollution of the Baltic Sea, (iv) biodiversity conservation and (v) waste management. Projects aiming at: energy conservation, promotion of renewable sources of energy, elimination of methane emissions and CFCs phase out are eligible within the first project area. Grants from the EcoFund are in general provided for investments, whereby the equipment provided within these projects has to be provided from the countries contributing to the Fund. Grants are normally limited to 20 – 50 % of the project cost.

Tables 5 and 6 provide an overview of projects leading to the reduction of GHGs emission financed by the National Fund for Environmental Protection and Water Management, the Bank for Environmental Protection and the EcoFund in the period 1990 – 1996.

[3] A similar agreement has been concluded with Finland.

Table 5: List of projects leading to the reduction of GHGs emission financed by National Fund for Environmental Protection and Water Management and Bank for Environmental Protection in 1990 – 1996.

Financing institution	Project type	Amount of co-financing (thousand PLN)	Number of projects
National Fund for Environmental Protection and Water Management		**206 096**	**482**
	Modernisation of heating systems	138 004	350
	Coal conversion to gas	-	-
	Gasification	44 800	114
	Use of waste heat	-	-
	Use of renewable energy sources	23 292	18
Bank of Environmental Protection		**42 665**	**167**
	Modernisation of heating systems	7 618	19
	Coal conversion to gas	31 409	124
	Gasification	3 228	17
	Use of waste heat	-	-
	Use of renewable energy sources	410	7
	Total	**248 761**	**649**

Source: Second National Report to the Conference of the Parties to the UNFCCC (1998), Ministry of Environmental Protection, Natural Resources and Forestry

Table 6: List of projects leading to the reduction of GHGs emission financed by EcoFund in 1993 -2000

Financing institution	Project type	Amount of co-financing (thousand PLN)	Number of projects
EcoFund		**239 082**	**131**
	Modernisation of heating systems	150 600	54
	Coal conversion to gas	49 455	34
	Gasification	-	-
	Use of waste heat	11 817	15
	Use of renewable energy sources	27 210	28

Source: EcoFund Foundation

Joint Implementation

Poland participates in the pilot phase of Actions Implemented Jointly (AIJ), as a host country. At the moment, projects are implemented in co-operation with Norway and with the Netherlands. It is expected that Poland will adopt the position of a beneficiary country in Joint Implementation Projects.

The National Joint Implementation Secretariat is established within the Executive Office for the Climate Convention (EOCC) at the National Fund for Environmental Protection and Water Management. Responsibilities of the JI Secretariat are (i) project identification, (ii) monitoring of the financial and ecological effects of projects and (iii) reporting to the UNFCCC Secretariat.

Projects implemented jointly with Norway include coal-to-gas conversion in non-industrial boiler houses and energy efficiency in new residential buildings. AIJs with the Netherlands are (i) the reduction of atmospheric pollution through modernisation of heat supply system in the town of Byczyna and a project of sustainable heat and power for public networks in Szamotuły. In addition there are proposals for AIJ projects with Switzerland (modernisation of boiler houses and heating systems), the Netherlands (reduction of methane emissions through landfill gas utilisation and utilisation of wood chips for heating purposes in urban areas) and Australia (rehabilitation of natural gas distribution networks, modernisation of boiler houses and heating systems). Agreements have also been signed with Canada and Finland.

Environmental benefits (tCO_2/year) and cost-effectiveness (US$/$tCO_2$) of projects are evaluated against 'baselines', which are established in each particular case. Some projects establish CO_2-credit shares among the partners. Projects are co-financed by GEF, World Bank, the National Fund for Environmental Protection and Water Management, private investors and grants from the partner countries.

9. Assessment of Progress

Government policy and strategy - overall assessment

During the last decade of the 20th century, Poland has made important progress in the process of adapting its energy economy to market principles. In particular the Energy Law of 1997 should be considered as a major breakthrough in setting the framework for privatisation and restructuring of the energy sector and preparing for the integration of the Polish energy economy in the Internal Energy Market of the European Union. The establishment of an independent Energy Regulatory Authority is a crucial element in this transformation process.

Poland has also made major progress towards an environmentally more sustainable energy system, both in terms of more stringent regulations concerning emissions from fossil fuelled generating plants, as well as with regard to the gradual substitution of coal to natural gas. Environmental levies and penalties are assigned to environmental projects via the National Fund for Environmental Protection and Water Management and Provincial Funds for Environmental Protection. Poland also plays an active role in the present pilot phase for Actions Implemented Jointly, as a host country.

