

Energy conservation policy in Ukraine

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Abstract

Ukraine is rather a big state with territory of 603 700 km² and population of 48,4 million. Here in the Carpathians the centre of Europe is located. Ukraine was one of the most industrially developed republics of the former USSR. Availability of cheap energy resources at Ukrainian territory (gas, oil, coal) and mines of mineral resources (uranium, iron, bauxite and others) fostered the process.

In 1990 Ukrainian production of ferrous metals rolling was 45,4 million tons, in 2001 after crisis in economics – 29,3 million tons. At the beginning of the 90s main natural resources of oil and gas have been depleted, while the price of import of the fuel (mostly from Russia) has grown. In result fuel-energy component of the industrial product price grew in 1990-96 3 folds. It has initiated the crisis in the economics. In result the energy intensity of the Gross Domestic Product (GDP) additionally has grown by 40% and 3-5 folds exceeded indexes of the developed countries. The main causes were: unsatisfactory structure of economics branches, certain technological lagging, shadow economics influence. Under this situation in 1994 Ukraine has adopted the “Law on Energy Conservation”, which envisaged institutional, regulative and motivating measures on energy conservation. In result of the approaches used, the GDP index has been stabilized through 1996-1999 and since 2000 its notable reducing has started.

To improve the situation in the sphere of energy conservation in Ukraine the measures on energy standardisation and popularisation, training of energy conservation specialists, energy conservation measures in budget sphere are carried out.

At present the main direction of energy conservation activity in Ukraine is the development of economical stimulation mechanisms and outreach on energy conservation.

Introduction. Energy intensity of GDP in Ukraine

This index is one of those that define the state of economics in any country. Energy intensity of the GDP is estimated as the general fuel and energy resources consumption P , necessary to cover industrial and non-industrial energy demand per GDP unit:

$$E = P / V$$

where E is the energy intensity of the GDP, V is the GDP of the country.

According the methodology, adopted in Ukraine, the index E is estimated on the basis of the total primary energy supply (TPES) (at that specifically electricity, generated at heatpower plants is not included in general account). Its dynamics with using of conditional fuel unit (c.f.) is displayed in the Table 1 (1 t c.f. equal to 7 Gkal).

Energy Intensity of GDP during 1990-1996 grew up to the level, which almost 1,5 fold exceeded its value in 1990,

Table 1. Indices, characterizing dynamics of GDP in Ukraine during 1990-2001 (cost indices are given in national prices of 2001). 1 Euro = 5,75 Ukrainian Hryvna (UAH) on January 2003.

Indices	Years							
	1990	1995	1996	1997	1998	1999	2000	2001
P, million tons c.f.	353,0	226,3	216,6	209,6	195,3	191,1	187,7	183,1
V, billion UAH	431,9	204,5	184,0	178,5	175,1	174,8	185,1	201,9
E, kg c.f. / UAH	0,82	1,11	1,18	1,17	1,12	1,09	1,01	0,91
Official exchange rates, UAH / USD		1,47*	1,83	1,86	2,45	4,13	5,44	5,37
PPP**			1,98			5,9		

* Ukrainian Hryvna where introduced in 1996; **PPP - purchasing power parity

Table 2. Energy intensity of GDP in Ukraine and some other regions and countries of the world (middle of the 90s) and GDP production per capita indices (1998).

Region, country	E, (kg o.e. / USD PPP*)	GDP per capita, thous. USD
The world as a whole	0,31	-
European Union	0,27	-
Japan	0,20	29,96
France	0,24	27,74
Germany	0,25	26,18
USA	0,34	31,75
Poland	0,47	4,10
Russian Federation	0,90	1,94
Ukraine	0,98	0,83

* PPP - purchasing power parity

in 1997-99 it got stabilized and only since 2000 its reduction is observed.

Comparing GDP energy intensities of Ukraine and other countries it is necessary to take into account not only official exchange rates of national currency, but also the discrepancy between these courses concerning their purchasing power. For example, in case of countries with transit economics, course of USA dollar (USD) exchange are overcharged due to the policy of export stimulation. Parities of purchasing power (PPP) are determined by International organizations (for instance, World Bank, OECD, UN regional economical commissions) basing on generalization of national currencies purchasing power comparison with USD. This comparison is carried out for about 2 500 types of customer goods and services and is a complicated and cumbersome procedure.

