The Oil and Gas Industries of the Soviet Union and Eastern Europe in Relation to the Comecon Energy Balance and the World Petroleum Market

THESIS SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY OF THE UNIVERSITY OF GLASGOW

John Daniel Park
Institute of Soviet and East European Studies
September 1977

ACKNOWLEDGEMENTS

During the time spent in preparing this study I have been fortunate to have had the benefit of discussions with a number of people, whose help and interest have been a constant encouragement.

Above all I owe a great debt of gratitude to my supervisors at the University of Glasgow, Professor Alec Nove, James Bonar Professor of International Economics and Director of the Institute of Soviet and East European Studies, and Mr D J I Matko, Lecturer in Economics at the Institute. Both these gentlemen have guided my work with good humour and fruitful suggestion. It has been a privilege to work with them.

I am grateful also to Mr R A Clarke, Dr Hannes Adomeit, Dr V V Kusin and Dr L Sirc of the University of Glasgow, who have given generously of their time and knowledge in discussing sections of the study.

I extend my thanks to Dr Philip Hanson of the University of Birmingham, Professor P R Odell of the Erasmus University, Rotterdam, and Professor P J D Wiles of the London School of Economics, who have made helpful suggestions on many issues raised in discussion.

A special note of gratitude is due to Dr R J Hay of Imperial Chemical Industries Ltd., who over a number of years' friendship has discussed varied problems arising in international oil and petrochemical markets.

I thank Miss Jean Fyfe and Miss Ruth Ferguson for typing the thesis for presentation and my colleague Graham Smith for the mapwork.

The study was supported by a grant from the Social Science Research Council, whose help I gladly acknowledge.

J D Park
University of Glasgow
September 1977

CONTENTS

List of Tables

Chapter Three

Chapter Four

List of Maps — Page

SUMMARY

This thesis analyses the development of oil and natural gas in the Soviet Union and Eastern European full members of the Council for Mutual Economic Assistance (Comecon) from the end of the Second World War to 1975 and assesses the likely role of hydrocarbon fuels in the Comecon energy balance to 1980. The major part of the thesis is concerned with developments in the 1971-1975 period, when the Soviet Union, the bloc's principal producer and supplier, experienced a number of technical and economic difficulties in the oil and gas industries and when world prices of oil showed a fivefold increase, which was reflected in turn in increasing prices of other energy raw materials. The objectives of the study are therefore to identify the problems faced in utilising Comecon oil and gas resources, to assess their impact on energy developments in the bloc and on the pattern of Soviet trade in oil and gas, and on relations with other hydrocarbon producers in the changing world market.

There exists a number of Western studies of Comecon energy developments, published in the early to mid-sixties, some of which suggested that the era of Comecon energy autarchy would come to an end and that the group might become increasingly involved in the world market as a competitive purchaser. This view was maintained in some quarters after the Organisation of Petroleum Exporting Countries (OPEC) imposed substantial increases in the selling prices of their crude oil in October 1973 and subsequently. However study of Soviet and East European techno-economic material has revealed that before the aforementioned price rises Comecon planners were assessing the possibilities of adjusting energy policy to cope with these difficulties, with the objectives of at least maintaining the export surplus of oil and of developing export trade in gas. Such theories of an impending "Comecon energy crisis" are re-examined, taking into account the capacity of the logistic system to allow planners to re-assess the relationship of oil to coal, gas and other fuels. The examination suggests that although considerable difficulties are known and acknowledged to exist in the Comecon oil and gas industries, the bloc has the opportunity of retaining self-sufficiency in hydrocarbon energy to 1980 and that current policy is directed to the attainment of this objective.

The thesis is written almost entirely from Soviet and East European technical and economic sources. Official Comecon statistical material, supplemented by EEC, OECD and United Nations publications, have been used to provide basic data. The metric system has been adopted throughout the thesis.

NOTES

A. Measures and Conversion Factors

The metric system has been adopted throughout this thesis. 'Tonnes' is used in preference to 'tons' or 'metric tons'. One billion equals 1,000 million.

