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INTELLIGENCE MEMORANDUM

INDICATIONS OF A PLANNED SHIFT
IN THE FUEL ENERGY BALANCE OF THE USSR

CIA/RR IM-413

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FOREWORD

The purpose of this memorandum is to examine the implications of recent Soviet developments that may affect the position of petroleum in the fuel energy balance of the USSR. The memorandum is in no sense a full analysis of the Soviet fuel energy balance. It is concerned with the relative shares of petroleum and solid fuels; it mentions hydroelectric power only incidentally and does not discuss atomic energy for peacetime use.

This memorandum has been coordinated within CIA but not with other IAC agencies.

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CIA/RR IM-413
(ORR Project 25.735)

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INDICATIONS OF A PLANNED SHIFT IN THE FUEL ENERGY BALANCE
OF THE USSR*

Summary and Conclusions

On 14 May 1955 an article in Pravda sharply criticized the relatively small share of petroleum in the fuel energy balance of the USSR. On 25 May 1955 there was announced the appointment of N.K. Baybakov, Minister of the Petroleum Industry and a leading petroleum specialist, as chairman of the newly organized long-range planning commission. These developments suggest that the share of petroleum in the Soviet fuel energy balance will rise more rapidly than it has during the Fifth Five Year Plan (1951-55) and that the share of solid fuels will decline.

As determined by Soviet policy in the past, coal has had a predominant and rising share in the fuel energy balance, and petroleum has had a small and declining share. That trend has been arrested during the period of the Fifth Five Year Plan. Because of a higher level of annual investment in the petroleum industry relative to that in the coal industry, production of petroleum has increased at a faster rate than production of coal. The new position on the fuel energy balance, as outlined in the Pravda article, may anticipate significant changes in Soviet planning.

The recent emergence of the Ural-Volga region as a petroleum area more important than Baku has reduced costs of transportation of petroleum products to most parts of the USSR. This reduction may have been so significant that the emphasis on greater utilization of less efficient local fuels is no longer justified on either economic or autarchic grounds.

It is also possible that for the past several years Soviet planners have seriously underestimated fuel requirements. The upward revision of the plan for investment in coal and petroleum in the 1948-50 period, the hydroelectric program of the early 1950's, and the numerous appeals

* The estimates and conclusions contained in this memorandum represent the best judgment of ORR as of 15 July 1955.

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and directives to reduce consumption of petroleum suggest recognition of the fact that energy requirements exceeded original estimates. Production of petroleum can be expanded more rapidly than production of solid fuels, and a sharp increase in petroleum production may be planned to meet these energy requirements sooner and with greater assurance. The relative availability of petroleum reserves and coal reserves may also affect such planning.

It is also possible that anticipated requirements largely exclude fuels other than petroleum -- requirements, for example, imposed by the recently revived program for dieselization of the railroads and by the apparent planned expansion of automotive production during the Sixth Five Year Plan (1956-60).

The Pravda article stated that the cost of production of a metric ton* of standard fuel in the petroleum industry was one-half that in the coal industry and that labor productivity in the petroleum industry was double that in the coal industry. Such stress on purely economic factors suggests that the controversy over the relative shares of petroleum and solid fuels may be part of a larger problem -- that of allocating resources, to a greater degree than in the past, on the basis of relative costs. Economic considerations, however, have often been subordinated to sociopolitical considerations in the USSR -- in the regional autarchy policy, for example -- and economic factors may not be the governing ones.

Changed strategic conditions also may underlie the indicated increase in the share of petroleum in the Soviet fuel energy balance. Dependence upon the vulnerable Baku area for a predominant part of the nation's supply of petroleum may have imposed a strategic limitation on Soviet reliance upon petroleum. The shift to the relatively secure Ural-Volga area as a major source of supply may have removed this limitation. Soviet strategists may feel that the changed geographic distribution of the petroleum industry now makes possible effective defense of the petroleum industry in time of war.

* Tonnages are given in metric tons throughout this memorandum.

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I. Introduction.