Table 2 gives comparative data for the middle of the 90s with consideration of the factor for Ukraine (which discrepancy at that time differed 1,98 fold, while in 1999 it was almost 5,9 fold) and some other regions and countries in the world, represented in oil equivalent indices (o.e.) (Shydlovsky 2000). To illustrate this factor influence importance on economics efficiency there are shown the indices of GDP production scope per capita in 1998 (The Statistical... 2002). It appears that difference in GDP energy intensity equals cores of hundredth turns to be discrepancy equal to some folds of GDP production per capita. If to take into consideration PPP, the discrepancy certainly diminishes but specific co-relations remain.

This index E in Ukraine is three-five folds higher comparing with relatively developed countries and objectively limits the competitiveness of national production and is a heavy

burden for economics moreover under conditions of its external energy dependence. Unlike western countries, where energy conservation is an element of economical and ecological soundness, for Ukraine this is an issue of survival, as far as the problem of balanced payable consumption both for interior and import TPES, has not been solved yet (Zhovtyansky 1993, 2000).

The problem of un-balanced interior consumption has sharply negative social and economical consequences:

- being two heavily energy intensive national production gains competitiveness only through reduction of payments for labor;
- the infrastructure of fuel-energy complex and water and heat supply utility plants is gradually destroying.

Energy conservation issue for Ukraine is accompanied with one more essential problem connected with its geopolitical interests. This is its unique role of transit European state. Due to it the country covers sufficient part of its demand for energy supply (for instance gas - as pay for its transit from Russian Federation to Western Europe). In great extent the very energy conservation due to the problem of unbalanced consumption in import is one of the causes, which induced the discussions on building of bypass pipelines construction in reference to Ukraine.

One more aspect of this issue is related to energy dependence of the country, as far as non effective interior.

TPES consumption demands their significant equal almost 50% of general scope - import, creating dependence on countries exporters. At that Ukraine own potential of energy

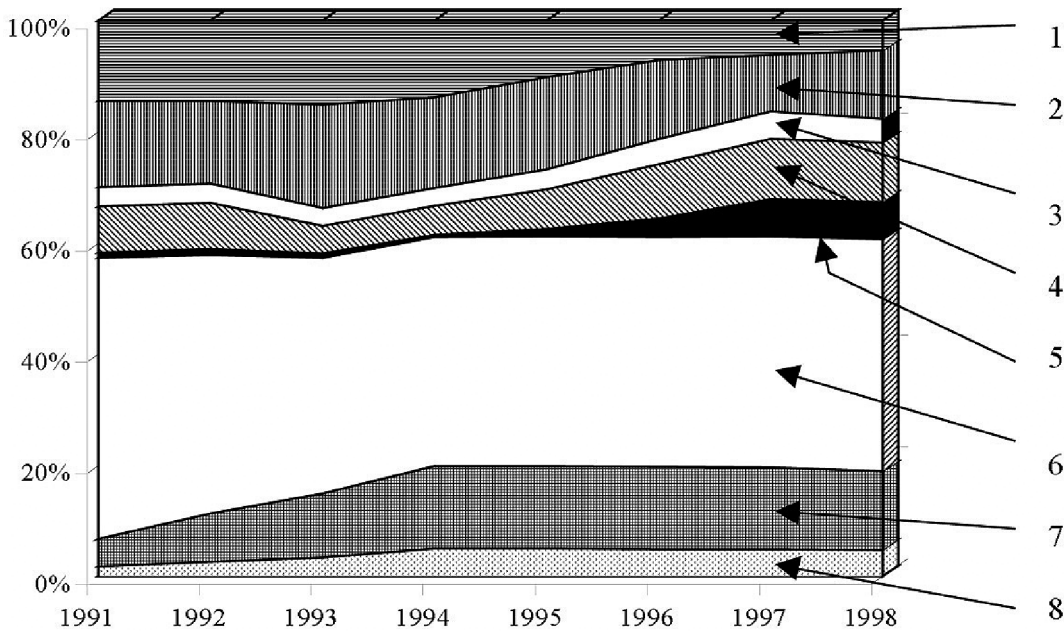


Figure 1. Dynamics of structure of expenditures for production of goods in industry in 1990-1998 years. 1 - profit; 2 other expenditures; 3 - social deduction; 4 - wage; 5 - amortisation of fixed capital assets; 6 - general material resources, including: 7 - fuel, 8 - electric power.

conservation is 42% of scope TPES consumed. Its realization will mostly permit to take off acuteness of the external energy dependence problem. Actually, the problem of payable energy resources demand is not less important than diversification of sources of their supply from the viewpoint of energy security of the state.