Soviet energy statistics are often recorded in 'tonnes of standard fuel equivalent' (tsf), 1 tonne containing 7000 calories per kilogramme. The conversion factors for Soviet data are as follows:

Crude Oil:	1 tonne	=	1.430 tsf
Natural Gas:	1 billion cubic metres	=	1.190 tsf
Hard Coal:	1 tonne	=	0.820 tsf*
Brown Coal:	1 tonne	=	0.420 tsf
Oil Shale:	1 tonne	=	0.325 tsf
Fuelwood:	1 tonne	=	0.249 tsf
Peat (to 1960):	1 tonne	=	0.400 tsf
(from 1960):			0.325 tsf

(*after 1970 this figure is 0.780)

The following corresponding factors are used for Eastern European countries:

Country	Natural Gas	Crude Oil	Hard Coal	Brown Coal
Bulgaria	1.20	1.40	0.59	0.29
Hungary	1.20	1.40	0.71	0.50
GDR	0.47	1.40	0.71	0.30
Poland	1.21	1.40	0.80	0.29
Romania	1.36	1.40	0.71	0.36
Czechoslovakia	1.26	1.40	0.80	0.48

(other factors, as for USSR)

Sources for the derivation of these factors are given in J Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin: Duncker & Humblot 1975, p.102 and R E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970 p.xix.

B. Transliteration.

The cyrillic transliteration scheme adopted by the British Museum and British Lending Library has been used, but the following exceptions have been made: final ий is 'ii', final ый is 'yi'; щ in Bulgarian is 'shch'; ъ in Bulgarian is 'o', as the hard sign in Russian is represented by ". Where an author's name appears in a language other than his own it is represented in that language or transliterated in accordance with the scheme. Instances of this are few.

C. The Bibliography.

Material used in the thesis is incorporated into a separate bibliography. However this contains a number of works which have not been attested in the thesis, due either to their non-availability via inter-library loans or to the incorporation of their content into later publications. In order to assist further research in the field and to give a more accurate indication of the nature and extent of material relevant to the subject as defined, it was agreed that such works should be included. Attention is drawn to the excellent bibliographies relating to the administrative structure and technological levels of the Soviet fuels industries to be found in Campbell (1968) and Shimkin (1962), both cited in this bibliography. Where the content of certain articles is not evident from the title a short precis is included.

Chapter 1. The Development of the World Petroleum Market to 1975, and the Scope of this Study.

In the period from 1960 to 1975 the world petroleum market underwent substantial change, particularly after 1970. During this time North American, Japanese and West European industry enjoyed a high rate of growth, due to a great extent to the availability of low-cost oil mainly through imports from the Middle East, and at a later stage in the USA and Western Europe to indigenous production of natural gas. The apparent ease with which a small number of highly integrated companies controlled exploration and production and to a degree processing and distribution contributed to the mood of confidence that pervaded government and industrial circles of these growing economies in the probability of continued availability of cheap hydrocarbon energy. During this time those countries in which the integrated multinational companies operated brought to fruition a policy intended to curtail activities which they believed to be against their long-term interests. Such activities included the rapid development of oil (and in some cases gas) reserves at a rate which led to a marked decline in oil prices and revenue per barrel to the producer countries throughout the sixties and the oil companies engaged in keen competition for an increasing share of the expanding markets, primarily of Japan and Western Europe. However the oil-producing countries gradually accumulated economic

and political strength from the time of the formation of the Organisation of Petroleum Exporting Countries (OPEC) in 1960. This culminated in the attainment of two of their prime objectives in the latter part of 1973 and the first few months of 1974 in independently raising the selling price of their oil and in deciding on production policy. The nature of the decision-making process and the extent of its impact confirmed a fundamental shift in the power structure of the world petroleum market from the oil companies to the producer governments acting through OPEC. Almost four years have passed since the Yom Kippur War and the "oil crisis" and the power of OPEC shows no sign of waning.

