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East Europe Report

ECONOMIC AND INDUSTRIAL AFFAIRS

(FOUO 5/80)



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EAST EUROPE REPORT
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INTERNATIONAL AFFAIRS

EFFECTS OF FERTILIZERS ON GRAIN QUALITY OF WHEAT

Bratislava AGROCHEMIA in Czech No 3, Mar 80 pp 75-76

[Article by Doc Eng Jaroslav Prugar, Candidate for Doctor of Science, Institute for the Research of Vegetable Produce, Praha-Ruzyne Part 2]

[Text] Nitrogen fertilization has the maximum importance for the synthesis of proteins in the plant and the storing of them in the wheat grain. Hundreds of experiments [conducted] all over the world under the most varied conditions have confirmed, however, that fertilization with nitrogen alone is not sufficient and that only a balanced source of nutrition with all biogenic elements, including trace elements, in the quantity and ratio that optimally meet the needs of a given variety can lead to a successful result from the viewpoint of both quantity and quality. The protein content of wheat grain (and of cereal grasses in general) does not necessarily always rise proportionately with the increasing amounts of nitrogenous fertilization. This applies particularly to the current, highly productive varieties which react to fertilization with a steep rise of the grain yields. This is especially striking in those cases when CCC (expansion unknown) and herbicides were applied and growths were maintained in an optimum state (46). It leads to that "diluting effect" which we are currently seeing in our practice as well: record yields of wheat, especially the Soviet varieties of the Mironov culture, are often associated with a great decline of the protein content and vitrescence of the grain. With the current potentials of the agricultural production this unwelcome phenomenon can be prevented only by additional fertilization with nitrogen in the later stages of growth thus giving the plant the possibility of utilize these nutrients primarily for improved grain quality. Most of the many publications dealing with questions of fertilizing wheat in all the countries where this grain is cultivated are concerned with nitrogen fertilization.

The largest number of such studies is currently found in Soviet technical literature. While (Knyaginichev) (47) in 1951 in his monograph on the biochemistry of wheat was still justified in stating that "studies of the effect of fertilization on the quality of wheat grain for these areas (he means the dry areas of the USSR) were few and inadequate--only the total yield of grain was followed," today there is in the USSR no area important for wheat cultivation which has not been subjected to many fertilization experiments aimed at the study of the grain quality adapted to the local characteristics and regional varieties. This applies not only to such

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renowned areas as the Ukraine, Northern Caucasus, Volga region and Kazakhstan, but also to vast areas of the non-chernozem zones.

From the large number of Soviet studies on the subject of "nitrogenous fertilization and quality of wheat" we list at least those which, from the beginning of the 1970's, we have been comparing with the results of our own experiments (48-75).

The action of mineral and especially nitrogenous fertilizers on the quality of the wheat grain was given great attention at the VIIth International Congress of Industrial Fertilizers in 1976 in Moscow (76, 77). Pavlov et al (78) prepared the basic report on this subject on the basis of data acquired when dealing with a project of similar orientation in the CEMA countries.

It was found that with low rates of nitrogen application (around 40 kg per hectare) the protein content in the wheat grain as a rule does not rise; on the contrary, it may even decline, namely in those cases when the plant utilizes the supplied nitrogen for increased yield but not for improvement of the grain quality. Nitrogen rates around 80 kg per hectare usually increase both the yield and the protein content. With further rate increases of nitrogen fertilization the protein content continues to rise, but the increments of hectare yields gradually level off, and at unusually high rates of supplied nitrogen one can even note depression of yields. This was demonstrated experimentally, for example, in the GDR, the USSR, the Romanian People's Republic and the CSSR. According to the results of VIUA [the D.N. Pryanishnikov All-Union Scientific Research Institute for Fertilizers and Agronomic Soil Science] obtained under conditions of the non-chernozem zone, a nitrogen rate of 90 to 100 kg per hectare appeared optimal for obtaining the highest grain yields, while 120 kg per hectare was optimal for increasing the protein content to 14 percent and higher.

In the years 1971 to 1975 the Department of Vegetable Produce of the College of Agriculture in Gorki jointly with VIUA studied the effect of high doses of industrial fertilizers (N₆₀-240, P₆₀-180 and K₆₀-120) on the yields and quality of grain of the Mironov variety and their subsequent effect on the productivity and quality of the grain of summer wheat and barley. (Kodanev) et al (79) presented the results of these and additional experiments at the Moscow Congress. It was found that the highest and best balanced yields of winter wheat were obtained with nitrogen rates of 90 to 120 per hectare. Larger applications did not result in yield increases, while the protein content in the grain, on the whole, rose evenly from 13.5 to 15.9 percent.

From 1968 to 1971 in the Polish People's Republic in Wroclow (80) field experiments were carried out with ten varieties of winter wheat using different levels of nitrogen fertilization: 30, 60, 90 and 120 kg per hectare, applied either as a single dose in the spring or fractionally, a part before sowing and a part in the spring, or a part in the spring and the rest during the phase of grain formation, always in the form of ammonium

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nitrate. The reaction of the varieties differed on the average, however, increased doses of nitrogen increased the content of total and protein nitrogen, while the content of non-protein nitrogen showed practically no change. The content of all amino acids likewise rose but when converted to proteins, the content of essential amino acids started to decline in the majority of the varieties studied beginning with 120 kg per hectare.

In 1969 to 1972 Polish researchers in Stettin (81) carried out detailed studies of the reaction of a number of winter and summer wheats to varying doses of nitrogen in heavy soils with the medium content of phosphorus and potassium. Rates of 40 and 80 kg per hectare increased the yield of winter wheat, while administration of 120 kg per hectare had a depressive effect on the yields. Variety Grana reacted most to nitrogen fertilization, while variety Zeliarna and the Swedish variety Starke, the least. The protein content in the grain increased parallel with the rising rates of nitrogen. The values for the sedimentation test and farinograms also improved concurrently.

As to the yield, a nitrogen rate of only 40 per hectare was found sufficient for the summer wheat; further increases, to 80 and 120 per hectare had only a minimal effect. The protein content increased, however, from an average value 13.3 percent (40 kg per hectare) to 14.9 percent (120 kg per hectare). Both with the winter and summer wheat the maximum yield of proteins per unit area was obtained at the nitrogen rate 120 per hectare.

The author compared the experimental data obtained with the results of experiments carried out earlier (82, 83) on the same soil with different varieties and nitrogen rates of 30, 60 and 90 per hectare. At that time the tested varieties reacted differently: the yields increased with rising doses of fertilizers, while the qualitative indicators generally did not change.

In the experiments carried out in Romania (84) in podsolized soils, the yields rose to a nitrogen rate of 120 per hectare, and the rise of the protein content in the grain continued up to the rate of 160 per hectare, the optimum ratio being $N:P_2O_5 = 2.5 : 1$. Fractionation of proteins confirmed that gliadin, i.e. the prolamin fraction, is mostly responsible for the increase of the protein content. Its rise was associated with a concurrent decline in the lysine content of the grain.

Workers of the Experimental Institute of Grains and Technical Produce in Fundulea, using the Aurora variety obtained very interesting information about the effect of fertilization on the susceptibility of wheat to fungal attacks (85): Annual nitrogen application of 120 and 160 per hectare instead of 40 to 80 per hectare not only had no positive effect on the grain yield but also sensitized the plants to fungal attacks; this was manifested in the shrivelling of the grain and reduction of mass per 1000 grains.

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At the College of Agriculture in Novi Sad in Yugoslavia, Drezgic et al (86), using a sowing progression of wheat-corn-barley in the chernozem-type soil, studied changes in the yield and quality of wheat with graduated doses of nitrogen--60, 90, 120, 150 and 180 per hectare. The Italian Libellula was the experimental variety. The yield increased only with low and medium doses of nitrogen, with the maximum around 80 per hectare. The total content of nitrogen and proteins in the grain showed a linear rise up to the maximum rate.

Jevtic and Malesevic (87), investigators at the same institution, set up field experiments with two varieties of wheat--Sava and early Novosad--on chernozem in the northeastern part of Yugoslavia. They applied nitrogen doses of 50, 100, 150 and 200 per hectare with the same ratio of nutrients $N:P_2O_5:K_2O = 1:0.8 : 0.6$. In the variant without irrigation the yield declined at the rate 200 kg per hectare, and on the irrigated plots the yield decline began to manifest itself at 100 kg N per hectare. The content of nitrogen, proteins, and protein layer of the grain increased with the graduated nitrogen fertilization; the gains were maximum at the nitrogen doses of 50 and 100 kg per hectare. The content of essential amino acids in the grain showed a similar pattern. The authors did not include the content of amino acids converted to proteins, but from the data in the tables one can deduce that the biological value of the proteins was beginning to decline at the highest nitrogen rate.

At the FAO [Food and Agricultural Organization] symposium on the effect of fertilizers on the quality of plant products held in New York in 1974, Kulakovskaya (88) reported on experiments in the Belorussian, Latvian and Lithuanian SSR's with graduated mineral fertilization. Optimum doses of nitrogen, manifested positively both in the yield and in the quality of the wheat grain, varied between 90 to 120 kg per hectare. Further increasing the nitrogen doses was not cost-effective.

Further studies along these lines were carried out in the 1970's in Bulgaria (89, 90), Poland (91, 92), Hungary (93, 94), GDR (95), Romania (96, 97), Yugoslavia (98, 99), FRG (100, 101), the Netherlands (102, 103), Austria (104), Italy (105), Scotland (106), Ireland (107) and the U.S. (108, 109, 110). Most of them have noted the favorable effect of nitrogen fertilization on the protein content of the grain. As a rule, however, higher rates bring about depressions of yields.

In recent years many projects in the CSSR have also been aimed at studying the effect of nitrogen nourishment on the quality of the wheat grain. The purpose of some was to study various forms of nitrogenous fertilizers (111 to 119); others also studied the influences of other agroecologic factors acting concurrently with fertilization (117, 118).

Conclusion

The largest number of studies in the area of research on the effect of mineral nourishment on the quality of wheat deal with nitrogenous fertilization. It has often been demonstrated experimentally that the increase of

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the protein content in the grain is not always proportionate to the amount of nitrogen supplied. It depends on the genotype and on the external environmental conditions whether the growing crop will utilize this element more for the increase of the yield or the quality of the grain. A number of results obtained with different varieties and under different ecological conditions cite the range 90 to 120 kg per hectare as the optimum doses from the quantitative and qualitative viewpoint. Higher doses are economic only with applied in a separate applications.

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CZECHOSLOVAKIA

CAPITAL INVESTMENT REVIEWED IN DETAIL

Capital Investment in 1980

Prague INVESTICNI VYSTAVBA in Czech No 1, 1980 pp 3-10

[Article by Eng Karol Ujhazy, deputy chairman of the State Planning Commission, in Slovak: "Capital Investment in the 1980 Plan"]

[Text] The 14th Plenum of the CPCZ Central Committee discussed the report of the Presidium of the CPCZ Central Committee on the most important development goals of the national economy for this year. Consistent with the increasing exigency of contemporary development, the results of the past four years of the Sixth Five-Year Plan were assessed more critically than in previous years. An appropriate place at the plenum was allotted to capital investments. This was fitting and in accord with what was stated by Comrade V. Hula: "To a significant extent, increases in technological and economic potential; innovation in and modernization of its structure; the rise of the technological level of production, products and services; labor productivity and effectiveness are [all] determined by capital investments."

Establishing the major targets for 1980 is exceptionally important, because

--more than at any time hitherto we realize the impact external economic conditions have on our domestic economy, as well as the fact that we have as yet made little effort to adjust to them;

--while this is the final year of the Sixth Five-Year Plan, it is also the preparatory year for the Seventh Five-Year Plan, which we are currently working on;

--moreover, we realize more than ever the role of our own shortcomings in the comparatively low effectiveness of development which, however, to a decisive degree, holds down the rise in our people's living standard.

In order to understand correctly the tasks in capital investment we should mention at least briefly the existing basic trends in the development of the economy taken as a whole and the tasks in overall development for this year.

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Results of the Fulfillment of the National Economic Plan for the Sixth Five-Year Plan

In the report of the Presidium of the CPCZ Central Committee it was stated that a sober assessment of our evolution during the past few years reveals the positive growth of the economy of our country, despite the fact that our economy is operating under worsened international conditions (the rise in the prices of energy and raw materials on the world markets) and for two years out of the last four our agriculture was affected by exceptionally bad weather. Even though we are not completely achieving the results stipulated by the Sixth Five-Year Plan, the 17-percent rise in national income, the 21-percent rise in industrial output (including a 32-percent rise in engineering), and the 24-percent rise in construction testify to the increase of our country's economic potential. And the average annual agricultural production is 7.6 percent higher than was that of the Fifth Five-Year Plan.