A Pravda article of 14 May 1955 ^{1/}* sharply criticized the fuel energy balance of the USSR and called for an increased share for petroleum in this balance. To implement this change, a sharp increase in the production of crude oil and natural gas was advocated. If acted upon, this proposal would effect substantial changes in the levels of production and consumption of petroleum products and in investment in the petroleum industry. This memorandum provides a background against which to evaluate the possibility of a change in policy regarding the fuel energy balance of the USSR and examines current developments as they may affect that energy balance.

II. Background.

A. Policy and the Fuel Energy Balance, 1930-54.

A clear statement of prewar Soviet policy on developing primary sources of energy is attributed to the XVI Party Congress (1930). One of the most important tasks of socialist development, according to the statement, was a maximum increase in the production and utilization of local fuels (peat, shale, coal, and natural gas), substituting them wherever possible for fuel hauled over long distances. ^{2/}

The Party position on the role of petroleum in the fuel energy balance is reported to have been voiced in 1939 by A.Ye. Probst, a fuel economist. He is alleged to have stated that "if an eight- or ten-fold increase in the production of petroleum were required, this would be not only practically unattainable, but also would be undesirable from the point of view of the national economy." ^{3/}

From 1932 until 1951 the share of coal in the Soviet fuel energy balance increased, and that of petroleum decreased. According to a Soviet source, ^{4/} the percentage of shares of fuel (in terms of standard fuel) in the USSR was as follows:

<u>Fuel</u>	<u>1932</u>	<u>1937</u>	<u>1940</u>	<u>1950 Plan</u>
Coal	59.4	69.5	71.9	75.6
Wood	19.9	13.6	13.9	9.7
Peat	3.7	5.5	6.2	6.2
Crude oil	17.0	11.0	7.9	6.3
Natural gas	0.0	0.0	0.0	1.4
Shale	0.0	0.1	0.1	0.8

* For serially numbered source references, see the appendix.

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On the basis of available data, it is not possible to extend the foregoing tabulation. On the basis of known production of petroleum products and coal and known production or production trends for the remaining types of fuel, however, it seems probable that in the 1951-54 period the relative share of petroleum products was rising moderately while the relative share of coal remained stable.

As indicated in the tabulation above, "the decisive mineralization of the fuel balance [the sharp rise in the relative share of hard coal*] is the principal feature of the development of the fuel industry." 5/ This feature of the Soviet fuel energy balance is in sharp contrast to the trend in the Free World.

The first important postwar announcement by the Russians on fuels was made in February 1946 when Stalin announced certain long-range goals (15 to 20 years) for coal (500 million tons) and petroleum (60 million tons). 6/ In March 1946 the Fourth Five Year Plan (1946-50) goals for coal (250 million tons) and petroleum (35.4 million tons) 7/ reflected approximately the same ratio (8 to 1) as indicated by Stalin. Stated aims of the Fourth Five Year Plan included intensive extraction of coal from local fields and the substitution of local fuels for more distant supplies. 8/ Also planned was large-scale development of both natural and manufactured gas. 9/

The Soviet policy of increasing the share of local and synthetic fuels in the fuel energy balance is reflected in several Soviet publications that appeared during the period of the Fourth Five Year Plan. Nikolayevskiy, a prominent petroleum economist, 10/ and Probst, a member of the Academy of Sciences of the USSR, 11/ both stated views which supported development of local, low-quality fuels and expansion of production of synthetic fuels, primarily for the purpose of avoiding long hauls of natural fuels -- particularly petroleum. A similar view was voiced in a 1949 article entitled "The Saving of Mazut** -- a Most Important Task for the National Economy." 12/ This article was an appeal to reduce consumption of mazut in all sectors of the economy, chiefly by the substitution for mazut of fuels such as pulverized coal, generator gas, coking gas, associated gas, dry gas, and coal.

* The term hard coal is used here in the European sense and includes anthracite and bituminous coal.