During this period the Soviet Union might seem to have remained insulated from the events that shaped the development of the world market. Once the immediate problems of post-war reconstruction were over, the Soviet Union, exhibiting an impressive rate of economic growth, regained her self-sufficiency in energy and became once more an exporter of oil, regaining the position enjoyed in the thirties. The rapid rise in demand for oil in the relatively conveniently located markets of Western Europe coincided with the Soviet Union's development of her substantial reserves of coal and natural gas, the latter at a relatively late stage by world standards, in addition to the exploitation of the prolific Volga-Ural oilfields. Exports of oil and refined products showed steady growth from the early sixties, and it seemed likely that the Soviet Union would be well placed to continue to satisfy her own demand for energy, to accelerate the

trend from coal to hydrocarbon fuels within the domestic energy balance, to meet growing demand in the member-countries of Comecon,* who, with the exception of Romania, were and remain poorly endowed with hydrocarbon reserves, and to continue to take advantage of opportunities for hydrocarbon exports to the hard-currency markets.

However by the late sixties there arose some measure of doubt as to the Soviet Union's ability to maintain the rate of hydrocarbon development that had been achieved in the late fifties and early sixties. The view was expressed in a number of quarters that the Comecon bloc might become a competitive bidder for oil produced by the Arab-American oil companies, whose internal relations were becoming increasingly unstable.

The development of the world petroleum market can be viewed as being dependent on the interaction of 4 major spheres of influence, which at times coalesce or conflict. Firstly there are the large international companies, whose prime objective is long-term profit maximisation and who operate across national boundaries, optimising within international legal and economic constraints; secondly the home governments of these companies, who have become energy importers and one of whose objectives is to secure energy supply at least cost to the national economy, having regard for the international political and economic impact

---

*Throughout this study 'Comecon' denotes the USSR, plus Poland, Romania, Hungary, the GDR, Czechoslovakia and Bulgaria.

of decisions in energy policy, since they are historically the major participants in the international financial and political institutions; thirdly the Organisation of Petroleum Exporting Countries (OPEC), which seeks to secure through their ownership of a single vital commodity the emergence of member-countries from economic backwardness and, in the light of deteriorating socio-political relations in the Middle East, the foundation of a new order in which such countries enjoy a greater measure of influence, and fourthly the Soviet Union, self-sufficient in energy but facing a number of problems as the economy develops that might be solved only by increasing trade and cooperation with the West, but nonetheless committed to a policy of (at least) containing the spread of influence of an essentially alien system.

The international oil market is dominated by seven large integrated companies.[1] These companies often joined together in exploration and production activity in the Middle East and negotiated concessions with the government on whose territory their operations were to be sited. Although accounting for the majority of the non-Communist world's oil production the major companies have been subject to increasing competition, attracted

---

[1] These consist of 5 American companies; Exxon, based in New York and trading for the most part under the Esso name, Standard Oil of New York (Mobiloil), Gulf Oil, based in Pittsburgh, The Texas Oil Company (Texaco), one of the prime movers in the development of the domestic oil industry but less involved in international trade than the aforementioned companies, and Standard Oil of California, trading under the 'Chevron' name: to these are added the British Petroleum Company, 49 per cent state-owned, and the Shell International Petroleum Company, 60 per cent Dutch- and 40 per cent British-owned.

in the first instance by the comparatively high profitability of the industry. From 1953 to 1972 over 300 private and 50 state organisations either entered the international oil industry or expanded their existing operations.[2]

The world oil market, which given the self-sufficiency of the Comecon bloc and the effect of oil import quotas in the USA[3] meant essentially Western Europe and Japan, was highly competitive during the sixties. This, coupled with the re-emergence of the Soviet Union as an oil exporter and the discovery of natural gas in the Dutch Groningen field in 1959, led both to the decline of the European coal industry and to a high level of dependence in Western Europe on imported energy.[4] The attractiveness of the Western European market and its competitive nature gave rise to declining profitability in the operations of the major companies. This latter fact generated some doubt as to the capacity of the Western oil industry for continued self-finance, and led to the formation in 1968 of the London Oil Policy Group.[5]

---

[2] A recent detailed and objective analysis of the development of the competitive process in the international oil industry is given by Neil H Jacoby, in "Multinational Oil" New York: Macmillan 1974, pp.120-149.

