ENERGY: TECHNOLOGY, ECONOMY, ENVIRONMENT, SOCIETY [1]

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1. Energy needs, energy prices, efficiency

Will there be enough energy for Hungary to start economic growth? ***A few years ago it seemed evident, that the main precondition of growth is stable supply of the economy with energy.*** Energy specialists demonstrated on time series how the volume of energy consumed rises year by year, and forecasts indicated the continuation of this tendency. By now however several signals, experiences, international comparisons have been accumulated which force specialists to think everything over and there are opinions saying that the question itself is wrongly formulated.

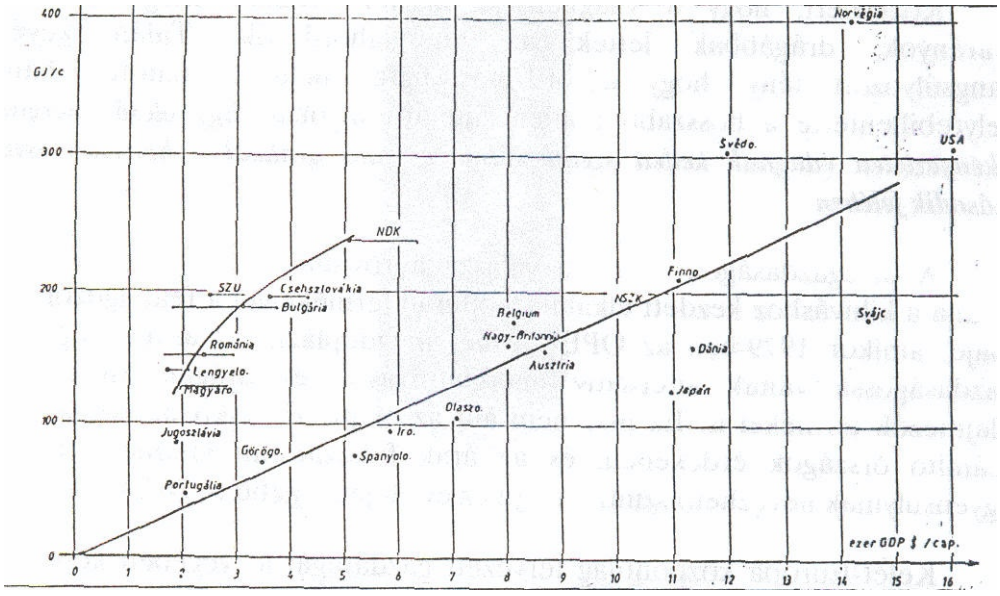

***FIGURE 1*. THE EFFICIENCY OF ENERGY USE IS IN CENTRALLY PLANNED ECONOMIES BEHIND THAT OF DEVELOPED MARKET ECONOMIES. From the vertical axis we can read off prime energy consumption of individual countries, from the horizontal axis per capita GDP which is a measure of a country's development level. Energy consumption of market economies is more or less proportional to the country's development level- their energy consumption per unit of production is more or less**

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the same - but Eastern-European countries constitute a different group, because they produce half that much output from a given amount of energy. (The latter group of countries is indicated on the figure not by points but by ranges, due to the inaccurateness of their statistical data and the problems of converting their national income into one common currency).

International comparison indicates that in planned economies - among them in Hungary - there should be tremendous reserves of energy. We could say that - contrary to received opinion - it is not more energy what is needed for economic growth but quite the contrary: excessive investments in the energy sector draw away resources from the restructuring of industry, a restructuring which is a precondition of competitive production and within it more efficient energy use. These countries, adapting themselves to Soviet energy supply, fell in the trap of "cheap energy" a large part of their resources (foreign credits included) they spent on expensive energy producing investments and thus it cost them more and more to utilise the comparative "advantage" of "cheap" energy. They have no breathing space to jump out from this vicious circle and so they lag the more and the more behind world trends of development.

It is well known that one and a half decades ago relative prices have changed all over the world. Energy became relatively more expensive. It is perhaps less well known that the 1973 shock, rather than distorting, put right long term price relations. ***A world spoiled by cheap energy had to face realistic prices in the second half of the seventies.***

The immediate response of market economies was short term energy saving. Then manufacturing industry began to adapt to the challenge by producing new products. In 1979, when OPEC doubled it's prices again, alternative energy and less productive oil fields became cost efficient. This was something against the interests of countries relying long term on oil and therefore prices gradually went back to their equilibrium level and even below (under $20 the barrel at the beginning of this year).

