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ENERGY EFFICIENCY ORGANISATION, STRUCTURES AND INSTRUMENTS IN THE CIS COUNTRIES

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Introduction

1. Armenia
2. Azerbaïdjan
3. Belarus
4. Georgia
5. Kazakhstan
6. Kyrgystan
7. Moldova
8. Russia
9. Tadjikistan
10. Turkmenistan
11. Ukraine
12. Uzbekistan

Conclusion

This paper was elaborated on the basis of available data, for most countries from 1993 and for some countries, from 1995. Sources of information are limited and in some cases practically inexistent. This fact explains the inequalities in the description of the energy efficiency organisation, structures and instruments in the various countries reviewed here:

Introduction

In every country of the Commonwealth of Independant States (CIS), the energy situation is characterized - when compared with West European countries - by very high energy and electricity use per unit of output of Gross Domestic Product (GDP), i.e. by very high energy and electricity intensities. This situation can be attributed to three main elements:

- a) The structure of economic activities: the largest part of the GDP is due to industrial production, with an emphasis on heavy industries (iron and steel, chemicals, machinery) which are big energy consumers.
- b) The very low level of energy efficiency of end-use devices, equipment and appliances (in particular in industry and buildings), aggravated by the lack of maintenance and the obsolescence of the equipment. Heavy energy losses occur for the same reason in the transport and distribution of energy products (district heating, natural gas pipelines).
- c) The economic crisis which the CIS countries have been enduring since 1989-1990: a deep

slow down in industrial production, a lack of investment in the energy sector, the non-payment of energy by the consumers, in particular in the energy sector itself. This explains a decrease of GDP in most of the CIS countries of about 50% between 1990 and 1995.

In the former USSR, the energy system was considered as a whole and the difference between the " energy rich " and the " energy poor " Republics was less apparent than now. With the new rules prevailing in the CIS and the need (at least theoretically) to buy energy products at international prices and in hard currencies, the energy gap between " energy producer and exporter " and " energy importer " is widening. The difficulties of the " importers " are increasing, without great improvement for the " exporters " since their global energy system is in deep crisis.

Faced with this situation, the governments of almost all the CIS countries, importers or exporters of energy products, are conscious of the vital role and/or of the absolute necessity of elaborating and implementing energy efficiency policies, to allow the countries to reconstruct their economy and pave the way towards sustainable development. These governments have in general proclaimed that energy efficiency is a priority of their energy policy (when this policy has been formulated).

For reasons which are both those commonly found throughout the world, or which are specific to the former-USSR countries or to some of them, the actual decisions and achievements are relatively poor in comparison with the needs, the potential and the benefits to be expected from a consistent energy efficiency policy.

Fortunately, the situation is not homogeneous and several countries - often helped by the international cooperation (notably by the technical assistance programmes of the European Union) - have taken decisive steps to set up legislative, institutional and sometimes financing instruments to develop energy efficiency programmes.

Energy efficiency policy instruments:

- 1 -Demand-supply integrated energy planning
- 2 - Energy efficiency institution(s): Energy Efficiency Agency (ies)
- 3 - Energy efficiency regulations
- 4 - Energy efficiency incentives
- 5 - Special "Funds" for Energy Efficiency
- 6 - Energy service companies (ESCOs)

1. ARMENIA

The Armenian economy is mainly based on large, energy intensive production units. Their energy efficiency is very low, mainly due to bad equipment maintenance, obsolete energy transmission, distribution and control systems and due to the energy saving actions which have not yielded the expected results to date. The total energy saving potential of the country is estimated at 30 - 35 % of energy use and the rational use of energy in all economic sectors is recognised as being of the utmost importance.

Development of renewable sources of energy, mainly small hydropower and geothermal energy is considered an important goal as well.

Armenia is for 96 % dependent on energy imports due to the lack of national energy resources. Given the difficulties encountered during the last years in the energy supply from abroad, the country is experiencing a serious energy crisis. The gas pipeline from Turkmenistan is frequently disfunctionning, petroleum products have to be imported under difficult transport conditions and the only source of energy available is the hydropower and a partially running nuclear power station.