** Mazut is a Soviet term for viscous liquids, principally residual fuel oils, road oils, and bituminous tars.

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The Fifth Five Year Plan called for a 43-percent increase in the production of coal in 1950 and an 85-percent increase in the production of petroleum. ^{13/} Other objectives of the announced Plan included "improvement in the geographical distribution of industrial enterprises ^[by] bringing industry still closer to the sources of raw materials and fuel with the object of eliminating irrational and excessively long shipments." The objectives for the petroleum industry included the development of production of synthetic liquid fuel. The gas industry was to be developed further, with the production of natural gas, coal gas, and shale gas "to increase by approximately 80 percent in three years." Consumption of gas by households and automotive vehicles was to be expanded. Production of peat was to increase by 27 percent, and further development of local coal deposits was to be assured. Production of synthetic liquid fuel from shale in the Estonian SSR was to be increased by approximately 80 percent.

The Plan objectives to increase the production and consumption of local and synthetic fuels were reflected in an article in December 1953. ^{14/} This article stated that the XIX Party Congress (1952) directed that because the available supply of liquid fuel was inadequate to meet the demands of all consumers, the use of substitutes (solid fuel and gas) for liquid fuel in all sectors of the economy be increased. The article singled out the automobile and tractor park, stating that it could be converted to the use of both natural and manufactured gas, thus conserving a large quantity of gasoline for other uses.

B. Postwar Investment in the Petroleum and Coal Industries.

According to available data, ^{15/} the average annual investment in the petroleum industry during the Fourth Five Year Plan was 3.9 billion rubles,* an increase from 1.9 billion rubles in 1946 to 6.2 billion rubles in 1950. Average annual investment in the coal industry in the same period was 6.3 billion rubles, an increase at a more moderate rate -- from 4.5 billion rubles in 1946 to 8.3 billion rubles in 1950.

The 6.2-billion-ruble investment in the petroleum industry in 1950 apparently marked a turning point in the level of annual investment in the coal industry. According to a Soviet source, ^{16/} investment in the petroleum industry during the Fifth Five Year Plan was to be about 45.7 billion rubles, 2.3 times the total investment made

* All ruble values are given in terms of 1945 prices.

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during the Fourth Five Year Plan. If this level of investment is achieved, the average annual investment in the petroleum industry during the Fifth Five Year Plan would be about 9.1 billion rubles. Available data indicate that this level of investment would be either slightly less or slightly more than that for the coal industry. ^{17/} Thus the gap between relative levels of investment in the coal and petroleum industries has been narrowed considerably, has been closed, or has shifted in favor of the petroleum industry.

In the 1946-51 period, estimated annual investment per million-ton increase in output was rising sharply in both the petroleum industry and the coal industry. This average annual investment was almost four times greater in the petroleum industry than in the coal industry. If the Fifth Five Year Plan levels of investment in the petroleum and coal industries are realized, this ratio would be somewhat increased. Because the calorific value of petroleum products is higher than that of coal, in terms of standard fuel equivalents, the capital-output ratio would not be quite so divergent (probably more on the order of 2 to 1 or 2-1/2 to 1). The recent sharp increases in investment in the petroleum industry undoubtedly are a reflection of increasing demand for light fractions in the output of petroleum products.

Because standard fuel equivalent comparison is a purely technical measure, it is not completely satisfactory. One hundred-percent substitutability between petroleum and coal is not possible. In certain sectors of the economy -- the automotive and agricultural machinery-tractor park, for example -- any significant degree of substitution is precluded, except in wartime emergency conditions, on the basis of economic and technical considerations. The above comparisons, therefore, are only crude approximations at best.

III. Current Developments.

A. Developments in the Petroleum and Coal Industries, January to April, 1955.

At the beginning of 1955 there was no evidence of dissatisfaction in the USSR with either the level of production of petroleum or the share which petroleum held in the fuel energy balance. In January 1955 the Minister of the Petroleum Industry reported that the plan for

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production of petroleum had been fulfilled ahead of schedule. The Minister also stated that tremendous sums had been allocated to the petroleum industry and that there were available all of the prerequisites for a further increase in petroleum reserves and for a continuing growth in the production and refining of petroleum. 18/