So, energy conservation becomes determinative factor of Ukrainian energy strategy.

Interrelation of energy efficiency factor and crisis phenomena in Ukrainian economics

Low indices of energy efficiency in Ukraine from one side became one of determinative causes of crisis processes which provoked the collapse in its economy at the beginning 90s, and from other side they appeared in result of it in the middle of the mentioned decade. The situation is better characterised by the data on dynamics of structure components of industrial production prices (Fig. 1), which were got on the basis of statistic indices (Zhovtyansky 2000). It is necessary to emphasize its two characteristic features. First what draws the attention is the significant increase of specific expenditure weight in electric energy production and fuel industry in total material expenditures at relatively small changes of the latter in structure of prices. Indeed, in the structure of expenditures in industry of Ukraine in 1991-97 summary part of the electricity and fuel in these expenditures grew 3 fold, reaching almost 42 per cent of material expenditures. It is necessary to remember that specific weight of expenditure increase for the fuel-energy complex production is induced by three factors:

- changes in proper physical scopes of production utilisation of this complex due to general structural changes in the industry;
- changes of the specific FER expenditures for production;
- differences concerning indices of prices growth.

We would like to emphasize that relative index of prices on electric energy and fuel industry of the production manufacturers in 1990-1997 was, respectively, 1,394 and 1,85 if we consider that industrial production index of prices as a whole through this period was equal to one unit. As a result of the mentioned set of factors influence the component of expenditures for energy resources during the 90s has grown within the limits of 6,2-18,9% while the profit portion on the contrary got diminished from 16,8 to its minimal meaning in 1997 about 5,7% and only in 1999 the latter index grew to 9,1%. Essential diminishing of profits influenced washing away of the working capital from economics, facilitating its barterization and other negative consequences from the viewpoint of the transition to market relations. Barterization is not consistent with the energy conservation regime as far as the cost of production has become the second rate factor. So, low energy efficiency became both one of the determinative causes of crisis phenomena in national economics and their consequence at the same time.

Determinative factors impact on GDP energy intensity

So the causes of GDP energy intensity growth include significant diminishing of the production scopes in all spheres of national economics, decrease of production capacities uti-

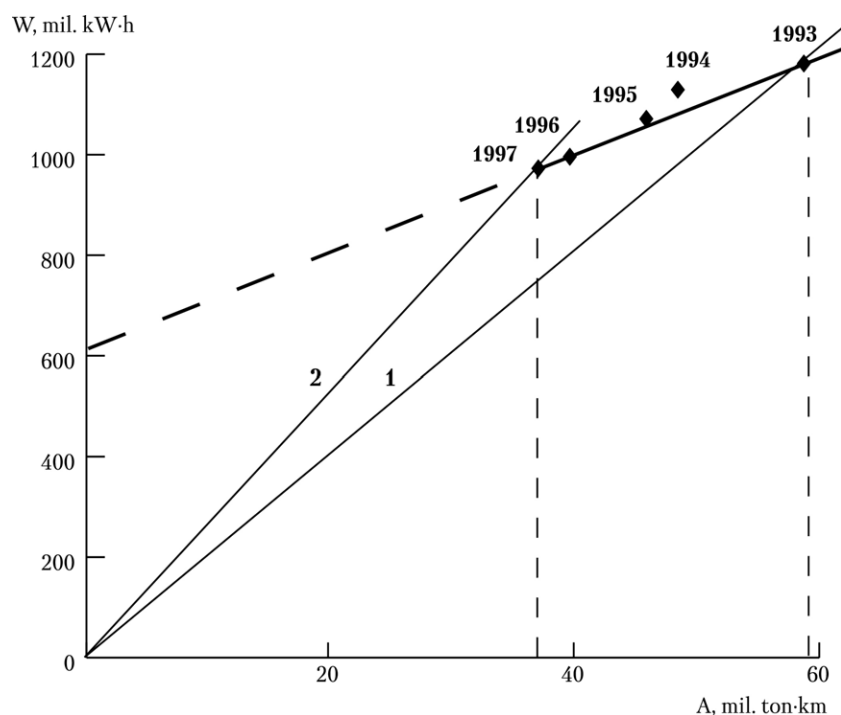


Figure 2. Dynamic of general electric power consumption by Ukrainian Railway in 1993–1997 depending on freight transportation.

lization level and accordingly increase of FER specific expenditures for the output production under the conditions of the violation of industrial processes rhythmic.