The primary energy intensity of the country (toe/1000\$US) was 0.59 in 1993 and the final energy intensity 0.32 . The final electricity intensity was 0.63 in 1993 (kWh/\$).

2. AZERBAIDJAN

The country has not yet defined a policy concerning energy conservation or energy efficiency, although a constantly growing demand in electricity and heat has been registered. An evaluation undertaken by the government has shown an energy conservation potential of 7.7 billion kWh/year of electricity and of 5.4 M tons of fuel for thermal power stations (1995).

Azerbaijan produces and exports oil and natural gas. In 1995, crude oil production was around 8 M tons, registering a 9% decrease when compared with 1994 (9.6 M tons in 1994 and 10.5 M tons in 1993). Primary energy use of the country in 1993 was 14 M toe. Final energy consumption during the same year reached 10 M toe. Final electricity consumption reached 12 TWh in 1993.

The primary energy intensity (toe/1000 \$) was 1.26 in 1993 (1.16 in 1990). The final energy intensity during the same year was 0.89. The electricity intensity in 1993 was 1.06 kWh/\$.

The Government elaborated an "Energy Programme" based on the assumption that the GDP growth rate will be of 3 % by 2010, provided that priority is given to the development of low energy intensive sectors of the national economy. To harvest the energy conservation potential, the government intends to introduce a taxation system on energy production and consumption, a system of energy consumption standardisation and penalties for excess consumption of energy, a system of financial incentives and a new system of tariffs for heat and electricity.

3. BELARUS

The government awards great importance to energy conservation and efficiency, considering them as a significant and separate source of energy. The energy analysts estimate that Belarus loses over one third of its primary energy supplies due low efficiency of energy production, conversion, transmission, distribution and final end-use. The total energy conservation potential could reach 38 % of total energy use (1994). The country is 90 % to 95 % dependent on foreign energy resources, mainly imported from Russia: in 1994, Belarus had to pay Russia over 1.5 billion \$US for natural gas, fuel oil and electricity. The country's domestic energy resources are very limited.

The primary energy intensity (toe/1000\$) was 0.55 in 1993 and final energy intensity 0.44. The final electricity intensity during the same year was 0.50 (kWh/\$).

In 1992 the government approved a long term energy programme : the "Power and Power Saving Development Programme up to 2010". The aim of the Programme is to secure electricity supply by rebuilding the power system of the country using modern technology and implementing a power conservation policy. In 1994, an "Energy Saving Law" was submitted to the Government for adoption. It also establishes the "Extra budgetary Inter branch Fund for Energy Saving" and penalties for non rational use of energy. In 1993, the government created Energy Efficiency Demonstration Zones.

4. GEORGIA

The country has no indigenous energy resources except for renewable energy sources such as small hydropower, geothermal, solar and biomass which cover less than 5% of the national energy demand: energy supply is fully dependent on energy imports. The government grants special attention to energy conservation and efficiency. Primary energy consumption in 1993 was 5.1 M toe compared to 14 M toe in 1990.

The primary energy intensity (toe/1000 \$US) in 1993 was 0.61 (0.52 in 1990) whereas final energy intensity in 1993 was 0.35. Final electricity intensity was 0.97 TWh in 1993.

In 1995, the Government created the "Fuel and Energy Corporation of Georgia" to development and implement the energy policy. In April 1996, the Georgian Parliament ratified the deal between Georgia, Azerbaidjan and the Azeri International Oil Consortium (AIOC) on transporting offshore Caspian oil across the Georgian territory.

5. KAZAKHSTAN

One of the main problems of this country's energy sector is its very low energy efficiency. Between 1990 and 1994, primary energy intensity increased twice, whereas final electricity intensity increased by a factor of 1.8. Kazakhstan has vast natural resources, mainly hydrocarbons and coal. However, the country is highly dependent on trade with Russia, exchanging its natural resources for finished consumer and industrial goods.

After Russia, Kazakhstan is the second largest oil producer among the former Soviet Union countries: in 1993, the country produced over 24 M tons of crude oil ; in 1995, Kazakhstan exported a total of 10.6 M tons of crude oil. In recent years the country produced around 8 billion m³ of natural gas per year. However, due to geographical and transportation reasons, the country exports its natural gas to Russia and imports around 90 % of its own demand in natural gas from Turkmenistan, Uzbekistan and Russia. Kazakhstan is a major coal producer, consumer and exporter. Coal production is around 125 M tons per year, of which 85 M tons are consumed on domestic market (in coal - fired power plants). The country imports 20% of its electricity.