Centrally planned economies of Eastern Europe were unable to adapt. Instead of accepting the new circumstances they concentrated their effort on keeping energy prices low. What could not be attained in the relation of OPEC and the West - namely to make the world through low prices dependent on oil production, and to perpetuate later this dependence on a higher

price level - succeeded completely in the relationship of the Soviet Union and its Eastern European partners. One should see it clearly that energy dependent production and lifestyle is not only vulnerable to the extraction of monopoly prices but what is even more dangerous, it ***may result a structural dependence, when the supplier occupies key political positions and uses his power for blackmail.*** In such a situation nobody knows who exploits whom through low prices : The real tradeoff may be appreciated only in the long run.

Energy means a double challenge to domestic economy. Western example points in the direction of restructuring, approaching the economic structure, and within it the share of the energy sector characteristic for developed countries. At the same time a short term shock is present and its effects are felt. This shock is resulting from the loss of cheap and secure energy supply, considered by decisionmakers as a blow of fortune when they discover that the problem cannot be solved by leaving intact every other circumstance.

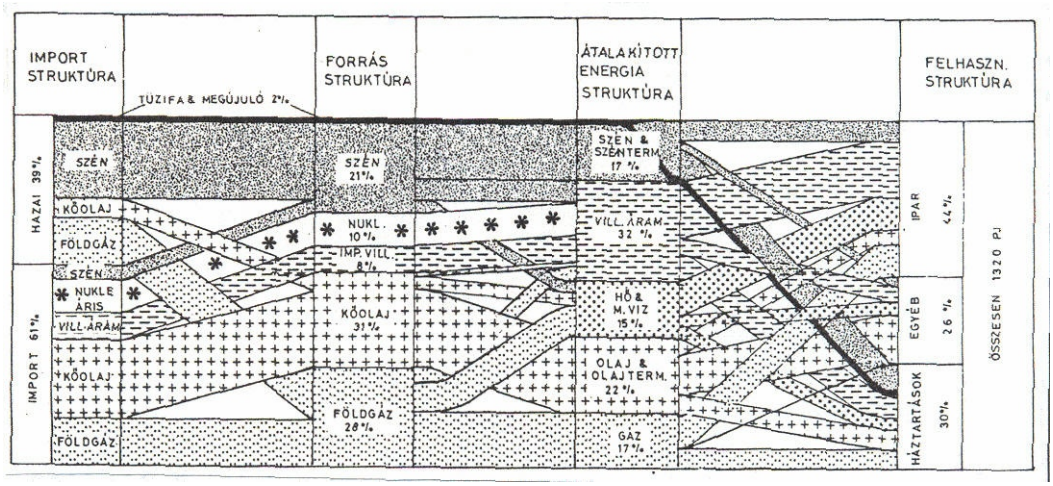

***FIGURE 2*. THE SOURCES OF DOMESTIC ENERGY AND THEIR PROCESSING UP TO FINAL USE**

If we consider nuclear fuel (10 % in the energy balance) as import, then 61 % of total energy use in 1989, expressed in standard energy equivalent was imported.

From total energy resources (domestic plus import) 21 % was coal, 1 % firewood, 31 % oil, 28 % gas, 10 % nuclear fuel, 8 % imported electricity (the share of domestic hydroelectric energy is only slightly more than 0.1 %, a little bit more is bioenergy, energetic use of thermal energy constitutes 0.4 %. Thus, firewood included, the total share of renewable energy is 2 %). Beyond

electricity and heat generation, one third of coal (mainly briquet and coke) and almost 100 % of oil is consumed in a processed form (these intra-product group transformations are not shown on the figure). One third of electricity which makes up one third of total energy consumption comes from import, half of electricity generated domestically comes from Paks (the Hungarian nuclear power station), one fourth from coal based power stations and slightly less than one fourth from oil and gas.

What concerns the breakdown of energy use among industries, different figures are circulating. Some statistics include energy consumption of the energy sector in the energy consumption of industry, others distribute it among all energy users. The figure is based on the latter. According to it, 44 % of energy consumption is produced by industry, and 30 % by the population (CSO date from 1989). The figure does not include change in stocks, nonenergetic use of source of energy and export; furthermore, the calculation imputes conversion and other losses to consumption. That means that electricity is taken with 10 000 kJ/kWh heat equivalent.

2. In other structure

The necessity of "structural adjustment" does not say in itself anything on the difference between the energy scenes of Eastern European and developed countries. More detailed comparison is needed in order that the main differentiating factors might be revealed. By investigating the present situation it turns out that in developed countries the share of industry is much less, energy intensity of production and of new products also less and their service content more than in this country. Accordingly, considering main energy consumer groups, the consumption of industry is in a market economies relatively less and that of households and the service sector more. One should add that an often heard argument in Hungary is that we need more energy in the future because the consumption of households will increase, in line with international trends. One should firmly declare that international comparison includes household consumption too, and the efficiency of total energy consumption has to double parallel with increase in the share of household consumption: that means that it has to be made up for by the improved efficiency of industrial consumption!