Another indication that in January 1955 there was no intention of increasing the share of petroleum in the Soviet fuel energy balance came with the announcement in that month that the coal production goal for 1955 had been raised to 391 million tons, a gain of about 45 million tons over 1954. This increase was the result of an upward revision of 20 million to 25 million tons in the original 1955 coal plan. 19/ A further change in the coal industry occurred on 2 March 1955, when A.F. Zasyadko was dismissed as Minister of the Coal Industry and replaced by A.N. Zademidko. Zasyadko's dismissal, reportedly, was for unsatisfactory work. 20/

In April 1955 appeared the first significant indication of discontent with an important aspect of the Soviet petroleum industry. In the leading article of the April issue of Neftyanoye khozyaystvo, the journal of the Ministry of the Petroleum Industry, there was severe criticism of the Soviet natural gas industry. The article stated that natural gas was the cheapest of fuels but that, along with associated gas and manufactured gas, it had not been delivered to the national economy in sufficient quantities. Current rates of development of the gas industry were described as extremely unsatisfactory. It was reported that the directives of the XIX Party Congress on the Fifth Five Year Plan, which called for an increase of about 80 percent in the production of natural gas, associated gas, and synthetic gas, were not being fulfilled. Exploration for natural gas in the last 2 or 3 years was said to have been carried out on too small a scale, and production of gas in the last 3 or 4 years was reported to have grown at a rate far from satisfactory. 21/

It may be of significance that the article by A. Solodko published in May 1955 cited the prohibitive cost of production of synthetic gas, and the April article complains of an insufficient level of production for all types of gas, including synthetic gas. This would seem to indicate that as late as April 1955 the new point of view -- that presented by Solodko -- on the relative merits of fuels had not crystallized.

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B. Possible Indications of a Planned Shift in the Fuel Energy Balance.

The first indication of a possible planned shift in the fuel energy balance of the USSR came with the appearance of the Solodko article in Pravda, of 14 May 1955. ^{22/} A. Solodko, a relatively obscure technical writer on petroleum matters, stressed the importance of increasing the share of crude oil and natural gas in the fuel energy balance of the USSR. He stated that the growth of the Soviet petroleum industry had been much slower than was warranted by the possibilities for the development of the industry.

Solodko also stated that the share of petroleum fuels in the Soviet fuel energy balance had been decreasing while that of coal had been increasing. To support his case, Solodko reported that production of coal in 1953 was 11 times that in 1913 and 2.5 times that in 1937 and that production of petroleum in 1953 was 5.7 times that in 1913 and 1.7 times that in 1937. In 1932, Solodko further reported, 1 ton of petroleum was produced for every 3 tons of coal and in 1953 only one-half ton of petroleum for every 3 tons of coal. He pointed out that as a result of this trend solid fuels accounted for about 85 percent of the fuel energy balance of the USSR and gaseous and liquid fuels for only about 15 percent.*

Solodko stated that this fuel energy balance was "not progressive," He declared that although coal would continue to play an extremely important role in the Soviet fuel energy balance, it would be economically more advantageous if the share of crude oil and natural gas were increased. Solodko even went to the extreme of pointing out that in foreign countries the trend was toward just such an increase.**

* The ratio apparently reflects the absolute tonnages for coal and petroleum, probably for the purpose of emphasizing the disparity.

** This statement would appear to be significant inasmuch as it would imply admission of a technological lag in the USSR. The trend in the Free World is toward a greater share for petroleum in the fuel energy balance. In the US the role of petroleum has been steadily increasing since before 1900. By about 1920 the share of crude oil and natural gas in the US fuel energy balance had reached the point indicated by Solodko as representing the present level in the Soviet fuel energy balance (85 percent solid fuels and 15 percent crude oil and natural gas). ^{23/} By 1952, crude oil and natural gas contributed 61.7 percent of the US energy supply from mineral fuels and waterpower. ^{24/}

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Solodko next advanced a number of arguments supporting his position on increasing the share of petroleum in the Soviet fuel energy balance. First, he referred to the efficiency of crude oil and natural gas as sources of thermal energy. Second, he stated that the cost of a ton of standard fuel obtained from mazut was one-half the cost of a ton of standard fuel obtained from coal. Third, he affirmed that productivity of labor per ton of standard fuel for workers engaged in production of petroleum was double that of workers engaged in coal mining. Fourth, he declared that the construction of an oilfield usually takes from 2 to 3 years and of a coal mine of equal capacity from 5 to 7 years.