The report also assessed as positive certain structural changes made in our economy during the past four years, the groundwork for which had been laid by capital investments made in the last years of the Fifth and the first years of the Sixth Five-Year Plans. Quoting from the report, "A not always sufficiently appreciated fact is that we devoted sizeable investment funds to insuring future development in the productive and nonproductive spheres. In four years we invested Kcs 564 billion in capital construction, approximately 64 percent of which was in the productive sphere."

In addition, the report cites capacities for the mining of brown and black coal, the construction of large thermal, hydroelectric and nuclear power plants, the natural gas transit pipeline, and natural gas underground tanks. The report cites other large-scale investment programs in which we have concentrated funds and capacities in recent years, such as nuclear engineering, tube production, the modernization and renovation of metallurgical plants, the construction of a modern petrochemical base in Zaluži, Slovnaft, and the construction of new cellulose mills and of the wood-processing industry generally. We could extend this list by mentioning new engineering capacities, new capacities in the food-processing industry, as well as decisions taken in the nonproductive sphere (for example, in transportation [this includes] the relaying of railroad beds, increased electrification, highway construction), and also construction in the broad complex in the North Bohemian Kraj, in the Prague metropolitan area, and in Bratislava.

On the other hand, the evaluation of results achieved to date is also justly criticized with respect to capital construction. After all, while the creation of national income is approximately a third lower than stipulated by the plan, part of the blame for this, in addition to insufficiently utilized fixed assets, is due to rising investment costs per extra unit of production, extending the time necessary for construction, the time it takes newly-built capacities to reach designed parameters and in sum, then, lower effectiveness from funds invested than envisaged by the plan.

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The economy of our country, which is poor rather than rich in natural resources, proved incapable of using exports to compensate for the rise in the prices of imported energy and raw materials. Moreover, the export targets, especially in engineering, were not even completely met during the past four years. And the impact of climatically adverse years, especially this last one, had to be made up for by expensive imports of agricultural products, of grain in particular.

These are all reasons why it was necessary to distribute the national income generated more cost-consciously and also to reflect the decreased scope of investments for last year and for this year in the way it was used.

Fulfillment of the Capital-Investment Plan in 1979

The deceleration of the rate of capital investment called for by last year's plan was adhered to as follows:

	<u>1978</u> 1977	<u>1979</u> 1978	Anticipated reality <u>1979</u> 1978
Year-to-year rates of investment growth			
--Investments in the national economy, total	104.7	102.3	102.1
--Investments in the national economy, without the "Z" program and private construction	105.5	102.4	102.4

These and the other figures given were derived from the anticipated reality as of the time of the writing of this article. Corrections to them will perhaps be necessary, but none that would affect the trends in last year's fulfillment essentially.

The task set at the 12th Plenum of the CPCZ Central Committee and in the plan was thus completely fulfilled within the over-all volume of investment. While the rate of investment is slowing down (to half of that of 1978 and a third of that of 1976), the complexity of structural changes in investment is increasing, as well as the difficulty of adhering to the structure and material content of investment set by the plan.

The results from last year where, despite agreement in total investment volume there is a significant difference in plan fulfillment in the structure of work and deliveries, must be appraised all the more critically. While deliveries of machinery and equipment last year were exceeded by 5.1 percent, that is, by Kcs 2.9 billion, construction work lagged below the

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level of the year's plan by 3 percent, that is, by Kcs 2.4 billion. This disproportion in fulfilling the structure of work and deliveries appears with even greater force if we compare last year's results with the tasks set for 1979 in the Sixth Five-Year Plan. Deliveries of machinery and equipment were exceeded by approximately the amount called for in the 1979 plan, that is, by 5 percent, but construction work was under fulfilled by 7.8 percent. The amount of uncompleted construction, as compared to that stipulated in the Sixth Five-Year Plan, amounts to nearly Kcs 6.5 billion.

Just as in the structure of work and deliveries, the results in the fulfillment of the plan according to individual indicators vary greatly. On the one hand, deliveries for construction projects budgeted at under Kcs 2 million and machinery and equipment not included in the budget (SZNR) were exceeded by 8.5 percent (the major portion of which overfulfillment, however, must be adjusted by the overfulfillment in agriculture, which resulted last year partially from the methods used to regulate this investment category). On the other hand, deliveries for projects budgeted at over Kcs 2 million were underfulfilled by 6 percent, that is, by approximately Kcs 3 billion. Projects with the special system of regulation were underfulfilled by 1.8 percent, practically the entire shortfall occurring in full-service housing construction.

Underfulfillment in construction projects budgeted at over Kcs 2 million would show up even more starkly in comparison with the Sixth Five-Year Plan. The tasks of the Sixth Five-Year Plan for this year were fulfilled by only 85.4 percent. With respect to the structure of work and deliveries [of materials] these tasks have remained 75% unfulfilled [sic] in the construction industry, being fulfilled by only 82.5 percent.

Although these deviations from the plan are relatively smaller than were those of the Fifth Five-Year Plan, it remains a fact that conditions are not improving in the category of construction projects budgeted at over Kcs 2 million except for those designated mandatory tasks. If we subtract from last year's results projects designated mandatory tasks, for which the plan for volume was fulfilled, indeed, even somewhat exceeded, then the entire Kcs 3 billion of nonfulfillment is charged to those projects not designated as mandatory tasks of the state plan. It is surprising that no improvement occurred in this category last year even after the fulfillment of deliveries for projects budgeted at over Kcs 2 million was, in accordance with organizational measures for last year's plan, to become one of the criteria for evaluating workers in contracting organizations in construction and in engineering.

A positive aspect of last year's development is that despite the deviations mentioned, last year, in contrast to the previous 2 years, the only deliveries to increase were those for construction projects budgeted at over Kcs 2 million and construction projects with a special method of regulation, combined (thus for larger construction projects), while deliveries for construction projects budgeted at under Kcs 2 million and SZNR essentially remained at the 1978 level:

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	<u>1977</u> 1976	<u>1978</u> 1977	<u>1979</u> 1978
Construction projects budgeted at under Kcs 2 million and SZNR	110.2	106.7	99.6-100.
Construction projects budgeted at over Kcs 2 million and projects with the special system of regulation	102.5	104.6	104.1

Behind the nonfulfillment of the plan for construction projects we must then also see nonfulfillment in commissioning capacities for trial operation. The results for this indicator last year were among the worst yet for the Sixth Five-Year Plan. As for the number of capacities that were commissioned in mandatory tasks, the plan was fulfilled by only 59 to 62 percent, thus with much worse results than in previous years. Of the capacities commissioned last year we should mention at least the following:

In fuels--the Jiri II open pit mine in the SHR [State Economic Council], the LAB II natural gas underground reservoir, and pumping stations on the natural gas transit pipeline; in metallurgy--construction projects 1 and 2 in the central oxygen plant in Ostrava--Vratimova's tube-production capacities in the Svermov ironworks in Podbrezova; in engineering--building No 4--separators in Tlmace, partial capacities in the construction program Tatra Koprivnice; in the chemical industry--petrochemical plant II in Zaluzi, a cellulose mill in Zilina, the polypropylene fiber cutting facilities of CHZJD [the Juraj Dimitrov Chemical Works] in Bratislava; in building materials--an additional section of the central telecommunications building in Prague; in transportation--the partial highway section between Horice and Humpolec and sewer section K in Prague; 127,000 housing units were completed and put into use.

On the other hand, however, some capacities were not put into operation, for example:

In fuels--some pumping stations on the natural gas transit pipeline; in the energy sector--the Kosice II power and heating plant; in metallurgy--some capacities at the SONP [United Steel Works] in Kladno; in engineering--the construction of the Pribor plant in Tatra in Koprivnice and capacities for Elitex in Surany; in the timber industry--capacities at the new wood combine in Polomka, and in the building materials industry--ceramic tiles Rako III; in full-service housing construction--a number of projects in technical and civic services at new residential centers.

New construction starts last year were exceeded only to the extent made possible by methodology (that is in agricultural construction such projects as drainage systems, putting in new gardens, vineyards, or hop-gardens). In comparison with the plan originally ratified for last year, however, there were deviations with the consent of the government, partially because it was not until last year that some construction projects got under way that

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had been originally planned for 1978 (for example, part of the second nuclear power plant in Jaslovske Bohunice budgeted at Kcs 5,3 billion), while, on the other hand, agreement was given to early starts to the detriment of the limit established in the directive for this year (for example, additional stages of the construction of the Dukovany nuclear power plant budgeted at Kcs 5.9 billion, some power and heating plants, etc). Even after making these adjustments, the total of new building starts remained below the limit set for the last year of the Sixth Five-Year Plan.

Nonfulfillment of the plan for construction projects budgeted at over Kcs 2 million was the major reason why the development of unfinished construction last year was not in accordance with the annual plan, much less with the plan for the Sixth Five-Year Period. The balance of RN (budget funds) at the beginning of last year was only 0.6 percent higher than in the previous year, and with a growth in the volume of deliveries of approximately 2.25 percent there was in 1979 even a slight decline in the volume of unfinished construction (not quite 2 percent). But even so the amount of unfinished construction at the end of last year was greater than stipulated by the Sixth Five-Year Plan for 1979.

The results of the fulfillment of the plan for capital investment had to be taken into account in making the preliminary draft of this year's plan.

Proportions in the Development of the National Economy in 1980

This year's plan focuses on creating the preconditions for maintaining the dynamic development of social production as the basis for a continually rising standard of living. The development of production must be insured while consistently taking into account our limited fuel-energy and raw material resources, while achieving the necessary savings in imports and the greatest possible effectiveness of the entire reproductive process. The tasks stipulated in the plans for particular areas of the national economy require the concentration of all available resources on the solution of internal and external problems connected with our economy's growth. The dynamics and the structure of material resources, with respect to their creation and their allocation to different areas of final use, are established with this objective in mind. The rate of growth of social product is to be higher than it was last year. This is to be insured by a growth in industrial output of 4 percent as compared to 3,9 percent in 1979 (5,8 percent in engineering), by a growth in agricultural production of 8 percent compared to an exceptionally bad preceding year, and a growth in construction of 3.8 percent.

The principle direction that increasing the effectiveness of the national economy's development will take in 1980 remains achieving the greatest possible savings in human labor while raising labor productivity 3.6 percent and while increasing production by improving labor productivity from its current figure of 94.7 percent.

Even though our fuels and energy base is better prepared for this year than it was at the beginning of last year, it will still be necessary to devote

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maximal attention to conserving all types of energy, especially liquid fuels. The plan has set demanding targets for conserving liquid fuels in all branches, particularly in transportation, construction and agriculture, and in freight and passenger transportation generally.

In comparison with last year's results, the plan counts on a growth in the total commodity turnover in foreign trade of 7 percent, with a priority growth in export of 8.4 percent as compared to an increase in imports of 6.4 percent. Fulfilling the targets for exports to both socialist and nonsocialist countries must be regarded as crucial. Insuring the planned relations in foreign trade must be considered one of the severely limiting factors in the development of the national economy in 1980.

The plan also established measures related to the state budget, targets for achieving savings in and cutting down on administrative and technical-economic staffs to achieve the planned slowdown in the present rate of growth of material costs in the nonproductive sphere.

The 14th plenum of the CPCZ Central Committee referred to the fact that targets for deliveries for the market funds in the requisite structure, variety and quality of products are no less obligatory than those for export. The primary goal should be to improve the way the market is supplied with several products that have not been available in recent years.

The targets for exports, for supplies for the domestic market and no less for the planned structure of capital investment are making increased demands on production to adapt more efficiently to the needs of the national economy.

The targets for the development of nonproductive consumption and for the potential scope of capital investment also are based on the potential growth of resources of national income and the necessity of solving the problems connected with foreign trade. The plan therefore calls for the more rapid growth of creation and the slower rate of domestic utilization of national income. This lower rate of growth of internal consumption of national income makes it necessary to ensure the practical and effective utilization of resources in the individual components of the economy, therefore also in capital investment.

The Basic Indicators for the Capital Investment Plan for 1980

At the 14th plenum of the CPCZ Central Committee, Comrade Hula in the report by the Presidium of the CPCZ Central Committee stated: "Starting this year (1979) and to an even more significant extent in 1980 we shall decrease the increment in the volume of capital investment projects from the originally planned 5 percent to 2.4 percent. Even so, the volume of capital investment is high and its share of the national income represents the highest possible limit."