Although an explicit part of the Governments medium and long-term energy strategy (the 'Assumptions for Poland's Energy Policy until the year 2020'), energy efficiency does however in practice not yet assume the role it should play in the transformation process towards a more sustainable energy economy.

In the view of the Review Team, this is mainly due to the following reasons:

- The transformation from highly centralised to vertically disintegrated electricity and gas sectors poses a lot of challenges both to the market players and to the authorities. It is therefore understandable that much of the attention, in particular of the ERA is focussing on these issues. It should also be recognized, that the efficiency gains achieved by market liberalisation are very important, both in terms of fuel efficiency and in terms of emission

reduction. ERA's legal obligation to "publish information with a view to improve energy efficiency and fuels utilisation" has still to be concretised.

- Polands international obligations under the Kyoto Protocol (6% emission reduction by 2008 – 2012, compared to 1988 levels) are likely to be achieved by the efficiency gains and fuel substitution processes which will be triggered by market liberalisation.

- Meeting the requirements of the *acquis communitaire*, i.e. fulfilling EU-accession requirements seems to be the major concern of the authorities. This means that the short-term focus is clearly on those measures which are required to in the context of accession, in particular the completion of the market liberalisation process.

Following this line of argumentation, it is understandable that particular emphasis is given to those energy efficiency measures, which are in line with EU requirements, in particular the requirement of energy efficiency standards and labelling for energy consuming appliances.

Nevertheless, both the 'Assumptions' and the Energy Law, provide some important lines of action, which should be translated into concrete measures or further developed respectively:

- In its strategy to promote energy efficiency, the Government proposes a number of concrete instruments (regulations and standards; economic and fiscal market stimulation; information, education, research & development), which need to be put into practice;

- The move towards decentralisation, including the new responsibilities of local authorities (in particular municipalities) to prepare 'development plans': Although in principle a move into the right direction (decentralisation of decision-making and implementation of measures), it should not be overseen that many new challenges will arise in this process, both for local and central Government authorities. It seems to be of highest importance, in this context, to (i) better define the responsibilities and the role of the various institutions on the national, regional and municipal level and (ii) to make a major effort to develop institutional capabilities and human resources at all these levels;

- The obligation of distribution companies to purchase part of their energy requirements from renewable energy sources (Art. 9, 3 of the Energy Law and Ordinance of February 2, 1999) offers the possibility to create a parallel market for renewable energy, similar to those currently introduced in various EU Member States (either quota or tariff-based or competition-based schemes based on tenders of green certificates). In this context, it may be necessary to revise the Ordinance of February 2, 1999;

- The Energy Law allows energy companies to include the costs of end-use energy efficiency measures in tariffs. If properly implemented, this regulation offers the opportunity to effectively introduce demand-side management as a common practice of energy companies.

In summary, the main short-term focus of the Government should be to develop an energy efficiency strategy and action plan, which should include well-defined objectives and targets. Mechanisms to realise periodical reviews of the progress made in achieving objectives and targets should be developed. This would also be in line with obligations forthcoming from the PEEREA.

Sectoral programmes

The *residential sector* has received so far priority attention, due to several reasons: (i) inefficiencies in the residential sector, in particular with regard to heat consumption, are very important, (ii) energy efficiency gains in industry were supposed to be basically achieved by restructuring of the sector, (iii) other sectors, like transport, may be more difficult to address.

The Thermomodernisation Programme and Fund are certainly motivated by this perception and point into the right direction. Based on the experiences made so far, possible modifications with regard to its operational characteristics are under consideration, including the possibility to offer assistance at the beginning of the project but not to the end. While a lack of publicity may be an aspect which prevents potential customers from making more widely use of the funds, procedures for obtaining financial support and problems related to decision making in housing co-operations and communities seem to be at least problems of equal importance.

The 'Master Plan Study for Energy Conservation in the Republic of Poland' provides very useful recommendations for programmes and instruments to promote energy efficiency in the *industrial sector*, which represent a lot of suggestions for concrete actions to be taken by both the Government and industrial companies. It appears to be essential, in this context, to intensify the dialogue between Government and industry in this respect.