The cost of a ton of standard fuel derived from natural gas, according to Solodko, is one-fifth the cost of a ton of standard fuel obtained from coal. The time and capital investment required for the construction of a gas field and necessary trunk pipelines, he said, is several times less than the time and capital required for construction of a coal mine of equal capacity. Solodko stated that despite the fact that the USSR had large reserves of natural gas, production was not large and that natural gas did not hold its proper place in the Soviet fuel energy balance.

Turning to consumption, Solodko stated that the use of petroleum fuels in railroad transport was very advantageous. He noted that a diesel locomotive was four times more efficient than a steam locomotive and that the life of a diesel locomotive was almost twice that of a steam locomotive.

Solodko devoted most of the balance of the article to placing the blame for what he termed an insufficient increase in production of petroleum resources. He attributed the failure partly to an underestimation by certain scientists of the potentialities of the USSR to develop the production of crude oil and natural gas. This, he declared, resulted from ignoring economic factors in planning the development of the fuel industry.

Two fuel economists, A.Ye. Probst and N.M. Nikolayevskiy, were singled out for attack. Probst was attacked for saying, among other things, that an eightfold or tenfold increase in the production of petroleum was practically unattainable and also was undesirable from the point of view of the national economy. Probst was also attacked for insisting on the "widespread" introduction of substitutes for petroleum fuel and for predicting a more important place for synthetic

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fuels in the economy. Solodko pointed out that the cost of a ton of gasoline produced from coal was six times that of gasoline produced from natural crude oil and that the cost of gas produced from solid fuel was three to four times that of natural gas.*

N.M. Nikolayevskiy, described as a doctor of economic sciences working in the petroleum industry, was attacked for including among a number of long-range trends a decrease in consumption of petroleum fuels by railroad transport by conversion to locally available, low-quality types of fuel and the introduction of substitutes such as synthetic gasoline for petroleum fuels.**

Solodko also attacked "certain workers of the Soviet State Planning Commission" for having subscribed to the theory that a substantial growth in the production of petroleum was undesirable. Solodko declared that workers of the Commission had not envisioned a sufficient rate of growth of the share of petroleum in the Soviet fuel energy balance. Solodko said further that the level of capital investment in the development of the petroleum industry clearly had been insufficient. M.A. Shchedrin, Deputy Chairman of the State Planning Commission, also was attacked indirectly -- Solodko named him as the editor of one of Probst's books.

Solodko concluded by stating that the USSR had the greatest natural resources of petroleum in the world. He remarked that a sharp increase in the production of crude oil and natural gas with a minimum investment of money and time would permit the USSR to make extremely advantageous changes in the structure of the fuel energy balance -- changes which would result in the conversion of a number of fuel-consuming sectors of the national economy from solid fuels to the more economic and effective liquid and gaseous fuels.

* It would appear that Solodko has presented only that evidence which would support his argument that Probst had underestimated the role of petroleum in the economy. For example, the first statement attributed to Probst appeared in a 1939 publication. In addition, Probst's position concerning widespread introduction of substitutes for petroleum fuels was part of a larger doctrine which advocated self-sufficiency for individual economic regions. This position was a reflection of Party directives.

** Nikolayevskiy's position also was in line with the doctrine advocating self-sufficiency for individual economic regions.

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On 19 May 1955, 5 days after the publication of the Solodko article, Pravda carried a speech delivered by Khrushchev, the Party Secretary, to the All-Union Conference of Industrial Workers wherein he indicated that long-range planning for energy was being considered at the highest level. In this speech, Khrushchev discussed the planned split of the State Planning Commission into 2 bodies, 1 for long-range planning and 1 for current planning. Speaking of the long-range planning body, Khrushchev said, "It is necessary to have long-range [literally, "perspective"] plans for a number of branches [of the economy], and especially for energy production* over the course of from 10 to 15 years." 25/

On 25 May there was a further development which suggested that the USSR might be preparing to reorient its views on the development of primary sources of energy. On that date it was announced that N.K. Baybakov had been released as Minister of the Petroleum Industry and had been appointed chairman of the newly organized State Planning Commission (for long-range planning). 26/ Baybakov is perhaps the outstanding petroleum expert in the USSR. 27/

IV. Possible Underlying Causes.

The content of Solodko's Pravda article clearly indicates a petroleum-solid fuel controversy (perhaps, more specifically, a petroleum-coal controversy) and suggests the possibility of basic changes in the Soviet concept of the fuel energy balance. These changes may be affected by a number of factors, probably in combination and in varying degrees of influence.