As an example, on Fig. 2 may be seen the result of unique “experiment”, which was conducted involuntarily in 90s in Ukrainian crisis economy due to of production reduction. It concerns the enterprises of Ukrainian Railway. (We wouldn’t wish to any other country undergo through similar experiments). Here the dynamics of total consumed electricity for auxiliary requirements reduction W is presented depending on the freight transportation A , which reduced year by year (years are indicated near corresponding points on the graph). All these points with one exception (the figure for 1994 is not reliable, due to reorganization in the sector) lay in one line, and after approximation to $A=0$ one will get value of so called quasi-constant component of expenditures for energy consumption. Specific electricity consumption, for example in 1993 and 1997, corresponded to the tangent of the angles of lines 1 and 2 slope on Fig. 2, where:

$$e_2 = \frac{W_{1997}}{A_{1997}} > e_1 = \frac{W_{1993}}{A_{1993}}$$

Thus, this well known for some technological processes or separate enterprises dependence is confirmed also for entire branch of economics and illustrates influence of production reduction to increase of specific expenditures for energy resources. Fig. 1 also indicates that the level of quasi-constant component of specific energy consumption constitutes considerable part of the total energy consumption.

Nevertheless, the factor mentioned is not the only one, which determines energy intensity in Ukraine.

TECHNOLOGICAL LEVEL

In the former USSR as a whole and in Ukraine in particular, under the conditions of relatively cheap energy resources the motivation to the most energy efficient technologies was insufficient. No relevant conclusions were done after oil crisis in the 70s. For instance GDP energy intensity in the USA during 1975-90 has been reduced at 46,5%, while in the USSR at the same only 16% (Shydlovsky 1999). At the same time the differences of GDP energy intensity for some types output production, which objectively characterize technological level impact, are not too big to explain the GDP energy intensity differences. Comparison of specific expenditures indices in the most energy intensive technological processes of ferrous metallurgy and electric power energetic was fulfilled. They summarily utilize in Ukraine more than a half of boiler-furnace fuel. The complete FER expenditures for the rolling production as a final output in the ferrous metallurgy in Ukraine 1,6-1,9 folds exceed the indices for industrially developed countries (France, Germany, Japan) and for electric energy output 1,1-1,25 folds.

SHADOW ECONOMY

In the process of formulating the main directions of legislation elaboration, it is important to make objective estimation of the real state of the economics and to apply adequate legislative measures. History of the previous period in Ukraine is characterized by the situation when the level of shadow economies got to 60% in according to evaluation of some experts. Figure 3 shows the indices, characterizing such situation in the economics of a number of countries according data (Bazyliuk 1998, Kaufman 1996). Scope of the FER consumption to meet productive and non-productive demands to estimate GDP energy intensity under the conditions of shadow economies is related to the total scope of