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This principle is completely adhered to by the plan for 1980, and thus it counts on a stagnation in the level of capital investment and in the rate of growth of capital investment projects in comparison with last year. Taking this as its starting point the plan:

--concentrates supplier capacities on providing for construction projects designated mandatory tasks of the state plan, especially in the fuels and energy sector; for important facilities that are due to go into operation either this year or next; for regions of concentrated construction, especially in the North Bohemian Kraj. If the process of realization requires it, then, in the interest of concentrating contractor capacities and deliveries, the rate of construction of some less urgent projects will be temporarily slowed down;

--gives priority to the renovation and modernization of existing fixed assets over new construction. For this purpose it stipulates the more effective utilization of funds for projects budgeted at under Kcs 2 million and SZRN. It stipulates that the major share of these investments will be used in accordance with integrated programs, either for modernization or for investment programs with rapid return of investment cost;

--the branch orientation of capital investments follows the fundamental idea set forth in the Sixth Five-Year Plan, but takes into account to a greater extent the concept of the Seventh Five-Year Plan being drawn up, especially with regard to the development of the fuel--energy base; construction projects that will ensure export or anti-import production; projects related to international economic integration and to the utilization of our own sources of raw materials;

--decreases the number of starts of construction projects budgeted at over Kcs 2 million by 20 percent below the guideline, that is by a total of Kcs 12 billion, and decreases the number of starts in the category of specially regulated construction projects by approximately a quarter. This measure is an attempt to accelerate construction and to decrease the amount of unfinished construction, although its effects will not become apparent until the first year of the Seventh Five-Year Plan.

The capital investment plan for this year stipulates the following growth in the volume of investment in the national economy (exclusive of Z-program projects and private construction) broken down on the basis of the structure of work and deliveries:

	<u>1980 guidelines</u> 1979 plan	<u>1980 plan</u> 1979 anticipated
Year-to-year growth rates of capital investment projects in the national economy, total	105.0	102.4
of which -- construction work	107.1	103.9
--machinery and equipment	102.0	100.3

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The slowdown in the overall capital investment growth rate is in accordance with the conclusions of the 14 Plenum of the CPCZ Central Committee. The slowdown in the dynamics stipulated in the guidelines for the 1980 plan is higher by almost half for deliveries of machinery and equipment. The higher rates of growth for construction work than for deliveries of machinery and equipment could lead to the erroneous conclusion that the active part of fixed assets, i.e., machinery and equipment, is receiving lower priority. It should be pointed out in this regard that the higher growth rates for construction work is due to the significant underfulfillment of the plan for construction work last year. The progressiveness of the structure of construction work and deliveries in the capital investment plan shows up more clearly if we compare this structure with that planned for 1980 in the Sixth Five-Year Plan. In this year's plan, construction work reaches only 93.4 percent of the volume planned in the Sixth Five-Year Plan and is Kcs 5.6 billion below this level; deliveries of machinery and equipment will be 4 percent higher than stipulated in the Sixth Five-Year Plan and will total Kcs 2.3 billion more than called for. This will also raise the proportion of machinery and equipment in the total volume of capital investment projects from 40.3 percent [of the figure] stipulated by the Sixth Five-Year Plan to 42.9 percent [of that] stipulated in the plan for 1980.

The slowdown in the rate of growth of investment projects as compared to the guidelines is reflected in practice in the categories of construction projects in projects budgeted at over Kcs 2 million and in projects and branches with a special method of regulating unfinished construction:

	<u>1980 guideline</u> 1979 plan	<u>1980 plan</u> 1979 anticipated reality
Total volume of capital investment projects	105.0	102.4
of which:		
--construction projects budgeted at over Kcs 2 million	111.8	106.1
--branches with a special method of regulation	106.7	103.9
--construction projects budgeted at under Kcs 2 million and SZNR	96.0	97.5

We consider the more realistic growth rate of work and deliveries for construction projects budgeted at over Kcs 2 million to be practical, based on the experience of recent years. Even so, the increase of 6.1 percent is twice that achieved last year. The growth rate of deliveries of machinery for this category (104.1) is below the level achieved last year (105.) On the other hand there is a certain risk or demandingness involved in the

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realization of construction work which, following the failure to fulfill the 1979 plan (the plan for work rose only 1 percent above 1978's level), is to grow by more than 7 percent this year as compared to last year's anticipated reality.

The slowdown in the growth rate of work on construction projects in branches having a special method of regulating unfinished construction is a consequence of the slowdown of work on the natural gas transit pipeline.

With regard to deliveries for construction projects budgeted at under Kcs 2 million and SZNR it should be mentioned that in addition to a stagnation or slight decline as compared to last year's anticipated reality, there was also a strengthening of investments in this category in comparison with the guidelines, as well as in comparison with the original Sixth Five-Year Plan for this year. The planned scope of work and deliveries in this category will be Kcs 3.7 billion higher (i.e., approximately 8 percent) than anticipated by the Sixth Five-Year Plan.

The principle of the priority concentration of deliveries for construction projects designated mandatory tasks is expressed especially clearly in the plan for this year in the deliveries of machinery and equipment, including installation. While deliveries of machinery and equipment as a whole are to remain at the level of the anticipated reality of last year, for construction projects budgeted at over Kcs 2 million they are to grow by 4.1 percent, and for projects designated mandatory tasks they are to be 7.7 percent higher than last year's anticipated reality. The reason for this more dynamic growth in the face of the less dynamic growth of construction work for mandatory tasks (only 2.6 percent) is to be sought in the adherence to the principles of the more rapid beginning and completion of projects designated social priorities.

While in recent years we have called attention to the fact that in the category of construction projects budgeted at under Kcs 2 million and SZNR the indices did not fully express the planned objective with respect to the means of regulating this portion of capital investments in agriculture (that part based on the possible surpassing of orientational limits on the assumption of their forming greater resources of their own), we must point out in the plan for 1980 that for the first time we are including the total potential extent of capital investments in agriculture in the volume of capital investments for this category. Under the normal functioning of the financial instruments of regulation for this part of capital investments in agriculture there could thus be only negative deviations in their realization. The limits were set at their full extent as maximal, obligatory and nonsurpassable.

A certain potential for exceeding limits in this category of capital investments in the productive sphere exists due to the reserve the State Bank of Czechoslovakia has for the purchase of machinery and equipment in the form of foreign-exchange--return credits.

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The share of particular categories in the overall volume of capital investment during the last three years of the Sixth Five-Year Plan also testifies to our failure to orient the work of contractor capacities in accordance with the plans for particular categories of capital investments:

	1979	1979		1980	
	actuality	plan	anticipated actuality	guideline	plan
Total capital investments of which	100	100	100	100	100
--construction projects budgeted at over Kcs 2 million	38.0	40.0	38.0	42.6	39.4
--sectors with a special method of regulation	23.0	24.4	24.0	24.8	24.4
--construction projects budgeted at under Kcs 2 million and SZNR	39.0	35.6	38.0	32.6	36.2

In the category of construction projects with a special system of regulation a steady proportion will essentially be achieved even with slight deviations in realizing the plans, or rather, between the guideline and the plans. But the redistribution between deliveries of projects for construction projects budgeted at over Kcs 2 million and deliveries for projects budgeted at under Kcs 2 million and SZNR continues to be appreciable. Even though this redistribution is more evident in deliveries of machinery and equipment we must point out that it is also somewhat apparent in carrying out construction work. This state of affairs testifies to the lack of adaptability of our capacities, particularly engineering, to the needs of our capital investment. On the other hand, it also points to the great reserves there are in utilizing the significant extent of capital investments realized in the categories of construction projects budgeted at under Kcs 2 million and SZNR. Unfortunately, in this category, which continues to represent more than one-third of the volume of capital investments in the national economy, neither in realization so far nor in the drafts for the 1980 plan is either an increased share of modernization and rapid-return-of-investment-cost projects, or a more appreciable shift toward a more integrated program for utilizing this category in capital investment clearly visible.

With regards to the Z program, the plan for this year leaves its total volume at the level set in the guidelines for 1980 in its orientation indicator. In view of the fairly significant exceeding of the Z program last year, adhering to this indicator would mean a rather substantial decline in the extent of Z program projects. In the plan we took certain measures which would help in adhering to the principles now in effect in this part of

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capital investment. To a certain degree the possibility of using contractor capacities for construction projects in the Z program is being restricted with respect to enterprises within the [Czech and the Slovak] ministries of construction, and also in other contracting organizations subordinate to the Federal Ministry of Fuels and Power and the Federal Ministry of Transportation.

In the sector composition of capital investments there are certain deviations in the plan from the guidelines, the result not only of a decline in overall volume but even more markedly of deviations in the implementation of the plan for last year:

	1979 anti- pated plan 1980 actuality	1980 1979 anticipated plan
National economy, total	102.6	102.4
of which		
--industry	102.8	99.5
(industry, exclusive of the natural gas transit pipeline)	100.9	101.3
including		
fuels and energy	116.3	101.6
(without the natural gas transit pipeline)	111.0	107.9
metallurgy	97.5	72.7
engineering	96.3	107.0
chemical industry	92.0	87.9
light industry	99.7	92.2
timber industry	127.2	125.2
food industry	97.8	104.4
building-materials industry	94.8	96.7
--construction	105.9	93.9
--agriculture and forestry	97.8	92.9
--transportation and telecommunications	102.0	99.8
--full-service housing construction	102.5	111.0
--special-purpose construction by national committees	97.7	108.2

For the first time in several years the growth rate of capital investments in industry is slower than in the national economy overall. This is caused by the slowdown in the tempo of capital investments in fuels and energy (basically by the smaller volume of capital investments in the natural gas transit pipeline). If we disregard the influence of capital investments in the gas transit pipeline, however, then the overall growth rate of capital investments in industry is up from last year's level, and the decline in the rate for fuels and energy is less. The rate of growth of capital investments in metallurgy is declining, deliveries in this industry having peaked to a certain extent in 1978 and 1979. The situation is similar for crucial construction projects in the chemical industry. On the other hand,

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capital investments continue to increase significantly in the timber industry, chiefly with the progress of projects at the pulp mills in Ruzomberok and in part in Paskov as well. Capital investments are increasing in engineering and, after [many] years, in the food industry as well.

The growth rate of capital investments in full-service housing construction and in special-purpose construction by the national committees is indirectly determined by the significant underfulfillment of the plan in these areas last year. It should also be added that the scope of capital investments, both in full-service housing construction and with respect to the number of completed housing units, will once again at the beginning of the year, in the final phase of checks on housing construction regimes, be verified and adjusted according to the results (most likely downward).

Finally, a note in conclusion on the table in this section: these figures, in view of their greater detail than in previous tables may have a greater influence on final results than data of a more general nature.

Increasing the Share of Machinery and Equipment for Progressive Modernization and Rapid-Investment-Cost-Return Undertakings

After the last few years, which we can regard as a kind of test period, we have increased the percentage of modernization projects by an average of 5 percent. These percentages are set as an obligatory task of the state plan. This means that this part of SZNR and construction projects budgeted at under Kcs 2 million cannot be used for other purposes. On the other hand, we have stipulated in the organizational measure that if it should be impossible to complete all deliveries for these programs according to the adopted programs by the end of the year, and if these percentages have not been exhausted, it will be possible to carry them over to the following year (on the condition, of course, that the overall limits of SZNR will not be exhausted by a similar extent).

In establishing the percentage we began with the requirements for modernization, especially in the processing industry, but also took into consideration previous results. For this reason the differentiation of percentage shares is still rather significant, ranging from a low of 22 percent in the CSR timber industry and the CSR health-care-products industry to a high of 44 percent for construction output in the CSR and the SSR in both ministries of construction. High percentages are stipulated for engineering: in general engineering, 40 percent; in heavy engineering, 38 percent; in consumption engineering in the SSR, 41 percent; and in consumption engineering in the CSR, 37 percent.

Putting Capacities into Operation

By channeling funds into construction projects budgeted at over Kcs 2 million the plan creates the preconditions for putting capacities into trial operation, as well as for the gradual finishing of projects in 1980. Partly in

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accordance with the postulates of the Sixth Five-Year Plan, but also partly as a result of shortfalls in putting capacities into operation last year this year is more demanding than any previous year of the Sixth Five-Year Plan.

