

Mikhail Krasnyansky

Ukraine
Donetsk National Technical University
Department of Applied Ecology
P.O. Box 7940
83055 Donetsk-55
Ukraine
E-mail: [mikrasna@skif.net]

Saving of power resources is one of most important direction in the ecological and economical safety of the Ukraine

Mikhail Krasnyansky, professor of Donetsk National Technical University, member-corr of the Academy of Technological Sciences of the Ukraine

I'd like to draw your attention to the fact that energy problems (and connected with it ecological and economical problems) of the countries with transitive economy, like Ukraine, differ radically from the analogous problems of high-developed countries.

The Ukraine consumption of power bearers both the own and imported ones is shown in the table 1.

Table 1. - Power Consumption in Ukraine

Power bearers	Price	Annual necessity	Own production	Import
Gas	\$80/1000 m ³	78 milliards m ³	18 milliards m ³	60 milliards m ³
Oil products including light products	\$350/ton	50 millions tons	5 millions tons	45 millions tons
black oil	\$150/ton	15 millions tons 10 millions tons		
Coal including energy coal	\$15/ton	85 millions tons	80 millions tons	5 millions tons
coke coal	\$25/ton		50 millions tons 30 millions tons	
Electric power	\$0,035/kilo-watt-hour	200 milliards kilowatt	170milliards kilowatt	deficit

These figures in themselves do not speak about something. But if to compare them to the power consumption of other European countries, we'll see a very alarming picture. Really, Ukraine occupies "honorary" 5-6th place in the world on the quantity of the consumed power (of all types), but it stays in the end of the 1st one hundred of countries on the values of the home gross out-put per head produced per annum. See the table 2 (data for 1999)

Table 2. - Comparative estimation of specific consumption of energy for some countries

Country	Population, millions	Home gross out-put per head per annum	Gas consumption, milliards m ³ in a year	Gas consumption for	
				1 person, m ³	\$1 home gross out-put, m ³
1	2	3	4	5	6
Ukraine	~ 49	\$800	78 (from them ~9 are for municipal economy)	1590	2.0
France	~ 56	\$20000	38	625	0.03
Poland	~ 38	\$4800	12	316	0.07

It's seen from the table 2 that Poland consumes gas 6 times less than Ukraine, for all this it has the home gross out-put per head 6 times more. If to count a difference in gas consumption per \$1 of the home gross out-put we'll receive a result 2.0 : 0.07 (these are the figures from 6th column of the table) = 28.6 times! It turns out that Ukrainian economy is 28 times more gas capacious than the Polish one (and 67 times more than the French one). It is characteristic also that the municipal economy of Ukraine which produces only 5-10% of scanty without that home gross out-put consumes gas almost so much (~9 milliards m³) as the WHOLE POLAND considerably more high productive (12 milliards m³). For all this 50 millions tons of energy coal and near 8 millions tons of black oil are burnt out in Ukraine. It's connected first of all with incredibly high power capacity and material capacity of Ukrainian heavy industry. Thus, on the estimation of European experts an average power capacity of 1

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ton of industrial production is 1.9 tons of "conditional fuel", while this index for the Western Europe is equal to only 0.2 tons, i.e. almost 10 times less (for Poland 3-4 times). The same 1 ton of the Ukrainian "heavy" production gives 9 tons of not utilized wastes (on all chain – from mining of raw material and energy production till final product in packing), while for Western Europe the amount of such wastes is equal only 0.5 tons, i.e. 18 times less. One more example: the energy part occupies till 50% (sometimes even more) in the cost price of 1 ton of the coal, i.e. having mined 1 ton of such coal, we burn out a half of 1 ton at once to mine a next ton.

Since the Ukrainian economy cannot be 28 times more energy capacious than Polish one, another bad conclusion follows from data of the table 2. If our Ukrainian economy is in general 4-5 times more energy capacious than the Polish one, then Ukraine needs gas 4 times more than Poland, i.e. $12 \times 4 = 48$ milliard m³/year. But Ukraine has already so much gas, namely:

$$18 \text{ (output in Ukraine)} + 30 \text{ (for Russian transit)} = 48 \text{ milliard m}^3/\text{year.}$$

And it means that Ukraine need to buy NOT ONE CUBIC METRE OF GAS in Russia or Turkmenistan. More probably that "extra" 30 milliard m³, which are bought and paid with such a great effort, serve directly (or indirectly) the "shadow" economy of Ukraine.

The situation with electric power is analogical: for example, only losses of electric power in Ukraine taken into account have made 30 milliards kilowatt-hours in 2000 (for all this the population of Ukraine have consumed only 23 milliards kilowatt-hours). If to add not taken into account losses to the total we receive near 50 milliards kilowatt-hours (i.e. almost every third kilowatt of generated 170 milliards kilowatt/year disappears without leaving a trace). Electric power superior officials name it "commercial losses", but Ukrainian population believe that it is a grate-scaled theft. There is a citation from a speech of the ex-deputy of the Ukrainian Parliament V. Fialkovsky: "If somebody tells me about unprofitableness of atomic electric power stations, let him go to Yuzshno-Ukrainsk city and look at a private mini-town grown near the Yuzshno-Ukrainsk atomic electric station: it is more luxurious than Monte-Carlo! But the debts of this station are growing continuously..."