Finally, both the *Tertiary* and the *Transport Sectors* apparently lack of specific programmes for the promotion of energy efficiency. The extension of the Thermomodernisation Programme to the public sector should open the door for more specific action directed to the tertiary sector. A coherent strategy for promoting energy efficiency in the transport sector still needs to be developed.

Organisation

Poland has a complex and effective organisational structure for energy efficiency policy and programmes development and implementation. There are many operational bodies, which have gained important national and international experience working very often on a commercial basis.

There are a couple of concerns. Once a national programme for energy efficiency is defined (this being the top priority), there is a need for defining responsibilities between the various actors. Especially for KAPE it should be made clear how to operate as a governmental body in charge of building the market for energy efficiency and how and to what extent to develop activities on a commercial basis. While this is never an easy task, resources are required to implement governmental policies. Another aspect that requires attention is the need to maintain good co-ordination and co-operation, to ensure efficiency and to avoid duplication between the large number of organisations involved in implementing energy efficiency measures. The transmission and distribution companies should start implementing their plans to invest in DSM programmes. At the local level, municipalities should be encouraged to build the necessary capacity to develop and implement the energy efficiency/rationalization plans required by the Energy Law.

Energy Pricing and Taxation

Price reform evolved well towards the elimination of subsidies and reflection of costs. The Energy Regulatory Authority started to operate professionally since 1999 both in terms of liberalising the market (43% opened in the year 2000 for electricity) and in regulating energy prices. The operation of ERA allowed decreasing electricity transmission and distribution costs, which rose from 34% of delivery costs in 1991 to the peak of 49% in 1993, stabilised then on the level of about 44% afterwards and fell to 37.6% in the first half of 2000. In this period the increase of other generation costs (excluding fuel costs and environmental fees) was observed from 29% in 1991 to almost 34% in the first half of 2000, stabilisation of fuel costs share at a level of 26%-27% and a decrease in environmental fees share, from 4.5% in 1991 to 2.1% in 1999 and first half of 2000.

Prices of energy carriers gradually approach the levels of prices in the EU countries. Due to much lower incomes of the population, costs or the energy in Poland constitute a much bigger burden for household budgets than they are in the EU countries. Relations between prices for the industry and households are similar to the relations observed in the EU countries. There are still cross-subsidies between households and industry, and this may hamper the effectiveness of the market. Paying due consideration to social aspects, other direct financial measures and policies should allow energy prices to cover real costs for the various consumers.

The tax system evolved toward more transparency by eliminating various preferential regulations and encouraging economic activity through reduced corporate tax. Nevertheless, in a longer perspective the tax system will have to address various issues, such as the commitment to reduce greenhouse gas emissions. Encouraging energy efficiency projects may be one of the options.

Environment

Poland is apparently making good progress in adapting environmental standards to EU regulations. Also, targets to reduce GHG-emissions in accordance with the Kyoto protocol are very likely to be achieved.

Although these developments are of course very positive, institutional and policy strengthening seems to be essential for pursuing this positive trend in respect of developing action aiming at further improving of energy efficiency and GHG-emission reduction. Existing policy guidelines and legislation offer the possibility to proceed further than the existing targets.

It seems that the potentials of energy efficiency and renewable energies to reduce pollution and CO_2 emissions have by far not been exhausted.

Financing of Energy Efficiency

Further to the obvious necessity to improve the operation of the Thermomodernisation Fund, other options for funding energy efficiency and renewable energies should not be overseen:

- Energy efficiency projects could assume a more important role in the project portfolios of the National Fund for Environmental Protection and Water Management and the EcoFund;

- Part of the EU pre-accession funds could be allocated to stimulate energy efficiency and renewable energy development;

- Financing of demand-side management and decentral energy options by energy enterprises, via tariff mechanism as foreseen in the Energy Law, should be encouraged;

- Central and local Governmental Agencies should receive the necessary support to accomplish their legal and policy mandate;

- Co-financing of projects among the existing funds, private banks and investors should receive more specific attention.

International Co-operation

Poland is a member of several international organisations and institutions, like OECD, the World Bank, EBRD and the World Energy Council, and plays an active role in various international co-operation schemes, including Activities Implemented Jointly, bilateral and EU co-operation programmes.

It seems to be very important that the Government further stimulates the participation of Polish institutions and enterprises in relevant programmes, like SAVE and SYNERGY. Research institutions and enterprises should also be stimulated to participate in the EU Fifth Framework Programme for Research, Technological Development and Demonstration Activities, in order to strengthen the national research base.