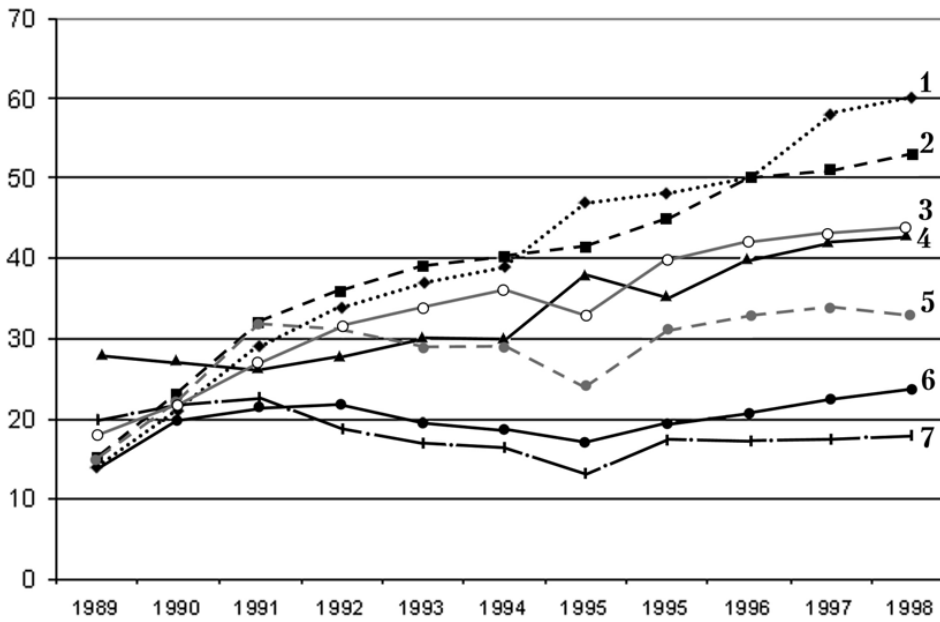


Figure 3. A share of shadow economies concerning volumes of general economies (in percentage) of some countries of the Central and East Europe: 1 - Ukraine; 2 - Russia; 3 - Bulgaria; 4 – Countries of the former USSR (on the average); 5 - Baltic Countries (on the average); 6 - Central and East Europe (on the average); 7 - Poland.

Table 3. Indices, characterizing energy intensity dynamics in Ukraine during 1990-98 pp. (cost indices in prices of 1998)

Indices	Years								
	1990	1991	1992	1993	1994	1995	1996	1997	1998
P, million tons c.f.	353,0	341,8	303,9	270,1	235,4	226,3	216,6	209,6	198,8
V, billion. UAH.	252,7	232,5	209,7	179,4	136,5	121,3	109,2	105,7	103,9
E, kg c.f./ UAH	1,39	1,47	1,45	1,51	1,72	1,87	1,98	1,98	1,91
E, kg c.f./ UAH	1,10	1,06	0,96	0,95	1,05	1,00	0,99	0,85	0,76

production in a country but it is compared only with legal sector of economies. So GDP energy intensity indices under conditions of shadow economies overcharge its actual indices. However GDP energy intensity growing of economies legal sector has essentially negative impact on its state and the efficiency of budget sphere functioning.

Essential level of shadow economies in Ukraine besides it has induced the necessity to prepare special state program to “unshadow” economies (which is now under elaboration), evokes significant methodological problems for definition of parameters in particular in the process of energy strategy of Ukraine elaboration. It is caused by essential ambiguity on output data concerning national economies branches and sub-branches development, each of which gives its own contribution in resulting GDP. The cause is that the official statistic does not take into account the shadow economies according its definition. There are no official modalities for its estimation in Ukraine. Its distribution within the branches in general is an enigma. This under summary value of shadow economies portion up to 60% can create essential difference between those indices which are taken for the calculations in modelling of national economies development in branches aspect (and for electric power engineering in particular) and the real ones.

The shadow sector of economies has significant and adverse impact on the character of FER using. Plants, working in this sector, get extra profits and are not interested in effective utilization of FER. It brings to their useless consumption and in result of this phenomena prevalence – to significant energy efficiency lowering.

It is easy to illustrate shadow economies influence on the GDP energy intensity indices dynamics in quantitative aspect (Zhovtyansky 2000). The Table 3 presents the indices dynamics during 1990-98, i.e. during the period, corresponding to the data of the Figure 3. Cost indices of the data are given in 1998 prices, however they fully correspond the Table 1 dynamics and are characterizes by the stable growth to the level, exceeding 1,5 folds its level in 1990, having small decrease in 1998. However such approach is too simplified. Indeed during this period the level of shadow economies increased from 15 to 60%. Using the data of the Fig. 3 concerning shadowing dynamics for Ukraine when determining GDP energy intensity index in Table 3 (similar to the Table 1) if to pass from index of official scope V GDP to its summary index V* one gets data for the energy intensity E* of summary GDP, presented in the Table 3. In that period already they has testified gradual improving of the economics partially in its energy intensity diminishing (Zhovtyansky 2000) and has become preface of future de-

Table 4. Fuel and fuel-oil materials consumption in branches in 2000.

Fuel consumed Total, million tons .c.f.	Specific weight of consumption in separate branches, per cents				
	Industry	Agriculture	Building	Transport	Municipal utilities
176,2	73,0	2,3	0,6	4,2	5,8

Table 5. Dynamics and branch structure of industrial production, per cents.