An "Energy Conservation Programme" includes institutional, legal and financial measures and establishes a "State System of Management in Energy Conservation".

6. KYRGYZSTAN

The government recognises the importance of the energy sector for the economic recovery of

the country and has elaborated its energy policy aiming at increased efficiency in energy production and consumption. There is an significant potential for energy conservation, which lies in particular in the reduction of electricity distribution and district heating losses and the increase of the efficient use of energy on the supply and demand side. As a result, the Government decided to proceed with an energy conservation and efficiency policy and to expand it to the dissemination of high - efficiency household appliances and will introduce regulatory measures to improve energy efficiency in existing and new buildings.

The energy sector has an important role in the economy of the country. There is a large hydropower potential (estimated at 26 000 MW, of which some 2,870 MW have been developed). Average annual hydropower production is 10,000 GWh.

There is also a limited production of oil and gas, as well as a precarious coal industry. The country imports coal, petroleum products and natural gas, and exports electricity from its hydropower plants, mainly to Kazakhstan. Other sources of energy are wood with a standing stock in the forest estates estimated at 23 million m³ and other biomass (dung is used as fuel and efforts are made to develop solar and small hydropower).

The country depends on foreign suppliers and clients (Russia and other Central Asian countries) for about 60 % of its primary energy demand as a market for its exports. Energy imports were 2.2 M toe in 1994 (40 % of those in 1991) due to a dramatic decline in residential demand, even though there is a tendency to increased use of electricity for cooking and heating.

In 1994, primary energy consumption was 3.3 M toe, i.e. 740 koe/capita. The primary energy intensity was 0.67 in 1993 and the final energy intensity was 0.44. The final electricity intensity was 1.05 kWh/\$ in 1993.

7. MOLDOVA

Energy efficiency is low in all sectors of the Moldovan economy. Furthermore the actions currently supported by the government are inhibited by very low government-fixed energy prices, particularly in the domestic sector. There is currently a lack of awareness of the need to address all relevant opportunities to save energy in the country and there is little information on the methods to be used to achieve such energy savings. Almost all of the primary energy is imported, representing 40 % of the country's total imports. It can be stated that Moldova is 100 % energy dependent. The country's own energy sources are limited to a 40 MW hydropower station (Dubossary).

The primary energy intensity (toe/1000 \$) was 0.49 in 1993 and final energy intensity, 0.28. Final electricity intensity in 1993 was 0.68 kWh/\$.

The government decided to implement a series of measures to promote energy efficiency in the energy sector and in 1995 approved the "New Regulations on the Supply and Use of Electricity, Gas and Heat". An "Inter-ministerial Commission on Energy Payments" (ICEP) has been established and 9 regional Commissions are negotiating with energy debtors for the repayment of energy loans.

8. RUSSIA

With about 13% of the World's primary energy production, Russia is the second largest producer in the World (after the USA : 20%) and possesses considerable reserves of coal, oil and, most of all, natural gas. In spite of enormous resources and of huge production, the energy sector is in deep crisis due to the lack of maintenance and of new investments ; the rate of growth of new capacity is five times slower than the rate of increase of losses incurred in production. This crisis is a formidable threat to the whole economy due to the importance of the energy sector (in 1994, the share of energy exports to countries other than former USSR countries was about 44% of total exports). Not only is the economic situation endangered by the crisis of the energy sector, but also the global energy security of the CIS and of Western Europe, which rely heavily on Russian energy resources. At present, the situation is aggravated by the non-payment crisis.

Energy efficiency is considered to be a vital factor for the energy security - and hence the national security - of the Russian Federation and the CIS. And a decisive element of the quality of the cooperation between Western Europe and the CIS. The "Law on Energy Efficiency in the Russian Federation" was passed in Spring 1996. At the federal level, a "Fund for Energy Efficiency" was established (but is still at a very low level due to the "non-payment" crisis). At the federal level, non governmental organisations, in particular the "Moscow Energy Club" (MEC) and the "Russian Union for Energy Efficiency" (RUEE), in relation with the Ministry of Energy, contribute to the selection and promotion of energy efficiency projects, training and information, promotion of new financing mechanisms such as " Energy service companies " (ESCOs) in cooperation with public or private banking institutions and in close cooperation with the European Bank for Reconstruction and Development (EBRD).