Let us mention at least a few crucial capacities that are slated to go into operation this year which will determine whether the desired increase in the productive-sphere output will be achieved not only this year, but especially in the first years of the Seventh Five-Year Plan:

In fuels and power these are new capacities for mining brown coal at the Brezno open pit mine (1 million tons/year), at the giant open pit mine Maxim Gorky--at the fourth stage (1.7 million tons/year of coal); further capacities on the natural gas transit pipeline ("Consortium"), 621 km in length and with the appropriate fully-equipped stations, are slated to be put into operation; in order to increase capacities for the production of electric energy, the first capacity of the 500 MW block at the Melnik III power plant is to go into operation this year; the first blocks will also become operational at the Prunerov II power plant, backed up by Polish capacities (210 MW). At the nuclear power plant in Jaslovske Bohunice the second block, having an output of 440 MW, will go into trial operation as early as the beginning of the year. The increase in output at the nuclear power plant, in particular, together with the reaching of its designed parameters by the first block should provide the basic part of the increased output of electric energy. Of the larger thermal power plants, the capacity of the thermal power plant in Kosice is to become operational.

In metallurgy, there will be new, modern facilities at the blooming and billet mill in the United Steel Works, National Enterprise in Kladno, the third stage of the medium-section mill at the Klement Gottwald New Metallurgical Works in Kuncice and capacities for continuous slab casting at the VSV [Eastern Slovakia Ironworks] in Kosice.

In heavy engineering, the most significant increase is the conclusion of the construction of the reactor unit at Skoda Plzen. In general engineering there will be capacities for constructing the Tatra truck operation.

In the chemical industry the most challenging task will be the start-up of Petrochemicals II, a new ethylene unit in Zaluz, at the designed parameters. Important capacities will be obtained by expanding the production of synthetic fibers and polypropylene rope in the Chemical Works of Juraj Dimitrov in Bratislava and for polypropylene silk at Chemosvit in Svit.

In the food-processing industry a second meat combine for supplying Prague (Prague North) is slated to go into operation.

In the nonproductive sphere it will be necessary first of all to complete the number of housing units in full-service housing construction this year. The plan, as discussed by the federal and national governments, calls for the

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completion of 140,700 housing units. This appreciable increase over last year's level--nearly 11 percent--still requires verification of actual results. We should also recall here that part of the report of the Presidium of the CPCZ Central Committee at its 14th Plenum in December last year that criticizes the condition of so-called finishing housing units, which even after several months cannot be handed over to tenants, or tenants are unable to move in because of the lack of basic utilities (electricity, water, gas, etc). The housing construction plan for this year with its lower number of starts in housing also provides a smooth transition to the lower amount of housing construction during the Seventh Five-Year Plan.

An important increase this year will be the 56 kilometers of highway sections that by the end of the year will make more rapid travel between Prague and Bratislava possible.

In the extensive construction in Prague two subway extensions will come into use this year, [sections] on routes C and A having a combined length of 8 km with 7 stations.

New Construction Starts in 1980

In an attempt to compensate for the shortfall in decreasing the excessive volume of unfinished construction in the previous years of the Sixth Five-Year Plan, the federal government back in September 1979 approved a directive on drawing up a draft plan for this year to decrease the number of starts by 20 percent. The plan as adopted retains this directive. The plan for starts for construction projects budgeted at over Kcs 2 million is Kcs 12 million lower than stipulated for this year by the Sixth Five-Year Plan or set by the guidelines for preparing the plan for this year which were reduced last year by some construction projects approved in advance.

Even though the state of design preparation for construction projects slated to begin this year was seen to be unsatisfactory as early as August 1979, it remained a challenging task in the preparation of the plan to make this reduction in such a way that the fundamental proportions for the final years of the Sixth Five-Year Plan would not be affected, but chiefly so that the desired sectoral structure of capital investments for the years of the Seventh Five-Year Plan be taken into consideration. The number of starts this year, in addition to the volume of uncompleted construction, significantly affects the sector structure of capital investments during the first half of the Seventh Five-Year Plan.

Following precisely these approaches, 60 percent of the number of capital construction projects (even after the reduction is made) are oriented toward industrial development. Of the capital investments in industry, priority number one is beginning construction projects for developing the fuel and energy base, to which as much as 42 percent of industrial construction starts are devoted (25 percent of all starts in the national economy). A suitable share, nearly 9.5 percent, goes to the development of agriculture.

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The plan adopted also contains the fundamental technological-economic indicators for construction projects that are to begin this year. Analysis indicates that if these are adhered to in implementing the plan, these projects, after being put into operation, can contribute to increasing the export capability of the economy, to raising the overall effectiveness of the reproduction system. Profit from these projects rises faster than the value of output and the number of workers. An especially positive factor is that reconstruction and modernization projects show qualitatively better indicators. To a certain extent the large portion of the increase in manpower for newly-begun projects must be counted as a minus. Of all the construction projects in industrial production, almost half of the total number for newly-started projects are oriented toward fuels and energy. Of projects in industrial production, exclusive of fuels and energy, there are out of the total number of projects started such projects as will make it possible to increase our export potential in the future. State goal programs (such as were included in the objectives) have been allotted 28 percent of the total starts in the productive sphere. Carrying out these projects appears from the fundamental indicators alone to be quite demanding with respect to imports of machinery and equipment.

In this section on building starts it ought to be mentioned why the lists of key projects at least slated to be begun in 1981 and 1982 were not approved together with the plan for this year, as has been done in the past. This was because at the time when the plan for this year was being approved, the guideline for 1981 had not been approved for any area of the development of the national economy. The objective reason for this was the fact that at this stage of work, work on drawing up the draft of the Seventh Five-Year Plan was far from complete. According to the program for last year, such work was supposed to be finished in January or February of this year. We wish to mention that the basic indicators for the Seventh Five-Year Plan had already been worked out by this time in the independent materials on the problems of preparing the Seventh Five-Year Plan in the area of the reproduction of fixed assets. A component of the work on this material as early as the middle of last year were the checkered balances of deliveries of construction work [and] of machinery and equipment, as well as the work list of key construction projects slated to be begun during the years of the Seventh Five-Year Plan. To be sure, this list was more exhaustive in the fuel and energy sector, and was only selective in the other sectors. In the guidelines for the preparations for the plan for 1980 the orientation list of construction projects to be begun in 1981 was also ratified. Accordingly, during the ratification of the plan the methods for completing the work on the plan for designed works for this year were also ratified.

We have to admit, however, that such a state of affairs tends to interfere with the smoothness of the preparations for capital investment, or at least gives rise to the possibility of formal excuses for a slower rate of preparation, either predesign or design.

The importance of timely design documentation [is something] we must be fully aware of for the plan for this year, too: approximately 20 percent

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of the construction projects that are supposed to or may begin this year did not have at the time when the plan was being ratified, fully ratified or approved design documentation at the level of the introduced design. The government therefore had to require the central capital investors throughout the year, but worst of all in April, to submit reports on the solution of supplier-customer relations based on the design documents completed, and only afterwards make a final binding decision on their beginning this year. This will be within the limits of the ratified limits. A separate problem with these construction projects is progress in the construction at the new cellulose mill in Paskov, or rather, the beginning of its further stages this year in accordance with the results of the evaluation of foreign offers and the decisions made regarding them.

Despite the significant limitation [placed] on the number of new construction starts, it will not be possible to decrease the volume of uncompleted construction to such a degree that the target of the 15th Congress of the CPCZ of reducing incomplete construction by 15 to 18 percent can be met. With a decrease in starts of 20 percent, as compared to the Sixth Five-Year Plan, and a 6-percent increase in the volume for construction projects budgeted at over Kcs 2 million, as compared to last year's actuality, a decline of budget funds of 5 percent will be achieved (taking into consideration the growth of budget outlays and reserves for them). In addition to the nonfulfillment of the plan for construction projects budgeted at over Kcs 2 million during the first four years we should also mention, however, that the volume of work and deliveries for construction projects budgeted at over Kcs 2 million will be 13 percent lower than envisaged by the Sixth Five-Year Plan. Taken all together, the evolution of these indicators testifies to the fact that the volume of uncompleted construction this year will remain at the same level, or will improve [only] insignificantly as compared to last year. The basic indicators and particularly the 20 percent reduction in the volume of uncompleted construction and the stipulated growth in the volume in construction projects budgeted at over Kcs 2 million this and next year are creating favorable conditions for the volume of uncompleted construction to decline approximately 8 percent in the first year of the Seventh Five-Year Plan.

The concentration of funds on the finishing of construction projects finds concrete expression in the quantified indicator for putting fixed assets into operation as well. As compared to last year's actuality, the value of completed capital construction projects added to the capital stock should rise approximately 13.5 percent.

Also directly related to this is the development of incomplete capital investment, that is, the amount of works and deliveries transferred but not yet added to the capital stock--it is actually a matter of unemployed assets. This indicator is supposed to decline 5.5 percent from last year's actuality by the end of the year. We have to admit, though, that the extent of incomplete investment, which nearly equals the value of the entire-year volume of capital investment in the national economy (excluding the Z

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program and private construction), is excessive. Even theoretical considerations, for example, bear witness to the kind of reserves we have for decreasing incomplete investments. If we decreased incomplete investment by 10 percent, then, assuming that at least half of this decrease would be new, productive fixed capital of at least average lucrativeness, we could achieve an increase in output amounting to roughly Kcs 4 to 5 billion per year.

The Development of the Basic Aggregate Indicators for the Reproduction of Fixed Capital

Due to the growth of measurable capital investment costs during the previous years of the Sixth Five-Year Plan, not even the relations between the growth of fixed assets and the growth of output in the final year of the Sixth Five-Year Plan are satisfactory. The most general basic relations can be expressed as follows:

		Indices of growth	<u>1980</u> <u>1979</u>
		Fixed assets	Output
National economy, total	a	106.8	103.7*
of which	b	109.0	
industry	a	107.7	104.0
	b	109.0	
construction industry	a	110.2	104.0
	b	112.0	
agriculture	a	106.1	108.0
	b	110.0	

a--total fixed assets

b--fixed assets: machinery

*--volume of national income created

In every part of the productive sphere the relation between the growth of output and the growth of mechanical fixed assets is unsatisfactory, the increase of mechanical fixed assets in industry and construction not reaching even half the rate of growth of fixed assets. Considerably better results than those of previous years were achieved in agriculture, where the growth of production is measured against an especially unsuccessful preceding year.

In the industrial sectors it was especially the productive-technological base in the fuels-and-energy sector that rose (by approximately 10 percent), and also in the building-materials industry, by 9.4 percent, and in the timber industry, by 8.3 percent.

The more rapid growth of fixed assets this year stems, to an important degree, from the cumulation of finishing of construction projects up to the last year

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of the Sixth Five-Year Plan. With a slower growth of output (caused by other factors than shortages of fixed assets, or capacity) there subsequently results a decline in the efficiency of fixed assets. For the major sectors of the productive sphere, this fall amounts to 2.2 percent overall, including 3.9 percent in industry and approximately 5 percent in construction. These and other indicators of the effectiveness of the reproduction process in industry as a whole lower the large share of expensive capital investments in fuels and energy. In the future it will therefore be necessary to test carefully whether capital investments in fuel and energy conservation would not be less expensive. Primarily, however, it is investors in the fuels-and-energy base who should approach the entire reproductive process and capital investment with greater regard for cost-consciousness.

In the structure of fixed assets, fixed assets in the form of machinery are growing faster this year than buildings. These basic indicators point out reserves we still have in the better utilization of existing fixed assets, especially the most modern of these, built in the last few years.

The plan for the reproduction of fixed assets this year stipulates the following development of the elimination and scrapping of fixed assets:

		<u>1979 anticipated reality</u> 1978	<u>1980 plan</u> 1979 anticipated reality
National economy, total	a	104.9	107.3
	b	110.0	109.1
of which, industry	a	111.5	110.3
	b	122.2	107.3

a--fixed assets, total
b--fixed assets: machinery

With an absolute increase in scrapped fixed assets, the rate of scrapping remains at essentially the same relatively high level attained last year. There is only a certain deceleration for machinery fixed assets in industry, where however, the dynamics last year as compared to a low 1978 were exceptional. As compared to the guidelines for 1980, there was in the plan a certain decline in the extent of elimination, primarily of a number of production capacities in metallurgy, in the chemical industry, in the building-materials industry, and in the food and timber industries. Adhering to the planned objectives for elimination is in the overwhelming majority of cases associated with providing the necessary manpower for newly built or modernized capacities, which could be better utilized with respect to time. For these reasons we shall impose sanctions this year as well for failure to fulfill the planned extent of elimination last year.