[3] USA policy stipulated that imports of crude oil and petroleum products should be restricted to a maximum of 10 per cent of demand. This figure proved unenforceable and was subject to revision before being finally abolished in mid-1973.

[4] A detailed analysis of the decline of the Western European coal industry is given in Richard L Gordon "The Evolution of Energy Policy in Western Europe: The Reluctant Retreat from Coal" New York: Praeger 1970.

[5] P R Odell "The Western European Energy Economy" Leiden: Stenfert Kroese 1976, p.18.

This body consisted of representatives of the major oil companies and met fortnightly. It drew up a strategy based on the continued free availability of oil from the Middle East at a price which would rise gradually relative to the general commodity price level in Western Europe, where the market for oil and refined products was planned to grow in an orderly and predictable manner. Accordingly the price rises imposed by Libya's Colonel Gadafy in 1970, the agreements of OPEC in Tehran and Tripoli in 1971 and in Geneva in 1972 were neither against the interests of the companies nor against their wishes. On the assumption of an expanding market the major companies continued their investment programme, expanding their facilities and gearing its level and timing to anticipated improvements in the financial quality of their operations. At no stage did the companies envisage relinquishing control over decisions determining price and production levels.

This strategy was undermined as a result of OPEC's assumption of control accomplishing in a few months what the oil companies sought to accomplish through the joint strategy in a period of years. However higher prices for OPEC oil, imposed at a time when no ready substitute existed, reduced the medium-term demand for refined products as a result of their worsening the economic depression of consumer countries and of stimulating consumer governments to impose restrictions on the use of oil in order to offset potentially serious deterioration in their balance of payments.

The structure of the international oil industry underwent marked changes in the postwar period. Profit attracted competition and the industry passed from that of a highly concentrated process involving less than ten participants, to a state of moderate diffusion, in which fifty or more integrated and, by world industrial standards, large companies interacted, cooperated and competed.[6] The seven major oil companies, whilst maintaining impressive rates of growth, lost market share at the hands of the competitors their success had attracted, the decline being reflected differently in each sphere of activity in which newcomers to the industry saw the best opportunities for return on their particular resources. The changing pattern is outlined in table 1.1. Analysis of the foreign capital expenditure of the major companies compared with the others, presented in table 1.2., indicates the changing pattern of the industry's financial structure.

The competitive process was curtailed because the USA market for crude oil and refined products was subject to restriction in the form of import quotas. Therefore the companies' commercial opportunities were found mainly in Western Europe and Japan. One outcome of competition for the Western European market was that prices for refined products declined markedly during the sixties, as detailed in table 1.3., with the result that Western European industry enjoyed an advantage in world markets afforded by relatively low energy cost. Pressure was brought to bear on the

---

[6] Jacoby op.cit. pp.172-212 gives an analysis of the structural change in the international oil industry to 1972.

TABLE 1.1 Analysis of Structural Change in the International Petroleum Industry 1953 and 1972.

Sphere of Activity	1953		1972	
	7 Majors	Others	7 Majors	Others
Concession Areas	64	36	24	76
Proven Reserves	92	8	67	33
Production	87	13	71	29
Refining Capacity	73	27	49	51
Tanker Capacity	29	71	19	81
Product Marketing	72	28	54	46

Source: N H Jacoby "Multinational Oil" New York: Macmillan 1974, p.211.