9. TADJIKISTAN

Tadjikistan has a low energy consumption per capita. Its energy sector is dominated by hydro-electricity, with little or no production of other energy. The country relies on imports for nearly all of its oil and gas needs. The energy systems are almost completely separated between the North and the South of the country. The largest electricity consumer in the country is the aluminium smelter which accounts for about 40% - 8 TWh - of total electricity consumption. Like all CIS countries, this country has high energy and electricity intensities:

- primary energy intensity (in toe per 1000 \$ of 1990) : 0.79 in 1990 and 1.63 in 1993;
- final energy intensity : 1.0 in 1993;
- final electricity intensity : 2.4 in 1993

Improving energy efficiency and ensuring the rational use and exploitation of all resources must be an essential part of the economic recovery process in Tadjikistan. We have no information on significant moves in this country to elaborate and implement an energy efficiency policy.

10. TURKMENISTAN

The energy policy of the country aims at developing national resources and increasing energy exports. At present, energy efficiency is not a priority for the Government and there is no limit imposed on energy consumption. Moreover, a part of electric energy produced by the country is being distributed free of charge to the population. At the consumer level, energy consumption metering systems (gas, electricity or heat) do not exist in the country. The country is a net exporter of energy, with natural gas representing 37 % of export income. Oil production was 9 M tons in 1995 and the Government aims at increasing it up to 28 M tons by the year 2000. The country produced around 65 billion m³ of natural gas and 15.1 billion kWh

of electricity in 1993.

Since 1993, the production of energy resources decreased, in particular that of crude oil and natural gas (natural gas production decreased by 44 % in 1994 when compared to that of 1993). Turkmenistan is the world 4th producer of natural gas. There is no specific law on energy conservation or energy efficiency.

11. UKRAINE

With heavy dependency on primary energy imports, Ukraine gives a special emphasis to improving energy efficiency and is one of the more active among the CIS countries in this field. Savings over 35 % of the total energy consumption could possibly be achieved at most of the plants in the industrial sector alone. In 1990, over half of the country's primary energy consumption was covered from its own resources, mainly coal. Crude oil, natural gas and power were making smaller contribution to the energy balance. In 1993, national production declined and natural gas production represented only 20 % of use, whereas crude oil production was only 8 % of the country's total oil consumption (12 500 tons per day for a requirement of 97 000 tons per day). In real terms, natural gas production in 1993 amounted to 16.1 M toe and declined in 1994 to 15.3 M toe.

To diminish its energy dependence, the country launched a national energy programme : "*Oil Ukraine 2000*". However, the implementation of the programme met with major difficulties and in October 1994, Ukraine and Russia negotiated a treaty which will increase Russian oil exports to Ukraine to about 60 000 tons of oil per day. At present (1995), national production of crude oil is around 4.1 M tons per year. The imports of crude oil represent 13.3 M tons/year. Ukraine has been experiencing important shortages in natural gas since 1993. Given its inability to pay for its energy imports, the country agreed to a payment deal with Russia which involved selling a stake in its gas enterprises to GAZPROM.

The national production of natural gas is about 18.2 billion m³/year. The country imports an additional 66.3 billion m³ / year so that its consumption of natural gas in 1995 reached 84.4 M m³. Coal production fell by 13 % between 1990 and 1993 and continues to decline : in 1994 it represented 59.4 M toe and in 1995 it decreased to 48.6 M toe (65.6 M metric tons). The national coal industry is highly subsidised in spite of an important reduction of subsidies in 1994 (covering 40 % of the coal industry's expenses). Concerning electricity, for 55.9 GW of installed capacity, the production was about 203 TWh in 1994 and 194.0 TWh in 1995. In 1994, the overall consumption of energy decreased by 14.6 %, a percentage which is lower than that registered for the decrease of the GDP (19 %). This caused a 5.4 % increase in energy intensity (increase in 1993 was 1 %).