The USSR has proved reserves of petroleum adequate to support a sharp increase in the production of petroleum and natural gas. 28/ Past reliance upon the Baku area for a predominant share of the petroleum supply, however, resulted in high -- and in some cases apparently prohibitive -- transportation costs, a situation which restricted consumption. By the shift to the Ural-Volga area (popularly known as "Second Baku") as the most important petroleum-producing region, 29/ the length of haul of petroleum products to most parts of the USSR, especially to the petroleum-deficit regions of Siberia,

* The term used here was energetika, which is the generic concept that covers the production of both energy fuel and electric power.

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has been reduced. It is possible that this reduction has so significantly changed the burden of transportation that the emphasis on greater substitution of local, and even synthetic, fuels is no longer justifiable on economic grounds.

It is also possible that during the past several years, Soviet planners have sharply underestimated fuel energy requirements. An apparent revision of the plan for investment in coal and petroleum in the 1948-50 period 30/ and the hydroelectric program of the early 1950's 31/ suggest recognition of the fact that energy requirements exceeded original estimates. In addition, the numerous appeals and directives urging or directing conservation of petroleum products (by measures ranging from more careful handling to substitution with low-quality fuels) in order to assure supply to more important consumers suggest that petroleum requirements have been greater than anticipated. Those requirements may be met sooner by a sharp increase in production of petroleum than by increases in production of coal or other solid fuels. As stated in Solodko's article, expansion of the rate of production can be achieved in petroleum in about half the time required in coal.

It is possible that anticipated requirements largely preclude the use of fuels other than petroleum. For example, the USSR has repeatedly delayed plans for dieselization of the railroads. The dieselization program has been revived recently, 32/ and meeting the planned goal will require a greater supply of petroleum. A substantial expansion of automotive production is apparently being planned for the Sixth Five Year Plan, 33/ and such an expansion would place an important degree of reliance upon petroleum.

Changed strategic considerations also may underlie an increase in the share of petroleum in the Soviet fuel energy balance. Dependence upon the vulnerable Baku area may have imposed strategic limitations upon that area as a regular source of supply, with the result that petroleum production and consumption were restricted arbitrarily. The shift to "Second Baku" provides a more secure location strategically, and expansion of both production and consumption of petroleum products may now be considered strategically sound. The USSR may now feel able to defend the petroleum industry in time of war.

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Another factor in the new Soviet position on the fuel energy balance may be a higher level of technology that makes possible increased production of both petroleum products and petroleum-consuming equipment. Such an advance in technology would generate greater requirements for petroleum. For example, advances in petroleum technology may make possible greater production of desired lighter fractions. This, in turn, would make possible and desirable higher levels of consumption. Advances in internal combustion equipment would demand higher levels of production for the industrial and transport sectors of the economy.

In support of its position on the share of petroleum in the Soviet fuel energy balance, Solodko's article stated that the cost of 1 ton of standard fuel in petroleum was one-half that in coal and that labor productivity in the petroleum industry was twice that in the coal industry. Resort to purely economic considerations for support in the problem suggests that the controversy involving petroleum and solid fuels may be part of a larger problem, that of allocating resources more in accordance with relative cost than has been done in the past.

In determining policy, however, economic factors have often been subordinated to sociopolitical considerations in the USSR. For example, the drive to achieve regional autarchy resulted in many regions in an arbitrary exclusion of petroleum supply and the substitution of local, low-quality fuels -- often despite prohibitive costs. Economic factors, therefore, may not be the decisive ones in determining the share of petroleum in the fuel energy balance of the USSR.

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APPENDIX

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

<u>Source of Information</u>	<u>Information</u>
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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