Recommendations

Based on the findings of the Review Team and on the assessment of progress the following recommendations are provided to the Government of Poland:

General:

- Following the "Assumptions for Poland's Energy Policy until the year 2020", the Government should proceed further and develop an energy efficiency strategy and action plan with well-defined, general and specific objectives.

- The Government should develop and regularly update a programme on energy efficiency with well-defined national and sectoral targets.

- The Government should periodically review the progress made in improving energy efficiency in all sectors of the economy.

- Energy efficiency policies should be better integrated into the strategies of other economic sectors, like industry and transport.

Institutional framework:

- The Government should review and strengthen their actual institutional structure for implementing energy efficiency policy.

- The Government should better define the responsibilities and the role of the various institutions at national, regional and municipal level in the area of energy efficiency and renewable energies.

Energy pricing:

- Energy pricing mechanisms should ensure that existing cross-subsidies are eliminated.

- Energy prices should better reflect environmental costs and sustainable development objectives.

Energy efficiency funding and fiscal policies:

- Government objectives and priorities should be supported by appropriate budgets for energy efficiency programmes and institutions.

- The Government should consider to allocate part of the European Union pre-accession funds to stimulate energy efficiency and renewable energy development in the sectors subject to these funds.

- Amendments concerning the terms and procedures to obtain loans and grants under the Thermomodernisation Fund should be introduced as soon as possible, in order to encourage a wider and more effective use of the Fund.

- The criteria of improvements in energy efficiency should play a more important role in the process of selecting projects subject to financing from environmental funds.

- The Ministry of Economy should analyse the opportunity to introduce fiscal and taxation policies to promote energy efficiency.

Implementation of specific programmes and instruments:

- Energy efficiency standards and labelling legislation should be completed in line with existing EU-legislation in this field.

- The Thermomodernisation Fund and other instruments for improving energy efficiency in buildings should be continuously monitored, evaluated and further developed.

- The Government should support the development and implementation of standards for conducting energy audits in buildings, based on an integrated approach, covering thermal insulation, efficiency of heating and hot water supply as well as utilisation of renewable energies.

- The Government should consider the introduction of energy efficiency labelling for buildings.

- Individual metering should be promoted as a means of motivating consumers to undertake energy efficiency measures.

- The Government should develop a programme for energy management and monitoring in public buildings; local authorities should be encouraged to take steps in the same direction.

- The Government should undertake concrete steps towards implementing the most cost effective provisions of the “Action Plan for improving energy efficiency in industry”, as defined in the "The Master Plan Study for Energy Conservation in the Republic of Poland" (1999).

- The use of biomass fuels in combination with coal in power stations and CHP plants should be encouraged, on the basis of advanced technologies.

- Research and development programmes should stronger focus on demand-side energy efficiency aspects.

Promotion of renewable energy:

- The Government should continue to develop and promote legal and fiscal frameworks for renewable energies.

- Clear and binding targets should be established in the legislative provisions concerning the purchase of electricity and heat from renewable energy sources.

Data collection and monitoring:

- The efforts to harmonise the data collection and statistical system with the IEA methodologies should be further continued.

- Analysis should be undertaken, methodologies and disaggregated indicators should be developed to assess and monitor improvements in energy efficiency.

Education and information:

- Education in energy efficiency should aim at inducing changes in attitude and therefore include primary education and public campaigns, complementary to specific courses in secondary and university education.

- Information on energy efficiency programmes, funds, technologies and practices should be better disseminated by national, regional and local governmental and non-governmental organisations.

Participation of the private sector:

- The Government should create provisions encouraging the private sector, including energy service companies, to promote energy efficiency and renewable energies.

Annex 1

Energy Situation of Poland

With a production of 180 Mt of coal in 1998, Poland was the seventh coal producer in the world. However, production of coal started to decline, and Poland announced in 1998 a restructuring programme for the coal industry, which will lead to closing 30 out of 54 mines. Poland has also significant gas reserves, which ensured about 40% of the internal consumption, and there are plans to increase exploration and production.

Indigenous energy resources provided 91.5 % of Poland's energy needs in 1998. These included hard coal (55.2%); lignite (13.1%); wood, waste and renewables (3.9%) and hydro-electricity (0.4%). Petroleum products and natural gas were mainly imported (95.9% and 66.8%) of domestic consumption respectively.