Conditions to Provide for the Realization of Capital Investments for 1980

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With a 20-percent decrease in the number of starts it could be assumed that the construction projects begun will be better provided with design documentation than in past years. Unfortunately, we must once again state that nearly 20 percent of the reduced number of construction starts did not have at the time of ratification of the plan a completely concluded design documentation at the level of the introductory designs. Therefore the government had to establish separate targets for the investing ministries for completing design documentation and for supplier-customer relations, in order to insure the beginning of these construction projects. More than half of such projects are projects of the Ministry of Fuels and Energy. The reduced number of projects to be begun creates better conditions for the continuous provision of the projects being executed.

The reduced scope of the construction part of capital investments, by approximately Kcs 4.5 billion from the guideline level, should create for the builders, after an unsuccessful last year, more realistic conditions for insuring the planned scopes of construction work. In the resources part of the plan, work by nonconstruction organizations remained unchanged, at the level established by the guidelines, and deliveries of construction capacities are rising by approximately 10 percent as compared to the guideline level (also as compared to last year's anticipated reality). This rise in construction capacities delivered is not the result of commissioning new construction projects, but this is required by rational procedure at uncompleted or finished projects, especially at large projects such as the construction of the Prunerov II electrical generating plant or the construction of the cellulose mill in Ruzomberok.

In the section of construction work from contractor and nonconstruction organizations there is less difference with respect to the guidelines, the result in particular of fulfilling the plan last year:

	1980 guideline	1980 plan
Construction work, total	100.0	100.0
of which, construction organizations	78.6	77.4
including: the ministries of construction of the CSR		
and the SSR	60.7	59.8
other national	10.4	10.5
federal	7.5	7.1
nonconstruction organizations	19.2	19.9
imports	2.2	2.7

In this period of emphasis on completing construction projects and putting capacities into operation, insuring the deliveries of machinery and equipment in the requested structure is of prime importance. The overall extent of deliveries of machinery and equipment remained at essentially the level set in the guideline (with an increase of under 1 percent as compared to the

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guideline). Not even in the composition of suppliers were there any significant changes:

	1980 guideline	1980 plan
Total machinery and equipment	100.0	100.0
of which, of domestic manufacture	71.8	73.7
including FMHTS (Federal Ministry of Metallurgy and Heavy Engineering	27.2	26.5
FMVS (Federal Ministry of General Engineering	29.8	30.6
other	14.8	16.5
imported	28.2	28.3

Perhaps only the shift of two points between deliveries from imports and deliveries from domestic manufacture with an increase in deliveries from domestic manufacture is more suggestive.

"Chess-board" balances of deliveries of machinery, just as of those of construction work, have their obligatory part in deliveries for construction projects budgeted at over Kcs 2 million; in the course of construction at the projects these deliveries are of key importance. A check at the end of the third and the beginning of the fourth quarter last year showed that in engineering in particular the mandatory character of "chess-board" balances for deliveries for construction projects budgeted at over Kcs 2 million lagged in practice behind the need for it, in some cases in the very specifications for these indicators from ministries to VHJ's and from VHJ's to prime contractors.

The total volume of deliveries of machinery and equipment for construction projects budgeted at over Kcs 2 million this year is 13.4 percent below the guideline. This means a somewhat more realistic scope for deliveries and installations. The percentage shares of individual contractors, however, are not changing significantly: (see table below)

	1980 guideline	1980 plan
Machinery and equipment for construction projects budgeted at over Kcs 2 million, total	100.0	100.0
of which, of domestic manufacture	73.0	69.7
including FMHTS (Federal Ministry of Metallurgy and Heavy Engineering)	45.7	44.7
FMVS (Federal Ministry of General Engineering)	11.7	10.4
other	15.6	14.6
imported	27.0	30.3

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Note: Only the 3.3 percent increase in the share of deliveries from imports and the corresponding decline in deliveries from domestic manufacture is comparatively marked.

As is done every year, supplier-customer relations for this year's plan were specifically discussed up to the level of the central organs for construction projects designated mandatory tasks. It must be said that these discussions went better than in previous years. Under the leadership of the FMTIR [Federal Ministry of Technological and Investment Development] the requirements were verified for work and deliveries based on the provisions of construction-project flowcharts and schedules. The number of projects for which it was necessary to resolve disputes at the VPK [State Planning Commission] level with the cooperation of the central organs of investors and contractors and the FMTIR in the course of preparing the plan declined from last year to this. Nonetheless, in spot-checking on the fulfillment of the plan for mandatory tasks during the third quarter of last year at the end of the year it still proved necessary to point out that in some cases construction-project schedules for this year still had not been worked out and concluded. We believe that it has already happened or that it will happen in the very first month of this year that the plans and schedules at the construction sites will become a real instrument for managing the construction process.

In preparing the plan it proved more difficult than in previous years to balance the required scope of steel construction fabrications. This is partly because part of the capacities for manufacturing them had to be freed for producing track transport for the brown-coal coalfield, and partly because the labor-input requirements has grown extraordinarily for deliveries of steel construction fabrications for the new types of nuclear power plants in Jaslovske Bohunice and in Dukovany. In some cases at less important construction projects where it was impossible to meet the need for steel construction fabrications, it was necessary to make adjustments in the volume of construction work, and in exceptional cases even to extend the deadline for completing the projects.

The balance of resources and requirements for building material fabrications will not be any better in the near future. Therefore, it is more important than ever to be conscious of the necessity of using these fabrications sparingly and to specify them in plans or use them only where it is absolutely required by the technology of the future operation or the use of the building. We cannot allow these steel fabrications to be used [simply] because this construction technology better accords with the fulfillment of indicators for construction enterprises. It will be necessary to abide more consistently by the regulations already in effect on the use of building-steel constructions, especially for structures of a nonproductive nature, or in the nonproductive sphere in general.

The better material provision of planned capital construction for this year will also be helped by the sharp rise in the number of balanced items, both at the SPK as well as at the ministry and VHI levels.

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The slowdown in the tempo of investment and thus the growth of deliveries to capital construction, the decline in the number of building starts and the intensification of the balance method in the plan create without doubt better conditions for the uninterrupted supply of building sites and the planned progress of construction. All this, however, cannot substitute for, but continues to call for, good organizational work on the part of all those who are responsible for insuring the progress of construction, especially in the supply and investor areas.

Some Methodological Adjustments in the Plan for This Year

Even if we assume that in drawing up the specifications for the plan the workers involved were acquainted with resolutions by the national governments on the plan and with organizational provisions for the 1980 plan, which were an appendix to government resolution number 320/1979, we still consider it useful to point out some changes:

--The resolution of the federal government prohibits the construction of new projects budgeted at over Kcs 2 million of an administrative nature, with the exception of those that are a part of necessary new outfitting of housing facilities and which were approved by a team of government experts.

--The government resolution ordered that the greater part of SZNR deliveries be oriented by program toward the unified modernization of production lines or operations. Programs thus worked out are to be furnished by the central organs to the Czechoslovak State Bank so that it can make provisions for their goal-oriented financing.

--For construction within the framework of the Z program it was ordered that they not be allotted deliveries of construction work from contracting organizations within the CSR and SSR ministries of construction, the Federal Ministry of Fuels and Power and the Federal Ministry of Transportation.

--It must also be pointed out that the resolution moves up the deadlines for working out and ratifying design tasks and preliminary designs for construction projects slated to begin in the coming years. Design tasks for projects scheduled to begin in 1982 should be ratified by 1 August 1980, and preliminary designs for projects slated to begin in 1981 by 1 August 1980.

Organizational provisions for the 1980 plan were published in an appendix to HOSPODARSKE NOVINY No 49 last year. Of the measures that were newly formulated for this year or more extensively interpreted, let us mention the following:

--modernization programs for unified production sectors; machinery and equipment slated for modernization and their priority and priority provision for these starting with the drafting of the plan;

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--modernization programs for unified production sectors; machinery and equipment slated for modernization and their priority and priority provision for these starting with the drafting of the plan;

--for construction projects designated mandatory tasks, the responsibility of meeting the ratified interim work deadlines;

--the explanation of the method to be used in making adjustments to construction project schedules at the beginning of the year and in evaluating the implementation of the plan in annual volumes in cases of savings in budgeted outlays achieved at construction projects;

--measures providing for the method of drafting and implementing the plan for design work.

This year is the final year of the Sixth Five-Year Plan. We could therefore also assess the fulfillment of the plan of the entire five-year period (assuming that this year's plan will be completely fulfilled). We can already state that the overall scope of investment as well as the size of investments developed within the framework of the overall proportions established in the Sixth Five-Year Plan. Of the potential resources for investment, approximately 4 percent will remain unused. This will occur especially for construction work, where part of the originally planned resources, however, were not even generated due to the lower increase in construction capacities. The average year-to-year rate of increase in investments (4.2 to 4.3 percent) was lower than in the previous five-year plan (7.4 percent and somewhat lower than called for by the plan (4.6 percent).

In the implementation of the planned structure of work and deliveries for capital construction, despite an overall nonfulfillment of the volume of investment amounting to some 1.5 percent, the shortfall for projects budgeted at over Kcs 2 million and projects with a special method of regulation, combined, will come to 8.3 to 8.5 percent, and projects budgeted at under Kcs 2 million and 2 projects combined will be exceeded by nearly 11 to 12 percent. This shift from large-scale construction projects to comparatively small undertakings we consider to be a fundamental problem of the current and past evolution of capital construction. It is caused only in part by the lack of discipline on the part of investors, and to a greater extent by the insufficient adaptability of contractor capacities to the planned structure of work and deliveries.

One of the important indicators of the Sixth Five-Year Plan, namely, the decrease in the volume of uncompleted construction by 15 to 18 percent, will not be met. Assuming that this year's plan will be fulfilled, the

volume of uncompleted construction this year will remain at essentially the same level as in the first year of the five-year plan. The conditions allowing for the decrease in uncompleted construction by 8 percent next year will, however, be created.

We can consider as positive results a certain stabilization in the budgeted outlays for construction projects and their slower increase. The branch proportions in the implementation of the Sixth Five-Year Plan will be adhered to in a relatively favorable way with the desired slight increase in the share of investments in the productive sphere.

Important capacities were (or will be) put into operation during this five-year period. Thus, for example, in the history books of the future the Sixth Five-Year Plan will stand for the largest increase in electrical generating station capacities (almost 3000 MW from steam electric plants and 880 MW from the nuclear power plant. During this five-year plan the largest number of housing units ever constructed in a five-year period will be completed (660,000 units). On the other hand, however, not all deadlines were met, and not all capacities planned in the Sixth Five-Year were (or will be) put into operation before the deadline.

A negative result of the five-year plan is that the economic effectiveness of the reproduction of fixed assets did not improve. On the contrary, there will be a worsening in the indicators characterizing the effectiveness of the reproduction process as a whole, especially with respect to the relation between the growth of fixed assets and the growth of social product or the national income produced. There will be a decline in the efficiency of fixed assets in industry, in construction, and in agriculture as well.

We must reflect seriously on these and future, more detailed analyses of the results of the implementation of the Sixth Five-Year Plan in devising the Seventh Five-Year Plan.

Economic Efficiency Discussed

Prague INVESTICNI VYSTAVBA in Czech No 1, 1980 pp 11-12

[Article by Jiri Klima, corresponding member of the Czechoslovak Academy of Sciences: "On Perfecting the 'Principles for Assessing the Effectiveness of Investments'"]

[Text] Two years ago a discussion had already developed in the pages of INVESTICNI VYSTAVBA (1) on the experience gained in implementing decree number 3/1975 of the Federal Ministry of Technological and Investment Development on the principles for assessing the effectiveness of investments (henceforth, 'Principles'). At that time I (2) pointed out several advantages the Principles had over previous methods, not only for the energy sector, but, I think, for the greater number of the other branches and departments as well.

What is involved here is primarily a matter of introducing a unified normative of the comparable economic effectiveness of investments; of introducing the

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time factor; and further, of the coefficient of the economic effectiveness of investments (presented in Paragraph 8 of the Principles) taking into account both the economic lifetime of the fixed asset under consideration as well as the time factor. I consider the chief advantage of the Principles to be that in selecting the economically most effective alternative of the various investments being considered they return to the criterion of the minimum of transferred costs expressed as an absolute [value], as compared to the previous method (3), which was based primarily on relative indicators, chiefly the indicator for return. In this respect, the Principles also enforce a certain integrating tendency with methodological suggestions [being made] in the countries of the socialist camp, primarily in the Soviet Union.

The theory and practice of evaluating the effectiveness of investments is still in the process of development, however, and therefore it would not be sensible to regard the methods in use even today as definitive. Significant in this respect is, for example, the article by Academician Khachaturov (4), an extensive discussion in VOPROSY EKONOMIKI on the theory of the effectiveness of investments where the author asserts the positive role of the Soviet entire-state methodology (5), but at the same time points to the necessity and the directions for its further improvement. I think that our Principles, too, require a certain improvement in a number of areas.