In 1995, final energy consumption amounted to 106 M toe (primary energy supply - national production plus imports - was 161 M toe). In real terms the primary energy intensity (toe/1000 \$) was 0.83 in 1993 when compared to 0.73 registered in 1990. The final energy intensity in 1993 was 0.75 and the final electricity intensity for the same year was 0.73 (kWh/\$).

12. UZBEKISTAN

There is some awareness of the potential benefits of saving energy in terms of reducing cost, improving efficiency and releasing wasted energy for productive use within the country, or for export. But energy prices are below the international market prices and are not related to

production costs. As a result, the incentive for energy saving is drastically limited.

The country has large natural resources such as oil deposits and a huge supply of natural gas. The new oil fields discovered recently will make the country self-sufficient in energy and a larger energy exporter. Its natural gas reserves are estimated at 2 000 billion m³. The reserves of crude oil are estimated at 350 M tons and those of coal are considered to be 2 billion tons. In 1993 Uzbekistan produced 35.9 M toe of natural gas and consumed 28 M toe. In 1995, natural gas production increased by 4.8 % and Uzbekistan exported 7 billion m³ of gas to Kazakhstan, Tadjikistan and Kyrgyzstan. It imports, however, some 5 billion m³ of natural gas per year from Turkmenistan. The country imported from Russia some 2.9 M tons of crude oil and condensate, adding to its production of oil which is about 1.8 M tons/year.

The production of coal, reached 3.5 M tons in 1995. With a total output of 60 TWh per year, the country exports also electricity. About 50% of the total energy consumption and over 90 % of the primary energy are covered by natural gas. Most of the thermal power stations (80 %) use natural gas and only 20 % burn coal and fuel oil.

The primary energy intensity (toe/1000 \$) in 1993 was 1.08 (1.0 in 1990) and the final energy intensity the same year was 0.75. The final electricity intensity in 1993 was 1.08 kWh/\$.

The energy and energy by-product price policy aims towards international prices. This is already the case for petroleum products and coal. The raise in natural gas prices will take place gradually, in particular for the population. The most recent audits carried out by the Uzbekistan Energy Centre in major industries revealed a potential for energy conservation of around 30 % of the total energy consumption.

CONCLUSION

This review, notwithstanding its weaknesses, revealed several interesting points :

- a) The general situation of energy efficiency in the CIS is far from being satisfactory, given the importance of the needs, the potential, the expectations and, in most cases, the political declarations...
- b) It is particularly striking to see that some countries which are almost totally dependent on energy imports representing an enormous burden for their economy are not active in energy efficiency which is by far their main and cheapest energy resource.
- c) The legacy of the former economic system as well as the deep economic crisis facing all CIS countries partly explain this situation. Nevertheless, the actual decisions in terms of human and financial resources are not, as a general rule, in accordance with the political orientations.
- d) Fortunately, some countries have already set up important instruments (laws and regulations, agencies, funds) and are ready to implement energy efficiency programmes on a large scale.

One of the main problems remains the lack of investments in this sector and one of the major tasks now facing both the national institutions and international cooperation is to establish financial mechanisms adapted to energy efficiency projects. Our recommendations are guided by the idea of taking advantage of the present situation, with all its weaknesses and also positive aspects, to decisively improve the development of energy efficiency policy

implementation in all CIS countries :

a) By encouraging each country to take the opportunity of the progress made - sometimes in different fields - by some countries, to create the appropriate structures and organisations for energy efficiency development : Agencies, Funds, Regulations.

b) To organise special training activities at CIS level on " Integrated demand-supply energy planning " (activity already in progress with the Synergy Programme) as well as on the financial mechanisms. In particular in view of the creation and development of " Energy services companies " (ESCOs).

c) We consider that enormous advantages can be drawn by an active cooperation in the field of energy efficiency between the CIS countries themselves through exchanges of experiences, exchange of staff, etc. We advocate the creation of the " International Association of Energy Efficiency Agencies of the CIS " in charge of organising, promoting and financing this cooperation with both CIS governments and international support.

d) We think that the time has come to establish a consistent and pluriannual cooperation programme on energy efficiency between the European Union and the CIS.