The Polish power sector is the largest in Central and Eastern Europe, with 33 000 MW installed capacity and a production of 138 TWh in 1998 (out of which 96% on fossil fuels and 3% hydro). There are about 4 800 MW installed capacity in large CHP plants and 3 000 MW installed capacity in cogeneration industrial plants. Total share of electricity produced in cogeneration amounted to 15.4% of total electricity production. At the level of the country the share of district heated households is 52%, half of this heat coming from CHP plants.

Poland became a net importer of energy since 1986. The issue of diversification of supply became increasingly important in the last years and it was addressed in the following way:

- by increasing reloading capacities of port oil terminals, which offered conditions for the diversification of supplies of oil and oil products;
- through the liberalisation of the trade resulted in the appearance of imported coal (mainly from Russia) in northern regions of the country;
- through the process of the diversification of supplies of natural gas:
    - at present, approx. 57% of the gas supplies come from Russia, from gas pipelines ending in Poland, but there will be possible supplies of gas from the transit pipeline as a result of the construction of the first part of the gas pipeline Yamal-Western Europe, which will improve the energy security of the country;
    - three connections of the gas pipeline with the gas transfer system in Germany were realised;
    - a contract for first deliveries of gas from Norway was signed for the amount of 0.5 billion m^3/p.a., with a perspective to increase it.

- through the interconnection of the Polish electric power system with UCPTE, which has considerably improved the electric power safety of the country in emergency situations.

Renewables sources of energy are starting to show their potential. Currently 3.9 per cent of primary energy demand is derived from renewables, mainly in the form of biomass and hydro-electricity. There have been many efforts to increase renewables, particularly in rural areas and in the forestry industries, where there is good potential. Existing renewable energy plants are mainly wood and straw fired boilers, small hydro power plants and – to a lesser

extent – wind turbines. Also biogas plants from sewage treatment and landfills show interesting potentials.

Total final energy consumption in 1998 was 63.5 Mtoe, of which 36% was consumed by the industrial sector, 31% by the residential sector, 15% in transport and 7% in the services sector. Energy intensity is still high in Poland. In 1998 it was estimated to be 1.382 Mtoe/billion US$. This is significantly higher than the EU average.

Table A1.1

Energy Balance for Poland

	1990	1995	1996	1997	1998
Total Primary Energy Production (Mtoe)	99.604	99.509	102.586	100.137	87.447
Net imports (Mtoe)	2.10	-0.01	5.53	7.37	9.22
Total Primary Energy Supply (TPES)(Mtoe)	100.091	100.241	107.517	103.527	96.440
Total Final Consumption (Mtoe)	62.431	65.242	69.110	67.856	63.504
Total Electricity Consumption (TWh)	124.71	118.14	122.02	123.92	123.99

Source: Energy statistics & Balances of OECD/NON-OECD countries 1997-1998, OECD/OCDE 2000 Edition

Table A1.2
Basic Indicators

	1990	**1996**	**1998**
Population (million)	38.12	38.62	38.666
GDP (billion 1990 US$)	58.98	69.80	69.80
Primary Energy Intensity (TPES/GDP)	1.697	1.54	1.382
Final Energy Intensity (TFC/GDP)	1.058	1.004	0.91
Electricity Intensity (kWh/GDP)	2.114	1.748	1.776
Electricity Consumption kWh per capita	3.271	3.159	3.207
Energy-related CO_2 emissions (Mt of CO_2)	349.12	364.70	338.1

Source: IEA
*-Excluding nuclear.

A1.3
Total Primary Energy Supply (TPES)
(Mtoe)

	1990	**1995**	**1996**	**1998**
Oil	12.682	14.635	15.639	16.420
Petroleum Products	0.559	1.515	2.367	1.897
Gas	8.940	8.992	9.443	9.512
Coal	75.412	70.335	75.738	64.402
Nuclear				
Hydro	0.122	0.162	0.166	0.199
Comb. Renewables & Wastes	2.466	4.842	4.433	4.310
Electricity trade	-0.90	-0.241	-0.269	-0.299
Total supply	100.091	100.241	107.517	96.440
Energy production/TPES	0.995	0.993	0.881	0.907
TPES/capita	2.626	2.598	2.784	2.494

Source: IEA

Annex 2

Selected End-use data tables

Table A2.1

Final Energy Consumption of the residential sector by energy source (Mtoe)