It's necessary to note that those branches (the coal, "heat electrical", metallurgical), which bring in "the contribution" in the ecological problems of Ukraine, are the low profitable or hopelessly unprofitable ones and cannot liquidate ecological problems "at own expense". The trouble is also that a share of these super energy capacious, low profitable or unprofitable, ecologically "dirty" branches in the home gross out-put of Ukraine grows continuously and already has achieved 60 %.

If to enter conditionally "energy-ecological cost" of each kind of products, such "cost" of 1 ton of steel or coal etc., looks so:

Table 3. - «Energy-ecological price» of ukrainian production

Production	Pollutions			Energy	
	Emissions to the atmosphere	Water escapes to the water basin	Exit of slag to slag-heap	Gas	Electrical energy
1 ton steel	50 kg	10 m ³	0.6 t	200 m ³	450 kWt
1 ton coal	20 kg	10 m ³	1 t	-	600 kWt
1 MegaWt	200 kg	20 m ³	0.25 t	375 kg "conditional fuel"	

Now multiply all this by 30 millions - so much steel is produced in Ukraine per annum, plus by 80 millions ton coal, plus by 170 milliards kWt etc. Now sum up it together. What is your opinion?

It's necessary also to take into account that the total efficiency of each Ukrainian coal thermoelectric power station does not exceed 35%; the efficiency of gas boilers is not more than 60%; losses of the heat in the heating main (in tubes with hot water or with steam) is near 30%.

Not smaller interest represents comparative calculation of emission of "hotbed" gases (CO₂) in accordance with Kioto Minutes (see to tab. 4).

From given tab. 4 (see last column) once again it is well visible, that on unit of - output of the Ukraine burns simply monstrous, nothing explained quantity of energy carriers, ruinous for economy, pernicious for the environmental natural environment, menacing to national safety of the country.

That's why the questions of the economy of power resource have to be considered as the most important not only economical, but also ecological problems of all countries like Ukraine. For such

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Table 4 . - Comparative calculation of specific emissions CO₂

Ncountry	Share of population of the Earth	Share of output of the Earth	Share of global emission CO ₂	% CO ₂ on 1% popul. (in relative unit)	% CO ₂ on 1% output of the Earth in relative unit)
USA	5%	25%	20%	4	0,8
CHINA	20%	5%	15%	0,75	3
UKRAINE	1%	0,2%	6%	6	30

countries there are 6 principal ways of the power economy:

- 1) reduction of the power capacity of produced articles at the working enterprises at the expense of the modernization of the technologies.
- 2) raising of the efficiency of boilers and reducing of losses of electricity supply networks and heating systems during the production and transportation of electric and thermal energy, and also in dwelling houses.
- 3) utilization of wastes contained energy.
- 4) introduction of alternative (without fuel) ecologically pure sources of energy.
- 5) gradual conversion of motor transport on electric (or gas-electric) motors.
- 6) gradual conversation of the economy on "intellectual" technologies (of computer, telecommunication, biogenetic and others) as considerably more less energy capacious, and also more profitable and ecologically pure.

Conclusions:

- 1) Both Ukraine and other countries with "transitional" economy have to move exactly this way (see items 1-6), but not the way of new electric power stations building, rising of mining or export of coal, oil and gas.
- 2) Rich countries – donors and International financial organizations, must: in the first place finance in Ukraine the setting of modern meters for gas, heat and electric power absolutely at all Ukrainian plants, factories and other enterprises.
- 3) They not must demand from the Cabinet of Ministers of Ukraine to raise tariffs on public utilities, because in this case they make the poor population of Ukraine to pay all losses and theft in power industry. It's rater to make an international examination of Ukrainian public utilities tariffs.
- 4) At a rigid state policy of economy of energy, and also under condition of full involving in power of Ukraine of available sources of secondary and alternative energy Ukraine will receive the following annual energy balance (all Ukraine consumes nowadays 180-200 million conditional fuel – **c.f.**):

Reduction energy loss in boilers and energy networks -	40 million tons c.f.
Biomass (biogas, bioalcohol) -	25 million tons c.f.
Energy of wind -	8 million tons c.f.
Energy of sun -	5 million tons c.f.
Coal and garbage methane, coke-gas -	4 million tons c.f.
Geo-thermo-energy -	2 million tons c.f.
Energy of gas-transport mane and co-generation -	5 million tons c.f.
Energy of waste nuclear fuel -	6 million tons c.f.

Total 95 million tons c.f., i.e. half of annual requirement of Ukraine in fuel.

If to take into account, that second half of power expenses serves ukrainian «shade economy», a rigid state policy of economy of energy, and also full involving in power of Ukraine of available sources of secondary and alternative energy PROVIDES 100 % of REQUIREMENTS of UKRAINE in ENERGY.

From here also follows, that on harmful emissions in an atmosphere, toxic dumps in hydrosphere will twice be reduced, the quantity dumps and pollution ground half will decrease. Accordingly, in the budget of Ukraine many billions grivnas which went on purchase of energy carriers will be kept.

To you great ecological and an economic target to which it is necessary to aspire!