TABLE 1.2 Total Foreign Capital Expenditure of Capitalist Oil Companies 1948-1972 ($ billion, % of total)

Year	7 Majors	%	Others	%	Total
1948	1.2	75.0	0.4	25.0	1.6
1950	0.7	46.0	0.8	54.0	1.5
1955	1.1	37.9	1.8	62.1	2.9
1960	1.7	32.1	3.6	67.9	5.3
1961	1.7	32.1	3.6	67.9	5.3
1962	1.9	35.2	3.5	64.8	5.4
1963	2.0	35.1	3.7	64.9	5.7
1964	2.3	37.1	3.9	62.9	6.2
1965	2.8	41.2	4.0	58.8	6.8
1966	2.9	38.2	4.7	61.8	7.6
1967	3.1	39.2	4.8	60.8	7.9
1968	3.5	36.5	6.1	63.5	9.6
1969	3.8	37.3	6.4	62.7	10.2
1970	4.1	34.5	7.8	65.5	11.9
1971	5.1	35.2	9.4	64.8	14.5
1972	4.6	28.9	11.3	71.1	15.9

Source: Jacoby op.cit. p.250.

TABLE 1.3. Average Annual Prices of Refined Product Imports in West European Markets, 1957-1970
(S per barrel)

Importing Country	1957	1958	1959	1960	1961	1962	1964	1966	1968	1970
Belgium	5.11	4.45	4.06	3.75	3.57	2.91	3.07	2.81	3.16	3.27
France	5.21	5.35	4.91	4.92	4.90	4.64	4.22	4.10	4.12	4.05
West Germany	5.11	4.22	4.33	4.13	3.99	3.67	3.37	2.82	3.49	3.24
Italy	6.22	7.05	4,25	3.45	3.33	2.87	3.48	2.93	2.93	3.65
Netherlands	5.66	4.05	3.69	3.53	3.61	3.49	3.29	3.02	3.72	3.54
U.K.	5.55	4.65	4.54	4.05	4.22	3.05	3.61	3.26	3.80	3.39

Source: Jacoby op.cit. p.239.

USA government to encourage the oil companies to negotiate oil price rises.[7] Odell argues that this constituted an "unholy alliance" between the USA government, the major oil companies and the OPEC Secretariat to undermine the success of Western European industry.[8] Philip Windsor expresses the view that an "alliance" was struck between OPEC and the oil companies to transfer the process of profit generation from the oil-producing states to the consuming countries.[9] One might attempt to justify these conclusions on the grounds that OPEC has been strengthened and the long-term profit potential of the oil industry enhanced as a result of post-1970 events at the expense of Western European industrial consumers. However analysis of any alliance and of the role of the oil companies can easily overlook the fact that planned rise in the price of OPEC oil during the seventies was not intended to have so severe an effect: the essential point is that for political reasons oil was used as a (highly effective) element in a long-lasting conflict probably without appreciation of the long-term effect of such a policy. Though it would be difficult to deny that neither OPEC nor the major oil companies sustained economic loss as a result of oil

---

[7] As did, for example, James E Akins, then Adviser on Oil Affairs to the US State Department, at a meeting of OAPEC in 1972. Odell (op.cit. p.20) makes the point that American industry was "fed up" with the advantage enjoyed by European manufacturers as a result of higher energy costs in the USA following the government's decision to maintain import quotas.

[8] Odell op.cit. p.21.

[9] Philip Windsor "Oil: A Plain Man's Guide to the Energy Crisis" London: Temple Smith 1975, p.103.

policy in the seventies, "alliance theory" must be tempered by consideration of the factors that diminished the companies' influence.

The significance of the Libyan price rise of 1970 was that it was imposed unilaterally by Gadafy and not via the negotiating process set up by the London Oil Policy Group. As Edith Penrose has indicated,[10] Gadafy's action "forced a settlement on the companies that irrevocably broke the pattern of the past". The possibility of isolating Libya within OPEC for the sake of maintaining the effectiveness of the Group was not open, since demand was high and, unlike in 1967, there was insufficient flexibility in the tanker market to cope economically with the loss of Libyan supply.[11]

Thenceforward the Group's effectiveness in the market waned, although the trend in OPEC's pricing policy was not counter to the Group's interests initially. Casting further doubt on the "alliance" hypothesis, Penrose points to one particular resolution of the OPEC meeting held in Caracas in December 1970, in which minimum acceptable terms for increases in the wellhead prices of oil within an inflexible time scale were laid down. The terms also provided for enforced compliance by means of united action should negotiations with the companies prove

---

[10] Edith T Penrose "The Development of Crisis" Daedalus Vol. 104, No.4, (Fall 1975), p.41.