	1990	1996	1997	1998
Total	18.028	23.018	21.68	19.532
a. Electricity	1.739	1.653	1.700	1.747
b. Heat	5.797	6.543	6.089	5.883
c. Oil products	0.042	0.444	0.596	0.644
d. Gas	2.992	3.421	3.587	3.305
e. Coal	6.640	8.545	7.32	5.604
f. Combust. Renew. & Waste	0.820	2.412	2.388	2.405
g. Others				
Floor Area (1000m^2)			706 700	
No. of dwellings (x 1000)			11 771	11 846
Residential use per dwelling (Mtoe/dwelling)			1.84	1.73
Residential use per surface (Mtoe/1000m^2)				

Source: Energy statistics & Balances of OECD/NON-OECD countries 1997-1998, OECD/OCDE 2000 Edition

Table A2.2

Total Floor Area in Public Buildings

Type	Floor Area (M^2)
Kindergartens	
Schools	
Colleges and Universities	
Clinics and hospitals	
Administrative Buildings	
Other	
Total	

Table A2.3

Final Consumption of Services (commercial and non-commercial) by energy source (Mtoe)

Service sector	1996	1997	1998
Total	4.516	4.417	4.545
a. Electricity	1.519	1.383	1.810
b. Heat	1.007	0.902	0.695
c. Oil products	0.055	0.184	0.290
d. Gas	0.449	0.581	0.842
e. Coal	1.23	1.137	0.691
f. Combust. Renew. & Waste	0.257	0.230	0.217
g. Others			
No. of employers (mil.)			
Floor area (1000m^2)			
Value added in (10^6 USD)			
Energy/value added (MJ/10^6 USD			
GJ/Employee			
GJ/m^2			

Source: Energy statistics & Balances of OECD/NON-OECD countries 1997-1998, OECD/OCDE 2000 Edition

Table A2.4: Final Energy Consumption of the industry sector by energy source (1998, Mtoe)

	Mining	Manufacturing							Construction	Total
		Iron and steel	Chem. and petrochem	Non-ferrous metals	Food and tobacco	Paper pulp and print	Non-metallic minerals	Other		
Coal	0.160	3.720	1.250	0.223	1.687	0.445	1.907		0.050	9.442
Crude oil										
Petroleum products	0.073	0.054	2.838	0.022	0.325	0.065	0.338		0.360	4.075
Gas	0.037	0.552	2.001	0.135	0.255	0.014	0.655		0.001	3.65
Nuclear										
Hydro										
Geothermal. Solar etc.										
Combust. Renew. & Waste	0.000	0.000	0.124	0.052	0.03	0.394	0.005		0.000	0.605
Electricity	0.162	0.641	0.739	0.312	0.379	0.226	0.300		0.040	2.799
Heat	0.066	0.073	0.676	0.018	0.109	0.050	0.050		0.032	1.074
Total	0.516	5.041	7.627	0.762	2.759	1.193	3.255		0.491	21.644
Value added per sector 1990 USD (USD x 10^6)										
Energy/value added (PJ/USD 10^6)										

Source: Energy statistics & Balances of OECD/NON-OECD countries 1997-1998, OECD/OCDE 2000 Edition
NB industry non-energy use is added to sector industry

Table A2.5 Transport indicators (1999)

	Freight	Travel	Total
FC (Mtoe)			
10^9Tonne-km	311	-	311
TFC/10^6tonne-km			
10^9 Person-km	-	65	65
TFC/person-km (TFC/10^6 person-km)			
Number of cars/1000 inhabitants	44	240	284

Source: Central Statistical Office

Table A2.6 Energy Balance in Transport Modes (ktoe)

	1985	**1994**	**1995**	**1997**	**1998**
All transport modes	n.a.	8 329.7	8 422.7	9 861.4	9 634.1
Railways	n.a.	685.4	677.9	615.4	597.7
Road	n.a.	7 078.7	7 140.8	8 940.7	8 771.5
Air transport	n.a.	558.0	556.3	274.0	236.7
Internal navigation	n.a.	7.5	47.8	12.7	10.4
Pipeline transport	n.a.			18.5	17.8