Industrial branches	1990	1995	1996	1997	1998	1999	2000
Industry, total (1990 – 100 per cent)	100	52	50	50	49	51	58
Industry, total – at that number:	100	100	100	100	100	100	100
Electric power engineering	3,2	11,0	12,6	12,6	16,5	16,2	12,2
Fuel	5,7	13,2	12,1	11,1	11,6	11,2	10,1
Ferrous metallurgy	11,0	21,8	21,6	22,7	22,9	23,8	27,4
Non-ferrous metallurgy	1,1	1,6			1,6	2,1	2,5
Chemicals and oil- chemicals	5,5	7,1	7,3	6,6	6,4	5,4	5,8
Machine building and metal working	30,7	16,1	15,0	15,8	15,1	14,1	13,2
Wood-working and cellulose-paper	2,9	2,2	2,2	2,0	1,7	2,2	2,3
Building materials	3,4	3,9	3,3	3,3	3,3	3,1	2,6
Light	10,8	2,8	2,1	1,8	1,5	1,6	1,6
Food	18,6	15,1	16,3	16,9	14,9	15,1	17,4

crease of index in the next period, the facts of which are presented in the Table 1.

Shadowing of the economies has become anyway determinative for the GDP energy intensity in the 90s, stressing the importance of its legalization.

More optimistic estimation for dynamic of share of shadow economies are: 1997 – 43%, 1998 – 40%, 1999 – 35%, 2000 – 33% (Determining... 2002).

THE GDP STRUCTURE

National economics is overburdened with energy intensive branches of industrial production with existing relatively insignificant role, for instance, of bank business. That is why GDP energy intensity lowering in Ukraine is directly related to problem of structural reconstruction of its economics in the direction of the intellectual product specific weight enhancing.

Transformation processes in Ukrainian economics find their reflection in industry branch structure of Gross Value added (GVA) (The Statistical... 2002), which testify significant decrease of portion of manufacturing goods branches (from 70,5% in 1990 to 53,8 in 2000) for the benefit of service providing branches. Specific weight growth of service providing branches is related to the development of financial sector, trade, communication and other market infrastructure components. This growth is also the consequence of the crisis phenomena and industrial decline in economics main goods manufacturing branches and the vacated manpower drawing to the sphere of services.

Traditionally negative feature of Ukrainian economics during all the period of it's reforming is its level of expenditure capacity. Portion of intermediate consumption as a whole in economics in 2000 was 60,8% of general output scope comparing with 50,8% in 1991, being 66,3 and 72,0% of goods manufacturing in industry relatively. The latter is

more essential for GDP energy intensity, as far as the industry consumes the biggest portion of the fuel (see Table 4).

In its turn branch structure of industrial production one is of essential factors, forming GDP energy intensity dynamics. During the years of economics reformation this structure got aggravated, because the portion of fuel raw materials complex, where mostly primary and intermediate output is produced, grew from 27,3% in 1990 to 57,1% in 2000 (see Table 5).

These branches are the most energy, fuel and material intensive, what at great extent determines general level of GDP energy intensity. Besides that, energy intensive goods of national production are not competitive at internal market in result of their inconsistency with existing demand. In result significant increase of raw-material branches portion takes place in particular in ferrous metallurgy, oriented for export, beside machine building and light industry degradation, has narrowed the interior market within state economics. Such branch structure of industrial production is unsatisfactory.

So, significant level of GDP energy intensity in Ukraine is determined by unsatisfactory economics branch structure. From the view point of this factor influence dynamics on the mentioned index, during the years of economics reforming two contradictory processes were observed: from one side – positive influence of service production growth, characterized by relatively small expenditures capacity, from other side- growth of energy intensive branches portion of industrial goods production. The final result will not depend so much on FER specific consumption for the production of the most energy intensive electric power and ferrous metals rolling (at their expense 1,5-1,6 folds reduction of energy intensity is possible), as on increase of GDP portion in the first turn in the sphere of services, which is characterized by relatively small FER expenditures.

Peculiarities and effectiveness of energy conservation policy in Ukraine

THE LEGISLATION ON ENERGY CONSERVATION

Law of Ukraine "On Energy Conservation" was adopted at the peak of crisis phenomena in the economics in 1994. It foresees the system of institutional, regulative and stimulating measures on FER save consumption motivation.

To realize institutional approaches of energy conservation the state bodies of management in the sphere of energy conservation in Ukraine during 1995-96 were established: State Committee of Ukraine for Energy Conservation (hereafter SCEC) and State Inspection for Energy Conservation with its territorial entities. It was recommended by government of Ukraine to create departments for energy conservation in the branch ministries and regional administrations. These rather extraordinary measures were adequate to the situation, characterized by unprecedented high GDP energy intensity level in Ukraine, which has been permanently growing. (Table 1). As far as the majority of the Law "On Energy Conservation" provisions are of indirect activity, the SCEC has faced the acute problem on its strategy realization. To solve them the following consideration were taken into account:

- the policy, based on principle of voluntary participation, will meet the smallest resistance; nevertheless it has also smallest economic consequences (Advise... 2002). Besides that in the country with long prehistory of centralized management background there was little hope for persuasive influence of such measures onto traditional managers of industrial sphere. Concerning new for that time market forms of business, the determining factor of economy was barter, when the cost price of production is not the determining factor;
- fast implementation of economic mechanisms for stimulation of energy conservation also looked rather problematic, as for the governmental structures with wide experience of centralized economy management such mechanisms were hardly perceived psychologically. SCEC's experience on practical activity in this direction has confirmed this position: only in 2002 the draft law on economic mechanisms for energy conservation stimulation has started getting into realistic forms.