Comparing the industrial structure of the two groups of countries from another point of view, it is evident, that means of production of developed economies are more up to date, they use less (materials and) energy: the same is true for products, household supplies, cars, garden tools etc. They replace equipment more frequently, therefore its stock is much newer and in better shape.

Although it belongs to the analysis of the state of industrial means of production, one should mention separately the efficiency energy producing, energy transforming and energy transporting systems, because they increase to a large extent the internal losses of planned economies.

Developed economies cut back on their energy intensive industries or put them out in the Third World (metallurgy, shipbuilding). Here one should mention the delicate social problems of crisis industries, such as unemployment, and one should ask why some countries may cut back on their energy intensive production. Is it not because other countries will do the work? In this case production world-wide becomes not more efficient, only its division is more advantageous for the developed world. The price for the favourable indicators of one country is paid by another country. If the latter is true we have to ask (even if it is not too polite) what can we put out (and

where) instead of stretching the use of every tool and technology up to the infinity.

Another problem worth discussing is the time dimension of the process of changes in developed countries. When discussing transition, structural change, one has to differentiate between short term and long term substitution.

Short term substitution means first of all the use of capacity reserves of already existing industrial equipment. One is not compelled to utilise all the existing energy-intensive production capacities and one can maintain - in line with present valuation principles - labour intensive, energy saving, perhaps not very "up to date" technologies.

The task of government in the area of short term substitution is to set free market impulses in the microeconomic sphere. Real decisions have to be made however by individual firms because it is their business strategy what determines what is rational and what is not (utilisation or setting aside of existing capacities, decisions concerning prices and tariffs, batch size etc.)

On the long run production curves of individual industries shift in developed countries too. Typical industries in the sixties tried to produce in even larger quantities, with improving unit and total energy consumption, and with less labour. From the middle of the seventies, development projects laid more stress on the reduction of total energy use, whereas in post-industrial development principle of the eighties need for the reducing the volume of production also surfaces. (production for order, with a service character, not for stock). In this service attitude the role of labour and personality is revalued, human participation is not something to be done away with, an unnecessary "cost factor", but an element improving the quality of service, a practice which - last but not least - contributes to the solution of the problem of unemployment.

Looking on the development of individual industries from an even broader, centuries long view, they are characterised by constant technological change, the implementation of ever more new paths of development. The investigations of Nakicenovic [1] have demonstrated that energy intensity of GDP and with it total energy consumption peaked in 1860, 1910 and 1970, clearly following the fifty year periods of the Kondratieff cycle; at the same time these were the years of saturation of a special type of energy, animal traction, coal consumption resp. oil consumption, as to their share in total energy consumption. At that time the given type of energy did not lose as yet its absolute leading role,

but the process of change has already started and it resulted in a 20-25 years long process in a total reversal of absolute shares.

Long term adaptation has to be based not on the actual market needs but on investigation of constraints effecting on development decisions and on longer term tendencies of demand (whether individual products, product groups are in the rising or falling phase of their cycle etc.).

If we recognise the cyclical character of long term change it can help us when we look at the other side, the sources side of energetics. Here we have to evade the simplifying common place whereby energy is scarce and there is competition for its stocks. Very often a broader environmental approach appears thus distorted in the technocratic argument.

In effect it is the whole product and profit oriented industrial culture or economic order what got into crisis because it cannot live in harmony with nature. We amassed so huge technological potentials in order to free ourselves from nature that it is doubtful whether humanity will able to reprogram himself to a totally different approach and value system: whether we will be able to do with nature what we were not able to do with the other man, the other nation, to think with his mind, to take into account his interests too.

As it is not our task here to treat exhaustively the topic of management of the environment, we want to stress only that our treatment of energy is the same problem as our treatment of the environment: the link between energy and environment does not begin with power station exhausts and nuclear waste. The central problem is not how to choose among the different methods of energy production but we have to reconsider the whole of our energy consumption, the circular flow of energy. From an environmental point of view the problem is not energy shortage but the fact that even in the case of renewable energy extraction cannot be separated from other functions of the energy resource. Biomass is a renewable source of energy but if too much biomass is drawn out from circulation soil loses its capability for renewal. Hydroenergy is renewable type of energy: but if in order to produce energy, all river-beds will be covered with concrete, then fish will die out, creatures living in the river and its banks cannot renew themselves, neither can the water etc.