Source: Energy Statistics of OECD / Eurostat 1996 and 1999 Editions

Structure of Energy prices

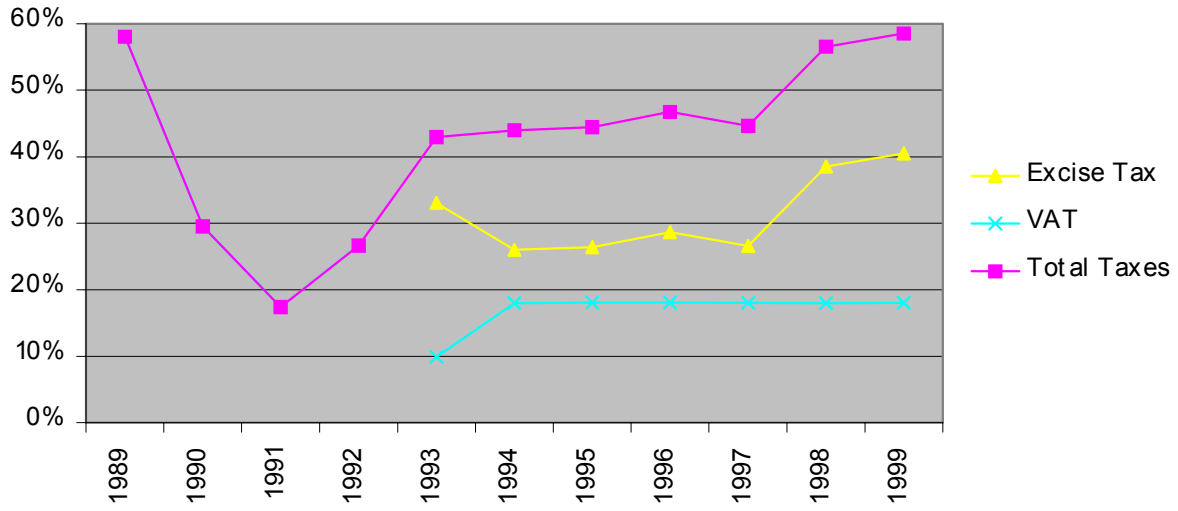


Figure A2.1. Share of taxes in the final price of automotive diesel
Source: Energy Market Agency

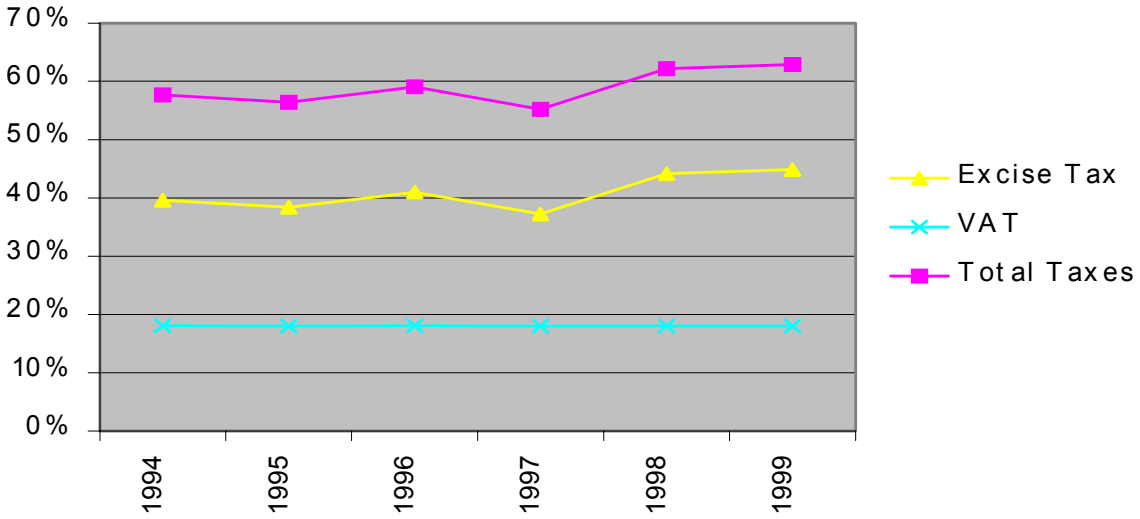


Figure A2.2 Share of taxes in the final price of premium unleaded gasoline (RON 95).
Source: Energy Market Agency