Distinguishing the Concepts of the Effectiveness of Investments and the Economic Effectiveness of Investments

The economic optimization of the productive system we understand as being the selection of that possible development of the system that, given limited resources, leads to the achievement of the stipulated economic goals, or that approaches these the most closely. The degree of attainment of the economic goal by such a development alternative of the productive system we define as its economic effectiveness. The "economic effectiveness" of the system of investments under consideration, and within the framework of this system, of every individual investment, we thus understand to mean the degree of attainment of the economic goal of the entire system by the decision in question.

Economic optimizations, criteria of economic effectiveness, are often criticized for not being comprehensive, for not taking into consideration certain unquantifiable conditions and relations in the system being optimized, for example, the environment, health and safety at work, psychological, aesthetic and other factors. In the great majority of such cases critics have extra-economic factors in mind, which economic optimization criteria do not in fact take into consideration, nor should they. It should be realized that consideration of the economic effectiveness of investments is merely one (even if the most important) part of the decision-making process.

A decision about the development of the system is always a political decision that must be based on systemic criteria; in the case of a social system, such as the economic system is, on society-wide criteria. One instrument used

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in such decision-making must always be an appraisal of social effectiveness, which includes not only economic but all extra-economic criteria as well. These we consider to be all social interests affected by the decision under consideration, such influences being as a rule incapable of being expressed in monetary terms and incompatible with economic evaluation. This often concerns such considerations as political, social, health, national defense, ecological, psychological, etc. Actual decision-making is often influenced by just such considerations and not always in accord with the results of the calculations of the economic effectiveness of the decisions being contemplated. This is because for decision-making what is of prime importance is the higher level of effectiveness--social effectiveness, which includes both economic and extra-economic considerations. Since, however, these disparate perspectives cannot be expressed in the same units (usually they can be expressed only in words), it is not even possible to formalize the decision-making process and one has to accept that decision-making must be more or less intuitive.*

One thing that I consider to be a deficiency of the Principles is that they fail to distinguish between these concepts and often designate as "effectiveness" what, from context, obviously means only economic effectiveness. This shortcoming is also reflected in another weakness of the Principles, namely in the ambiguous formulation of the economic effectiveness of investments and in distinguishing between what is the criterion and what is the indicator of effectiveness.

Expressing the Economic Effectiveness of Investments

A close study of the Principles reveals that they do not specify unambiguously the number and kind of criteria or indicators of for the economic effectiveness of investments and the hierarchy of their importance. In the second part of the Principles, the economic effectiveness of investments is characterized by the indicator of comparable economic effectiveness (transferred costs) and five indicators of overall (absolute) economic effectiveness. This, in my judgment the most valuable part of the Principles, which also resembles most closely the Soviet methods previously mentioned (5), stands here as somehow isolated, lacking any relation to the other parts. In the Federal Ministry of Technological and Investment Development Decree No 31/1975, to which the Principles are an appendix, there are given in Section 2, paragraph 1 an additional 11 mandatory indicators for evaluating investment objectives for productive construction projects and in Section 3, Paragraph 2 there are another 7 indicators for accessing preparatory documentation for productive construction projects.

Decree No 3/1975 of the Federal Ministry of Technological and Investment Development does not, however, explicitly define anywhere the use of even a single of the indicators of absolute economic effectiveness or the criteria of transferred costs for expressing comparable economic effectiveness.

*Only in certain cases is it possible to include quantified extra-economic criteria in the optimized model in the form of limits.

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With the best will in the world one can consider only Section 2, Paragraph 2, letter b to be such a definition, to which the introductory paragraphs of the Principles refer concerning absolute effectiveness (article 7) and comparable effectiveness (article 8). This part of the decree, however, concerns only construction projects that are a task of the state plan or projects that are centrally monitored. But there remain outside the scope of such monitoring all the other buildings and all the investments that are not buildings (for example, the machinery included in the budget of building projects frequently represents a larger investment volume than the buildings in which it will be installed).

Even in the other parts of the Principles themselves, however, a definition of the comparable and overall economic effectiveness of investments is not mentioned. In the third part of the Principles, which is devoted to the application of general methodological principles, they do not appear at all, while in article 22, paragraph 3, economic requirements and effects are described by 78 (!) indicators of economic effectiveness (of appendix number 5/D), among which are included indicators for comparable and overall economic effectiveness.

The lack of lucidity and the length of the Principles, with their large number of important and less important criteria and indicators, presented all together and not differentiated as to their significance, thus make it possible for different users to assess the economic effectiveness of one and the same investment completely differently, depending on which indicator or indicators they give greatest subjective weight to. It would therefore be desirable for the Principles to define one or two criteria for the economic effectiveness of investments (Soviet methods give one criterion for absolute and one criterion for relative economic effectiveness) and to list as supplementary indicators a fairly small number of those that in a specified form can partially supplement the criterion with regard to the practicality of the decision under consideration, for example, in terms of material and energy balance-sheets and so forth.

It would contribute to the comprehensive nature of the criteria for the economic effectiveness of investments if at least some of these supplementary indicators of effectiveness could be combined into a single separate criterion. Cooperative research studies conducted by the departments of economic and power management of the CVUT (Czech Institute of Technology) and the Research Institute for the Planning and Management of the National Economy show that it would be possible to take demands on investment funds, manpower, energy consumption and imports into consideration by including these factors, in the form of limiting conditions, directly in the type of cost criteria used. Implementing the results of this research in practice would help significantly in simplifying the Principles and in insuring their more unambiguous and unified application.

Evaluating the Economic Effectiveness of the Development of the Productive Systems

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With the development of our economy and the links between its individual elements it is becoming ever more difficult, in a number of cases, to evaluate economic effectiveness in isolation and to determine how individual investments (construction projects) have been realized independently of the other elements together with which it forms a certain productive system (for example, transportation, communications, energy, water management, etc). Khachaturov (4) also touches on a similar problem, namely, the expression of the so-called integral economic effect.

What is involved here is the expression of the economic effect of more comprehensive investments, of specific systems that are realized gradually, over a fairly long period of time. It might be a matter of selecting the optimal variant of complexes being constructed in stages that are composed of a number of partial capital investment projects that are put into operation in stages in different years, with a different economic lifetimes of the partial projects and that are functioning throughout their entire lifetime (for example, the gradual construction or elaboration of distribution networks, the gradual construction of heat and gas systems, the step-wise expansion of manufacturing plants by adding new units, etc).

The annual form of the transferred costs criterion given in the Principles is not suitable for making decisions in such cases. The correctness and suitability of aggregative criteria that take into consideration the entire period of optimization must be reviewed, and this period must also be defined, or a base period must be defined, i.e., a period, the data for which are included in the criterion selected). Examples for this already exist, both in the Soviet literature as well as in the methodologies of our own branches. (6)

Since the optimizations of developing systems are characteristic not only of the energy sector, I consider the problem of devising an integral criterion for system optimization to be an urgent one.

In order to further improve the Principles I suggest:

--That the concepts of the effectiveness of investments and the economic effectiveness of investments, and the concepts of the criterion of effectiveness and the indicator of effectiveness be consistently distinguished.

--That the usage of these criteria and indicators be unified in the sense of FMTIR Decree No 3/1975 and the Principles.

--That the number of indicators for the effectiveness of investments be reduced to an absolute minimum.

--That the comprehensive character of the criterion of the economic effectiveness of investments be increased by the inclusion of some important limiting factors.

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--That the criterion of the economic effectiveness of the development of the production system also be included in the Principles (an integral criterion of system optimization).

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Energy Constructions Viewed

Prague INVESTICNI VYSTAVBA in Czech No 1, 1980 pp 13-17

[Article by Eng Jiri Barcal and Eng Jiri Kobosil, "Notes on the Use of the Branch Method for Evaluating Energy Construction"]

[Text] A number of regulations have been issued serially for the area of capital investment, among which is the basic regulation concerning the evaluation of the effectiveness of investments, namely, the FMTIR [Federal Ministry of Technological and Investment Development] Decree No 3 of 11 Mar 1975 (henceforth FMTIR Decree) (1).

The current method of evaluating the effectiveness of investments has been in use for four years now and so it can be partially assessed.

In accordance with the FMTIR Decree, several departments have published branch guidelines in which they applied this regulation to their own specific conditions. One of these branches is the energy [sector]. We wish to acquaint the reader with some of the results of using the branch method and to attempt to summarize the information gathered to help further improve the quality of

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the data used in the decision-making processes at the different levels of preparing capital investments.

The Reasons It Was Issued

The publication of the branch regulation, Guideline of the Federal Ministry of Fuels and Power No 11 of 23 Dec 1975 on the Evaluation of the Effectiveness of Investments in Power and Gas Works (2) (henceforth, FMPE Decree) was necessary for two basic reasons:

--The first was the need to take into consideration the specific conditions in construction projects in the energy [sector].

The general regulations can meet the specific needs only of average construction projects, whether this be in respect to the scope and complexity of the project, technological solutions, automatic control, ecological considerations, the supplier systems, etc. For projects that do not fall under this heading, those that are of either exceptionally large or small scope or that involve very exacting production technology, working for systems where its products are put into use immediately, the general regulations are usually not applicable to the specific requirements of the needs of either the preparers nor the reviewers of documentation. Therefore, some parts of the general regulations cannot be used, and others must be extended and supplemented. The basic reasons for publishing the FMPE Guidelines are described in detail in (3). In this contribution we shall present only the basic supplements and adjustments of this guideline as compared to the FMTIR Decree.

- a) Augmenting the criterion of comparative economic effectiveness, i.e., transferred costs. The criterion given in the branch guideline makes it possible to take into account the dynamics of the use of investments (chiefly the start of their use) in the course of operating, while the FMTIR Decree assumes constant operating costs.
- b) The FMPE Guideline introduces a criterion for evaluating the variant of the system developing. A system wide perspective is essential for electrical and heating systems. The article Systems Optimization in the FMPE Guideline also makes it possible to evaluate the effectiveness of different ways of structuring the various stages of the construction of a given complex of projects.
- 3) The FMPE Guideline permits in certain special cases (chiefly in the heating sector), where it is impossible to achieve a suitable productive effect, certain adjustments in the criteria of transferred costs.
- d) The FMPE Guideline also establishes an outline for the economic part of projective studies. This proved to be necessary since it is in studies (studies of the development of a system, optimization studies, studies serving as a basis for issuing investment objectives--IZ) that the fundamental economic and technical comparisons (the selection of the technical solution, site selection, amount of resources, etc) between the most diverse variants

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are made. In view of the very long lead time for major capital investment projects in the energy field (studies, preparatory and design documentation including discussion, construction)--approximately 10 years--it is already too late for such calculations after the IZ [investment objectives] have been issued.

3) An appendix to the FMPE Guideline gives a detailed listing of specifications and indicators for the basic types of investments in energy (condensation electricity generating stations, nuclear power plants, hydroelectric power plants, electric stations, installation of electricity, power and heating plants, heating plants, heating mains, fly-ash control installations). It is also unambiguously defined which specifications and indicators must be verified at the various levels of documentation (perspective study, IZ, capital construction objective, study for a complex of projects (SSS), design task (PU), preliminary design (UP), final technical and economic evaluation of a project (ZTEV). For other types of project it is recommended that the listing of specifications and indicators be suitably adapted.

f) The FMPE Guidelines sets out in detail the economic content of the preliminary documentation report, which is most extensive for large-scale capital investment projects. The discussion of the progress of the work has been considerably simplified, a number of duplications and obscurities have been eliminated.

g) The FMPE Guidelines omitted some of the prescribed indicators of economic effectiveness of Sections 2 and 3 of the FMTIR Decree. These are indicators not pertinent to this type of project. On the other hand, some of the indicators were made more extensive.

h) The FMPE Guidelines omit areas that do not concern energy, for example, means of formulating and assessing the effectiveness of construction projects in the area of civic services.

i) The recommended indicators for internal relations are replaced by suitable indicators for construction projects in the energy field. In so doing their number, as compared to the FMTIR Decree, was significantly reduced.

j) The branch guidelines eliminate the recommended indicators for foreign trade (which for all practical purposes are irrelevant for construction projects in the energy field).

k) The FMPE Guidelines contain other minor differences and adjustments such as the definition of a single terminology for the economic section at the different levels of documentation, the introduction of a calculation for the updated total costs of a construction project (to determine the losses from unemployed investment funds after the construction period), and so forth.