That is why at the initial stages of work the SCEC's activity was based on regulative mechanisms of energy conservation. The base of regulative mechanisms consists of:

- standardization and normalization of specific expenditures for fuel and energy resources (FER) for the energy-intensive enterprises. The system of normalization at the enterprises includes development and realization of the technical-organizational measures plans, which focus on increase of FER utilization efficiency by these enterprises, and are based on specific quantitative parameters; it is also a basis of stimulation of the personnel of the enterprises for effectiveness of energy conservation. At the same time, limited norms of specific expenditures for FER for heat supply in municipal energetic and for its

consumption by budget sphere operators are established;

- administrative responsibility for violations in the sphere of energy conservation as defined by the Code of Ukraine for administrative violations;
- activity of State Inspection for Energy Conservation, that gradually gets preventive character and envisages using cautionary messages to the entities concerning following examination and establishment of the deadlines for elimination of the revealed by this examination infringements;
- conducting state expert appraisals of energy conservation at a stage of new construction designing; it is one of the lowest cost measures to ensure energy conservation. If the requirements on obligatory state expert appraisals were not observed, it may lead to the administrative responsibility.

By the Law of Ukraine "About ratification of the credit Agreement (Financing Ukrainian Energy Service Company UkrESCO) between Ukraine and European Bank for Reconstruction and Development", adopted in 1999, at the first time in the CIS countries, the mechanism of allocation of advance funding for energy conservation projects on the part of the executor and returning of funds as a result of economic benefit, was established.

The legislation on energy audit was adopted in 1999. Now there are about 140 energy audit companies in all regions in Ukraine.

The Law of Ukraine "On Alternative Types of Liquid and Gas Fuel" was also adopted (2000); the Draft Law "On Alternative Sources of Energy" is currently at the stage of consideration by the Parliament of Ukraine.

Charter and Protocol on energy efficiency and related ecological aspects to the Energy Charter were ratified by the Parliament of Ukraine in 1998.

THE STATE PROGRAMS FOR ENERGY CONSERVATION. POTENTIAL OF ENERGY CONSERVATION IN UKRAINE

In Ukraine the Comprehensive State Program for Energy Conservation of Ukraine (CSPEC) has being developed, approved by Government and are being implemented. It has determined, that potential for energy conservation in Ukraine is 42-48 percent of amount of consumed primary energy resources. Potential for energy conservation represents an amount of FER, which would be saved under condition of their use at a level of specific expenditures for production services, typical for developed countries. The structure of this potential for different branches is:

- Fuel and energy sector – 20.9%,
- Industry – 56.8%
- Municipal and household sphere – 11.5%
- Agriculture – 3.4%
- Transport – 6.9%

This Program envisaged centralized financing of the energy conservation projects, with source from small tax to consumed power resources (0,5% of energy cost). The method-

ology, used during development of the Program also allowed to determine amount of energy conservation, which had to be achieved in this connection. Under conditions of economic crisis in Ukraine such mechanism was never realized. The exception is made only for energy conservation measures in budget sphere; for that purpose, for the first time in 2001 there were allocated rather small resources (24,5 million UAH, or less than 0,1% of the state budget; the consumption of power resources by budget sphere close to 10% from size of the mentioned budget).

Nevertheless, if at the beginning of SCUEC operation the parameter of energy consumption was stabilized (see Table 1), after introduction of the measures of economic character in 2001 it has started to decrease noticeably. It is necessary to emphasize, that the fast rate of this decrease does not correspond (considerably exceeds by effectiveness) the amounts of the centralized financing. Here, apparently, there is an effect, which was observed during realization of the centralized programs in the USA and in Western Europe in the 80s, when the aggregate result of their performance exceeded 10-20 times expected result, in scales of national economy (Energy...1987, Schipper 1987).