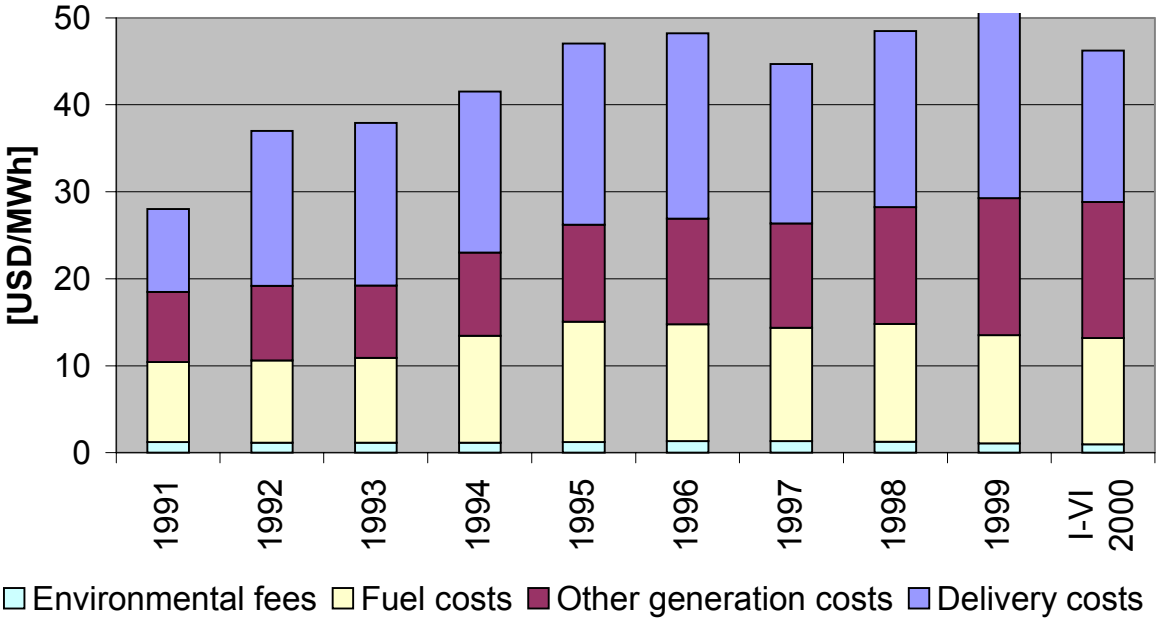


Figure A2.3. Electricity final price and its structure (without trade mark-up).
Source: Energy Market Agency

Annex 3

Organizations visited by Review Team

The review team met representatives of the following organizations:

- Ministry of Economy (Ministerstwo Gospodarki / MG)
- Ministry of Finance (Ministerstwo Finansów / MF)
- Ministry of Environment (Ministerstwo Środowiska / MS)
- Ministry of Transport & Maritime Economy (Ministerstwo Transportu i Gospodarki Morskiej / MTiGW)
- Ministry of Internal Affairs and Administration (Ministerstwo Spraw Wewnętrznych i Administracji / MSWiA)
- Institute of Energy (Instytut Energetyki)
- State Committee for Scientific Research (Komitet Badań Naukowych / KBN)
- State Committee for European Integration (Urząd Komitetu Integracji Europejskiej / UKIE)
- Energy Regulatory Authority (Urząd Regulacji Energetyki /URE)
- National Energy Conservation Agency (Narodowa Agencja Poszanowania Energii S.A. / NAPE)
- Foundation for Energy Effective Utilisation (Fundusz na rzecz Efektywnego Wykorzystania Energii / FEWE)
- Energy Market Agency (Agencja Rynku Energii S.A. / ARE)
- Polish Oil and Gas Company (Polskie Gornictwo Naftowe i Gazownictwa / PGNiG)
- Institute of Car's Transport (Instytut Transportu Samochodowego)
- Polish Railway Company (Polskie Koleje Państwowe / PKP)
- National Economy Bank (Bank Gospodarki Krajowej / BGK)
- State Office of Housing and Town Development (Urząd Mieszkalnictwa i Rozwoju Miast / UMiRM)
- Polish Power Grid Company (Polskie Sieci Elektroenergetyczne SA / PSE)
- Polish Heat Chamber of Commerce (Polska Izba Cieplownictwa)
- EC Baltic Renewable Energy Centre - EC BREC (Europejskie Centrum Energii Odnawialnej)
- EcoFund (EKOFUNDUSZ)
- National Fund for Environmental Protection and Water Management (Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej / NFOŚiGW)
- Polish National Energy Conservation Agency (Krajowa Agencja Poszanowania Energii S.A./ KAPE)