A second reason for publishing the branch guidelines was to unify a number of published regulations in a single comprehensive regulation.

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In our view it is essential that in the process of drafting the documentation of a construction project the economic section and technical-economic calculations not be dealt with only by worker-economists, but that technical-economic calculations, just like technical calculations, be made an element of the methods and process of conceptual workers too in the documentation of key projects. Nor is it correct to turn out specialized economists who come into contact with the technical problems of a construction project only from time to time and then demand that they draw up the technical-economic sections as a conclusion to the design process at the appropriate level of documentation. Experience shows that we have

--only a very limited number of centralized and specialized workers for the economic aspect of construction projects who supervise the work in this area of specialization, influence conceptual questions, determine the thoroughness of evaluation, etc.

--technical workers who in their work on designs provide for the economic part and who, to the extent possible orient the conceptual workers toward employing the economic perspective from the very beginning of work on the given documentation. Those workers who come into contact with the given problems only occasionally cannot be expected to have a detailed knowledge of all regulations and how they interrelate, for there is a considerable number of them. For example, the basic regulations in the area of evaluating the effectiveness of capital investment projects in effect today are the following:

----FMTIR Announcement No 163/73 of the Codebook of Laws, on documentation for construction projects dated 12 December 1973

----FMTIR Decree No 3 on principles for evaluating the effectiveness of construction projects dated 11 March 1975

----FMTIR and FCU [Federal Price Office] Decree No 4 on supplementary preparatory documentation for construction projects subject to review by a board of government experts dated 19 March 1975

----FMTIR Guideline No 2 on sets of technical-economic indicators (THU) in capital construction dated 15 February 1972

----SPK [State Planning Commission] Methodological Directions No 52240/74 for drafting the proposal for the Sixth Five-Year Plan for the years 1976 to 1980.

An indisputable advantage of the FMPE Guidelines issued was that all these regulations were combined in a single document, thus making possible their real and consistent employment in practice. It turned out that the branch guidelines made it possible to provide the timely, high-quality and unified elaboration of the economic section of the documentation for energy construction projects and thereby accelerate the decision-making process and thus capital construction itself in the branch.

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The Complex Nature of the Concept

This evaluation method is, when appropriately and creatively applied and when a responsible attitude is taken toward the work, applicable to practically all tasks that come up in practice. We shall name some specific tasks where this method has proved its suitability as well as its demandingness:

- the construction of the building [sector] administrative center for the energy
- the construction of ASR [Automatic Management Systems] in enterprise practice
- the construction of a desulfurization device for a condensing electricity generating plant.

The most important reason [for using this method] is to capture the broadest possible congruities, but at the same time only the most important of them, in evaluating capital investment projects, which are defined primarily from a national-economic perspective of evaluation. Here is where we observe the greatest contribution of this method as compared to earlier ways of evaluating the effectiveness of capital investment projects, where economic reports had only a single goal, the calculation of the prescribed indicators of the economic effectiveness of capital investment projects (the internal percent of capital investment projects (the internal percent of return, the time to recoup funds invested), which for the most part reflected the enterprise point of view. For this reason the adoption of the new method caused great difficulties and in a number of cases continues to do so.

We should mention the basic requirements of the national-economic perspective in evaluating the effectiveness of capital investment projects.

- the extent of uncovered requirements, the share of the project for covering these requirements (including the shares of other projects, as appropriate),
- the current and future use of existing capacities,
- the comparison of investment and noninvestment alternatives,
- the determination of the influence of the project on the use of existing fixed assets,
- coordination of the project with the development plans of the enterprise, V.H.J, branch,
- the effect of the project on changing the structure of work and deliveries from the contractors, on overloading the transportation [system], etc.
- the effect of the project on regional development,

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- how the project will affect foreign relations,
- the effect of the project on the scientific-technological infrastructure,
- extra-economic effects of the project (the living and working environments, health and safety conditions at work, etc).

Every construction project also has a large number of relations, which is also dependent on its purpose. We should limit ourselves to the essential requirements and effects, which are proportional to the effects of the given project, that is as a rule to its size, and deal with them in greater detail. It must be admitted that each of these points is demanding with respect to data and time for working these data up. The informative ability of the results is proportional to the depth and specificity of the data,

The basis of the approach should be a certificate testifying that the capital investment project suggested is the most effective means of covering the disproportion between requirements and resources. The fact is that a capital investment project is usually one of the most expensive solutions, up significant funds unproductively during the course of construction and predetermining the level of their effectiveness for very long periods. For this reason we often try, when evaluating alternatives to calculate the results of what is called the null alternative, that is, noninvestment solutions (utilizing the time fund, organizational solution, etc). Not until this variant has been considered is the evaluation of the alternatives suggested a complex solution. Unfortunately it is most difficult to obtain data for this alternative and there is an obvious fear on the part of the investors that reserves will be discovered in building funds, in the excessiveness of requirement, etc. If the investment is allowed, that is always a simpler solution than intensifying the use of existing production funds or optimizing requirements, etc. For the majority of construction projects in the energy [sector] the shortage of energy can be solved by intensification only very rarely. There are greater reserves in optimizing power demands on the part of customers.

Another frequent occurrence is the attempt to restrict or to lower the criteria for evaluating a construction project. This simplifies work on the documentation involved considerably. That this part may as a result be worthless, however, is in many cases overlooked; after all, the results this causes with respect to a given construction cannot be legally determined. At the same time, this effect must be dealt with sooner or later, and thus covering it up creates problems difficult to resolve for a later time. We see, therefore, advantages to the prescribed national-economic perspective in that it is relatively easy to detect the "maneuvers" referred to and then to eliminate their adverse effects more or less successfully.

The Influence of the Amount of Detail of the Technical and Economic Parts of Documentation

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The use of the given method of evaluating the effectiveness of construction projects points out, in a number of cases, that technical details are worked out quite unnecessarily in the preparatory documentation, for example, in line with the area of specialization and interests of those working on the documentation, while more fundamental technical-economic and extra-economic aspects of the project are left unconsidered. The argument here is that "the design capacity for the increased volume of the economic report is not available." Meanwhile, it would be enough if workers of specifically technical orientation were primarily technical-economic workers, and if high-quality operating capacity were available without demands for additional manpower. (The statement "this must be decided upon by the economist in a separate task" is simply incorrect, because this practically eliminates in advance the influence of effectiveness on the decision.) For the decision-making process it is not important at the PU [design task] stage what the detailed solution will be for such problems as, for example, fire escapes (unless this should happen to be a matter of an entirely new concept for this fire-escape that would also affect the selection of the concept of the entire capital investment project). What is important is what kind of external relations and effects the entire project will have, or certain individual projects or operational systems, as the case may be. The solution of these detailed tasks should be dealt with only by the drafters of the design.

The Importance of Relative Economic Effectiveness for the Decision-Making Process

It has turned out that strengthening the criteria of the relative economic effectiveness of capital investment projects in the FMPE Guidelines, that is, of transferred funds, in comparison with the generally applicable regulations, was a correct [decision]. In the course of working on the documentation of especially extensive systems of construction projects it proved, in fact, that this amplification was still not sufficient.

It must be borne in mind that the criterion of relative economic effectiveness is not the sole basis upon which options are selected in the decision-making process. It might perhaps suffice where it is just a matter of making a technical-economic judgment on partial technical solutions, for example the selection of the number of cooling pumps for some machines, where the effect of other, extra-economic influences is minimal. Where it is a question of the effect of external connections of various degrees of operational reliability, of various ecological effects, etc, the current regulations attempt to take these effects into consideration even in the decision-making process. The technical-economic calculation, of transferred costs of different alternatives, for example, is only one of the bases for decision-making. In order for there to be a certain objectivity in evaluating the influences referred to, in more complex cases (for example, for heating-plant systems) a tabular arrangement of all the major factors affecting the selection of the alternative in the decision-making process is utilized.

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TABLE I

Table I. Major Requirements and Effects of Alternative Development Decisions for a Power and Heating System

Factor	Unit of Measurement	Alternative 1, 2, 3 etc.
Capacity	Megawatt	
Annual energy supply	Heat unit/year Megawatt-hour/year	
Transferred costs	Kcs 1 million/year	
Investment costs	Kcs 1 million/year	
Increased requirements for fuels and energy	TeraWatt hours/year	
Increased manpower	Persons	
Ecological effects	Natural units	
Foreign trade effects		
--during construction	Kcs 1 million	
--during operation	Kcs 1 million/year	
Reliability	Relative, between alternatives	
Future prospects	Relative, between alternatives	

Table I is a simplified example of such a table for evaluating the alternatives for the development of heating-plant systems which has already been used in practice. Its advantage is the horizontal comparison of the pertinent data. Clearly, this arrangement was selected because it is not possible to express all requirements and effects (for example, ecological effects, local conditions, construction deadlines, reliability, etc) in monetary terms in such a way that their vertical sum would be a single overall value expressing the effectiveness (not just economic effectiveness, but effectiveness in the broadest sense of the word) of the given construction project.

In practice, the headings of this table must be adapted to the specific requirements of the particular type of projects, as well as of specific undertakings.

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The use of the filled-out table in the decision-making process then consists of the expert determination of the weight [to be given to] the individual specifications. We are convinced that this procedure must be further intensified by including experience gained and thus contribute to improving the quality of decision-making.

The Continuity of the Evaluation of Effectiveness at the Various Levels of Documentation

It appears that the groundwork for a correct orientation is laid as early as in the projective studies. In the energy sector these studies are of basically two types:

--optimization studies (studies on the development of the electrification network, tasks for the development of science and technology, etc). The drafters of these materials are research institutes, scientific-technological bases, and so forth. The methods used are varied and adapted to the specific purpose. They do not always employ the same methodological principles, however, and thus they are not always bound by the national-economic perspectives of the FMPE Guidelines. The relation of the evaluation of effectiveness to the evaluation of specific capital investment projects is sometimes weak.

--territorial-technical studies, serving commonly as a basis for issuing the IZ [investment objective], or several IZ's. What is involved is the selection of a suitable locality, location, selection of the optimal size of output, etc. The drafters are usually design institutes cooperating with the investor. Some of these tasks should be handled in studies of the first type, which is far from being the rule. The comprehensive comparison of possible alternatives, chiefly from the national-economic point of view, is essential here, however. The task is a difficult one, whether a new capital investment project, "in a green field," is involved, or expansion of existing capacities. When it is a matter of expansion, the question also arises of effects on the use of existing funds (or of their liquidation, as the case may be). The data must be carefully classified, since data are broken down differently in operation than is required for the evaluation of the effectiveness of capital investment projects.

The number and extensiveness of projective studies are increasing gradually and the predictive ability of the results, that is, their usefulness in making decisions on IZ, is also increasing.

This goal should always be kept in mind in drafting them. An appropriate aid here can be the decision table.

At this level, too, the evaluation of comparable economic effectiveness (the basis for selecting the most advantageous alternative) often ends, and further documentation for the most part expresses predominantly description and the results of the selected alternative of the decision, that is, it expresses the overall economic effectiveness of the specific construction project.

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The investment objective, the next step in the documentation of a construction project is, up until the time of drafting (and chiefly the ratification of the PU) the binding document of the project. The data and criteria of the IZ also express the value (for example, of funds) for which this investment proved advantageous in comparison with other alternatives and thus was chosen to be realized. If these values are exceeded it could happen that other, including noninvestment, decisions could prove to be more advantageous.

For key construction projects in the branch, the IZ study and the IZ itself are drafted far in advance of the realization of the project (as much as ten years), with the result that costs calculated for the project in the study are set at the level of the year it was drafted. In the course of preparing the project the calculated costs are generally not revised and updated and often not even the expanded scope of the project arising in the course of discussing and defining in greater detail the requirements of local organs, contractors or the investor.

Adverse changes in the basic specifications and indicators with respect to the specifications and indicators in the IZ occurring in the course of drawing up the preparatory documentation are undesirable and can interfere with the optimal nature of the solution chosen. In addition, it must be kept in mind that the data in the IZ form part of the bases upon which intermediate plans for capital construction are compiled, thereby increasing their importance. The IZ of key projects in the sector does not compare alternatives, it requires a certain conception of the construction to have been formulated already and gives only an evaluation of partial alternatives, usually of a technological nature in the preliminary documentation.

The figures given in the IZ are the first data with which the data achieved in the PU [design task], UP [preliminary design], and ZTEV [final technical-economic evaluation of the project] are compared.

In the IZ more complicated calculations of economic effectiveness are often not carried out; the basic questions of comparable economic effectiveness really must be solved in advance.