3. Thinking along prescribed tracts

But what is the cause that in energy policy plans only the problems of energy production figure and not the problems of rational use of energy?

Technological thinking about energetics makes a shortcut between a review of sources and needs: institutional structure and self-justifying reflexes direct the attention always on the same ill-conceived, unsolvable problems. Some well-known principles of East-European and industrial thinking belong here: the trap of cross-reference between hierarchic power and technological arguments, the vulnerability of large systems, the acceptance of exaggerated needs.

Looking at the domestic situation there is no doubt about energy production being- like centralised large scale industry - a burden on the economy. The only difference is that it was a successful industry, unlike other monopolistic firms, the sectors of transport, communication, water management. Activity of these industries ceased to be service, the customer had to "request" in order to obtain something. For want of the market, the centrally planned, redistributive economy depends to a large extent on central decisions. Therefore the participants have to develop strategies where by they may influence decisionmakers in order to secure their survival. In this system references to the needs of the consumer are strong arguments in the fight for central money resources. They legitimate the bankruptcy threats of the energy sector which try to export money from the government in power.

If there are several industries using this strategy this cannot be by chance. It is a characteristic mode of behaviour of non-market oriented economic actors. They try to influence those who dispose over their potential money resources. In the centrally planned economy this is the central government. It is still an open question today, whether the government having declared the march towards market economy will be able to expose to market effects the largest beneficiaries of government paternalism or they may preserve their exceptional position.

Several public service functions struggle with the same problems (mass transport, public utilities). It has not been decided what should be maintained in the hands of the government and what should be "denationalized". The system of arguments is the same for all industries concerned. They argue with the necessity of large, central networks of provision, and institutional structures built on them. This is a reversed argument however: in several areas it seems as if it was precisely centralised institutional-power interests which were

responsible for the deception that hierarchical organisation has unalterable technical causes. From a technological point of view a multi-center network is not only one among several possibilities but it is the future. In it, several horizontal regulatory centres may act autonomously, subject to a common system of rules, as part of a large network. Examples are computer, informatics networks, unified international technical systems such as railway systems or the Western European energy system.

As in the case of production in general, so in the case of energy production too one should not think only in large establishments. It is evident from a technical point of view that if half of domestic electricity is produced by one power station, then its breakdown will cause insurmountable problems.

The realisation of high level vulnerability did not lead up to now to the easing of concentration. Instead, ever more refined (and costly) technologies of defence and security were introduced. Paradoxically, it is already a stronger argument for the "efficiency" of the large system that the supervising, safety technology is costly, than is the actual cost of energy production. It is disregarded by the calculation that smaller units can better rely on one-another, and thereby a more flexible network can be created, which is better adapted to needs. To disregard this fact is the so-called vulnerability trap of large systems.

Another dimensions of the security of procurement philosophy is the questions: what needs should be served. In a market economy price is the filter between needs and supply, which lets through only demand equivalent with supply. Low energy price is democratic but if it is not price but an even more unjust distribution system what arranges consumers in to different castes, then doing away with price has no advantage. At the same time aggregate demand becomes unintelligible, and decisions about new energy investments are built into politically motivated government arguments and bargaining, without having a sound cost base. Quite the contrary: demand forecasts become the justification of the volume of investment realistic under the given bargaining situation: it becomes a basic technical-economic-scientific argument for the conception, a sacred fact what can be altered nevertheless from one day to the others beyond recognition if bargain is unsuccessful.

For the industry making the suggestion, the risk of error is not symmetrically distributed. If new investment is obtained, the industry will prosper, and the risk is small that in a shortage market it will turn out from a new establishment that it is

unnecessary. But the responsibility of having underestimated needs and causing thereby disturbance in provision, cannot be shifted to anybody, if there is no justification, that they wanted to invest but did not obtain money from the government. The wastage of resources is caused not only by price relations but also the interest of the producer in being irresponsible: this is the trap of needs overestimation.

In order to back his practical tactics, energetics developed a risk philosophy whereby the danger is only that there will be not enough energy. By this thinking, it is not a problem if national economy spends too much on energy producing capacities, drawing away thereby capital from manufacturing industry and falling ever more deeply into the trap of self-perpetuating materials and energy production.

Production capacities adapted to wrongly assessed needs deteriorate the chances of other necessary investments. Later self-justifying processes are started: in order to be able to operate the given capacity, irrational additional investments are necessary. The analysis of future needs should be separated from these interests, because in the contrary case planning will only serve short term interests, instead of laying the foundations for real structural change.

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4./ Reference:

[1] Nakicenovic, Nebojsa: Dynamics of change and long waves
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