It might be possible to explain such effectiveness by influence of concrete policy of the state (centralized financing – largest concreteness) onto the people, which make a decision at a level of regional bodies of authorities and enterprises, by a principle: do like me.

The probable volumes of energy conservation due to using unconventional and renewable sources of energy are defined by the Program of state support of development of unconventional and renewable sources of energy and small scale hydro and power energy engineering, approved by Government in 1997. It is provided, that during the whole period of implementation of this program till 2010, the economy of traditional power resources will make 190,5 million tons of equivalent fuel. The priority directions of performance of the mentioned Program, that can ensure the achievement of appreciable saving in shortest time FER in common production in shortest time, where determined. They are, first of all, use of artificial burnable gases in metallurgy and chemical industries, production and utilization of coal bed methane, development of small scale hydro power engineering and bioenergetics (particularly, biogas production), manufacture of high-octane oxygen containing additives to motor fuels on the basis of fuel ethanol, development of wind energy and other perspective ways of use of unconventional power and alternative fuel.

Ukraine has rather large potential of biomass available for energy production. Biomass (without it's share used by other sectors of economy) can provide near 5,3 per cent of the need in primary energy.

EFFECTIVENESS OF ENERGY CONSERVATION IN UKRAINE

It can be easily monitored by looking after an example of two centralized programs, which are being implemented under authority of the State Committee of Ukraine for Energy Conservation. The first one is operation of Ukrainian Energy Service Company UkrESCO and the second is realization of energy conservation measures in budget sphere. UkrESCO carries out financing and implementation "on a turn-key basis" of the energy conservation projects in

Ukraine on funds of the EBRD credit (15 million USD). The results testify, that, despite of rather high credit rate (12-13% per year), the significant market for deployment of UkrESCO services takes place. Even in view of problems related to guarantee of credits return by enterprises, according to rigid EBRD procedures, by the end of 2002 the projects on a total amount 8,4 million USD were in a stage of implementation.

The experience of introduction of energy conservation measures in budget sphere is significant. The activities here are adjusted by the legislation on the budget - therefore they are less flexible, than in business sphere, and consequently it is more difficult to expect on fast payback. However by results of competitive selection of the projects on introduction of energy conservation measures in budget sphere in 2001-2002, the annual reduction of the budget expenditures on these needs will make 66,67 million UAH, when total expenditures of the budget for the mentioned measures are only 25,01 million UAH. Supplementary attracted investments constitutes 24,47 million UAH. Hence, payback period of these funds does not exceed one year. Thus, it is possible to as certain, that economy of Ukraine is quite susceptible to measures on energy conservation, and the introduction of these measures is accompanied with fast payback.

In that way, it is more than Klondike for economics of Ukraine. By the way, year 2000 became a qualitatively new page in a history of national energy conservation: increase of GDP for the first time was achieved at level 5,8% with simultaneously reduction of energy consumption 2%, and the annual parameter of energy intensity of GDP reduction has reached 8%.

Informational and educational programs

In Ukraine significant attention is paid to the preparation of energy conservation specialists. Currently the preparation of such specialist is carried out in technical universities of eight regions in Ukraine. Elaboration of the manuals on energy conservation for schoolchildren and modalities for secondary schools teachers is in state of termination.

Beginning from 2000 in all regions so called Energy conservation Weeks are carried out, aiming at informing wide population strata and enterprises managers on the problems of energy efficiency improvement of industrial processes and in municipal utilities. Ukraine got significant support on this activity commencement within the framework of the TACIS Project EUK 9803, which was carried out by ESBI International (Ireland). The system of regional informational centers on energy conservation has become one more accomplishment of the Project.

Stages and determinative peculiarities of Strategy on energy conservation in Ukraine

Basing on that exclusive role, which energy conservation has for Ukrainian economics and specific features of the very state of the economics, one can foresee two main stages of its development.

During the first stage, which will take about one decade, the energy conservation is to develop in forced regime un-

der the conditions of limited financial possibilities. That is why during this period efficient realization mechanisms are to work:

- stimulating economical mechanism which prevail simple interest in low cost of industry production;
- foundation of special funds for energy saving in the state and municipal budget;
- deep reforming of the tariff policy in heat and water supply;
- gradual during about five-ten years reforming of the State Inspection for Energy Conservation onto audit companies;
- normalization and gradual optimization of electric power supply;
- State support of research in energy efficiency and development of unconventional and renewable sources of energy.

The second stage will include the typical measures for energy saving.

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