The study for a complex of projects (SSS) is frequently a further level of documentation, concerned either with its chronology (stages of construction) or its material aspects (relations with other investment projects being built at the same time).

The specifications and indicators for individual construction projects and for all of them taken as a whole form the basis for the work on the economic section of this document. An attempt is generally made, however, to limit the economic report of the SSS in comparison with the economic report of the PU of the main project, the PU of related projects, in view of the shortage of data, the amount of work considering the deadlines, etc. On the other hand it must be admitted that many SSS's have to be redone later because fundamental changes have occurred that raise doubts about the advisability

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of using the original study. Nevertheless, one must see that it is possible to decide upon the concept of a project constructed in stages, for instance a heating plant, only after the study for the complex of the entire heating system, including the economic report, has been completed. Only in this way can one see the advantage of seemingly disadvantageous pre-investments, the efficacy of the final concept, etc.

The degree of precision required for the economic report in the PU of key projects is then confirmed by the panel of government experts. The need for sufficient explanation, supporting materials, etc, is well known, despite which there are always many deficiencies in the economic reports in practice. The amount of work required by some sections is considerable, however, and frequently excessive. What is involved is principally

--comparing the THU of the project being evaluated to the standards. The THU of the project itself are essential, but it would perhaps be practical to omit some of the standards, for instance [that of] another similar project, particularly one abroad. The fact is that the THU in themselves tell nothing about the construction conditions of the project under review. In such cases it is perhaps better to use the project's complete technical-economic document for the comparison. The rules for converting to standard values--actually, comparable values--are followed by the comparison alternative in the sets of THU gradually being issued for the basic types of power plants, power and heating plants, electric stations, heating systems, ash control). Likewise, the comparison of every specification listed with [its value at] the previous level is perhaps excessive. It should be enough to compare the basic specifications and indicators, which is what is prescribed in the first section of the economic report under possibilities for limiting duplication;

--the quite complex calculation of profit generation and distribution. In the energy [sector] we have, to be sure, compiled computer programs to do this, as described in detail in (5), but there are times when a hand calculation for a single year of operation, for example a target year, would be preferable for a specific purpose, chiefly to analyze the effect of key factors.

Basically, we must realize that it is a matter of computing overall economic effectiveness at a time when the possibilities for selecting alternative decisions and their consequences (chiefly with respect to savings) are extremely limited as compared with earlier documents.

The Economic Report of the UP or the Single-Stage Project (JP) is the last overall technical-economic document of the project until it is completed. Practice has shown that it is only a matter of making the values given in the PU more precise. Since the concept of the construction is by this time quite clear, it is not necessary to justify it again in detail, as is often done in practice (in cases where this is not required by the panel of government experts for the PU). The calculations of comparable economic effectiveness in this document are important only in assessing possible

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alternatives for the detailed technical solution. The remarks on the excessive amount of work required by certain sections of the economic report of the PU also apply here.

The Final Technical-Economic Evaluation of a Construction Project (ZTEV) is the last document on the effectiveness and practicality of a construction project. From the standpoint of effectiveness it is the most important comparison of the THU's achieved with the requirements of the IZ, PU or UP. It often becomes necessary here to make complicated recalculations of the projects' requirements to the real operating conditions and implementation. This is not always objectively necessary but often merely serves as an alibi for some of the participants in the capital construction project. What is far more useful is to determine the pluses and minuses of a particular project in time for them to be reflected in other projects being designed and built. The length of time necessary to prepare and realize construction projects in the energy [sector], however, somewhat decreases the effectiveness of this final document. For key construction projects in the energy sector the ZTEV is conducted before all the major designed parameters can be attained (e.g., those of output, utilization, etc) which decreases the usefulness of this document still further.

Evaluating the Effectiveness of Reconstruction and Expansion

Capital investment projects for rebuilding or expanding existing industrial plants are becoming more common all the time. Instructions on how to evaluate these specific questions are scanty. Certain instructions do exist, namely

--in the THU system, where it is necessary to compare specifications and indicators in the starting year (existing conditions) with specifications and indicators in the target year (the future conditions after the reconstruction or expansion under consideration);

--for calculating the generation and distribution of profit.

This involves only calculations characteristic of the alternative referred to, that is only calculations giving the absolute economic effectiveness of the project. A disadvantage of the FMTIR Decree and the FMPE Guidelines is their neglect of this part of the task in calculating the comparative economic effectiveness of capital investment projects, i.e., in evaluating the alternative to the decision. Obtaining the increase in output desired by constructing new facilities is usually the most expensive way. It is clear, therefore, that first the possibility of achieving the increase in output by renovating or expanding existing capacities should be investigated, and only then should new construction be undertaken.

To solve the practical tasks it was necessary to devise and draw up new methods (in so doing we proceeded on the basis of the fundamental principles of the system-optimization criterion of the FMPE Guidelines).

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Let us mention some of the basic problems that arose in the course of dealing with these tasks:

How does one define a suitable period of time to use in comparing the alternatives to expansion being evaluated when existing and new facilities are involved? Is it necessary to evaluate the increased price of existing fixed assets when it is similar for all the alternatives and differences appear in the need for future investment, will it be enough then to evaluate only new capital investments? Does it suffice to evaluate only the change (usually an increase) in the cost of operation?

We devised certain methods because it is a matter of a task that we have to deal with frequently, and one that is in the most important area of the evaluation of the effectiveness of capital investments, the calculation of comparable economic effectiveness.

The Relation of These Regulations to Others

The FMPE Guidelines collected in one place all the regulations on evaluating the effectiveness of construction projects issued to that time. Since then other regulations have been issued, for example:

the advantage of apparently disadvantageous pre-investments become clear, as well as the practicality of the ultimate conception.

To concern oneself with the detailed technical-economic evaluation of one stage of the construction of a heating plant is a waste of time, even if it is an independent project, because what is important is the economics of the entire heating system which is to be detailed in the SSS. Then for the individual projects of the complex it must be verified that they agree in all parameters with the values of the corresponding SSS. If not, adjustments must be made and the SSS must be subjected to another technical-economic review.

The Economic Report of the PU [design task] is, up until the ZTEV, that is until the stage of ordinary operation is reached, the most important construction document, virtually replacing the IZ. The basis for economic evaluation in the PU should be

--the calculations for comparable economic effectiveness only if these have not already been made. Otherwise, it suffices to calculate the results together, reference being made to the appropriate sources;

--the working-out of the technical-economic indicators (THU) for evaluating the project and the comparison of these data with the comparative bases.

a) FMTIR and FCU [Federal Price Office] Decree No 4 dated 24 August 1976, which changes FMTIR and FCU Decree No 4 on supplementing the preparatory documentation for industrial construction projects subject to review by

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government experts dated 19 Mar 1975. This eliminated the necessity of working out the gross orientation conversion to the wholesale price level from the complex reorganization.

b) Communication on a method of studying the economic effectiveness of capital investments affecting woodlands (FMTIR Bulletin, Part 3--4 dated 18 July 1977).

c) FMTIR Methodological Instructions dated 28 October 1977 for evaluating the effectiveness of rationalization measures for conserving fuel and energy.

d) FMTIR and FCU Announcement on conditions for initiating construction projects and their registration and record keeping dated 1 November 1977. These general regulations conflicted with the complex concept of the FMPE Guidelines.

For a) the situation is very simple: the calculation of one of the tables in the preparatory documentation for industry construction projects subject to review by a panel of government experts was eliminated.

The change in b) was one of the first experiments in putting a [monetary] value on extra-economic influences, in this case the functions of the woodlands. As everyone knows, in addition to their direct economic importance as a source of wood, forests also have a value due to their effect on the climate, the recreational possibilities they offer, etc. The financial expression of all these aspects is very beneficial from the standpoint of the national economy and is the first step toward the possibility of a vertical addition in the decision-making tables. Meanwhile, however, misunderstandings have occurred in practice; in our view this value expression can be used only in transferred costs, specifically where the project's evaluated alternatives require different amounts of woodland, or where woodland is used with different degrees of quality. The practical significance is obvious: there is a possibility here of influencing this criterial size of the comparable economic effectiveness. The request of the sector of forest and water management is that these value specifications should also influence the absolute effectiveness of the project (lower profits, etc). This seems unrealistic, however, because no enterprise will make up the amounts calculated; this is a fictitious entry/item, as contrasted to the expression of losses in agricultural production resulting from construction.

With regards to c), the situation here is also acceptable because the FMPE Guidelines and the methodological instructions issued by the FMTIR are similar. What is involved is tightening up the rather general criteria of the FMPE Guideline on evaluating the specific tasks in the area of rationalizing fuels and energy, which in the form of practicality studies can be demanded during the discussions on the preparatory documentation of the project. Unifying the philosophy of economic evaluation has proved to be not only beneficial but objectively necessary. Rationalization, i.e., achieving savings in production and consumption, is always contingent upon the extra

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costs for its realization being available which is similar to one of the aspects of the comparable economic effectiveness of investments (whether it is better to make a capital investment or not). In these methodological instructions the CSSR's limited resources of fuel and energy are referred to quite frequently; we too consider this an important factor in the rational utilization of the primary energy resources.

There are great difficulties with d) in practice. The list of THU required by the FMPE Guidelines No 11, 1975 understandably does not include any of the specifications and indicators called for in the project's registration permit by announcement No 85/1977 of the Codebook of Laws. Misunderstandings and unnecessary correspondence are the consequences, giving rise to delays in discussing and approving the documentation for the construction project.

The 4 years these methods have been in effect have been enough to demonstrate their strong points and their weak points. Let us attempt to summarize the most important of these that we discovered in evaluating the effectiveness of capital investment projects:

Drafting the branch guidelines proved to be most useful. If they had not been issued, it would have been impossible to achieve the relatively great improvement in the quality of the documentation for construction projects in the energy sector, both because of the complexity of the demands and the comparatively low degree of specialization of those working on this part of the work.

The supplements and adjustments to the FMTIR Decree made in the FMPE Guidelines have completely proved their worth. Practice shows that in some sections they could be expanded even further.

Practice confirms the necessity of improving the calculations of the comparable economic effectiveness of capital investment projects (comparison of alternatives, justification of the project) and the possibility of restricting the calculations for overall economic effectiveness (description of the selected alternative in preparatory and design documentation). This situation is linked to the position of the energy sector, where the need for the construction is the result of very real need for energy, the primary purpose of the economic section of the documentation for construction projects in the energy sector being to demonstrate that the decision made was the optimal one.

It is essential, especially for major capital investment projects, to compare alternatives before the IZ is issued, and for this purpose to have this aspect of the evaluation of the effectiveness of construction projects more thoroughly covered by regulations. The general regulations have not yet dealt with this area; the FMPE Guidelines goes further in this direction than do the general regulations.

In justifying the construction project all the more important circumstances relating to the project must be evaluated, i.e., the project must mandatorily be evaluated from the national-economic point of view.

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It is useful to calculate comparable economic effectiveness by computing the so-called null investment alternative, meaning what would be the result if the capital investment project under consideration was not carried out.

Economic effectiveness can also be computed for projects not having a direct economic effect, or one we do not know how to express. It is still possible to compute funds transferred to this project, which then determine the societal reductions required to achieve the effectiveness of the given project.

The methods for computing the comparable economic effectiveness for renovation and expansion projects should be worked out in greater detail.

For construction projects that have an exceptionally large number of ties to other entities, the evaluation of the comparable economic effectiveness should be made by using a tabular arrangement of the major factors since the expression of transferred costs is not sufficiently comprehensive.

Changes in the regulations relating to the evaluation of the effectiveness of capital investment projects should be kept to a minimum, and to the extent possible they should be issued all together when the basic regulations are revised or supplemented.

Those working on drawing up the documentation must be induced to deal primarily with the basic technical-economic conditions of the construction project until the preparatory documentation is completed, even if this means leaving problems of technical details unresolved.

Design personnel, especially those working in design organizations, must incorporate the criteria of economic evaluation in the methods and processes of their work.

In conclusion, we can say that the methods used to evaluate the effectiveness of capital investment projects now in use in the energy sector have proved their worth. They have helped raise the economic justification of construction projects to a much higher level than formerly and provide, to a certain extent, an objective view of a contemplated capital investment project. The quality of this work is gradually improving, thereby also improving the basis for decision-making concerning a specific project. Nevertheless, adjustments to further improve this aspect of capital construction still appear to be necessary. In no case, however, can one agree with the opinion that these methods are unsuitable, complicated and superfluous. Experience and information show that these methods are basically in the right direction and that the changes recommended are of a quite minor nature.

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