[11] For an analysis of the circumstances leading to the oil companies' loss of operating flexibility see J D Park "OPEC and the Superpowers: An Interpretation" Co-existence April 1976, pp.49-64.

ineffective.[12] In the aftermath of the price rises of 1973 and 1974, she argues, companies became passive participants, having learned "to accept defeat...and to roll with the punches".[13]

It is not an objective of this study to examine in depth the "alliance" and "conflict" theories of relations between companies and host governments: suffice it to note from the foregoing analysis that although the companies have maintained their financial well-being their influence has been markedly diminished and their dependence on an insecure source of supply has prompted greater interest in exploration and development in areas other than the Middle East and South America. These include the Soviet Union.

The USA government can be said to be the most directly involved in international oil in that it is the home government of five of the seven major companies. Britain is the home base of BP and the centre of the world coordination of Shell, despite the latter's remaining under predominantly Dutch influence.

Governmental aims can usefully be viewed as those of securing availability of low-cost energy supplies, of minimising the negative impact of energy imports on the balance of payments and particularly in the case of the USA on foreign policy options that self-sufficiency or differing levels of dependence might afford. There has been a marked growth in dependence on the part

---

[12] Resolution XXI.120 of the OPEC meeting, Caracas, December 1970, recorded in Penrose op.cit. p.42.

[13] ibid. p.53.

of each of the major economic powers with the exception of the Soviet Union, as detailed in table 1.4.

TABLE 1.4. Dependence of Major Economic Powers on Imported Energy (%)

	1955	1960	1965	1970	1974
EEC (9)	19	30	46	59	62
Japan	23	41	65	84	88.5
USSR	-	-	-	-	-
USA	1	6	7	8	19

Source: D F Cooper "Energy: A Matter of Interdependence", Conference paper, Institute of Purchasing and Supply 1976, p.3.

Japan has been dependent on imported energy for well over the 25 years represented in the table. Domestic production has been severely limited by lack of resources and the 'economic miracle' has been substantially facilitated by low-cost imports. Table 1.5 shows the extent of Japanese dependence on external

TABLE 1.5. Japanese Oil Production and Consumption 1968-1975 (M tonnes)

	1968	1969	1970	1971	1972	1973	1974	1975
Prodn.	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.6
Cons.	142.7	169.0	199.1	219.7	234.4	269.1	258.9	244.0

Source: BP Statistical Review of the World Oil Industry 1976, pp.18, 20.

sources of oil in the period up to 1975. In the aftermath of the 1973-1974 price rises Japan was quick to oblige industry to export to the newly-rich OPEC bloc and to take steps towards developing trade links with non-OPEC oil producers, notably the Soviet Union and China. At the same time a government report stressed the need for the Japanese oil industry, till then confined to refining and distribution, to integrate increasingly into exploration and production on the grounds that widening the scope of the industry might strengthen the country's negotiating position opposite OPEC in securing supply.[14] The immediate effect of the oil crisis on Japan was that in a year of 11 per cent growth the fourth ("crisis") quarter showed only 1 per cent growth. The Japanese Economic Planning Agency estimated a maximum of 2.5 per cent growth for 1974, this following a twenty-year period in which Japanese GNP grew at between 8 and 12 per cent per year, energy consumption by a total of 500 per cent and oil consumption by 2300 per cent.[15] Despite the country's soaring demand for oil the Japanese government was able to devise a short-term energy policy which within two years of the 1973 crisis had minimised the impact of the price rises, as shown in table 1.6. In 1973 Japan had reached the point at which oil accounted for over 70 per cent of energy requirement and 99 per cent was imported. Some 75 per cent of refined products were

---

[14]This is discussed by Y Tsumuri in "Japan" Daedalus Vol.104 No. 4. (Fall 1975), pp.125-126.

[15]Petroleum Economist June 1974, p.215.

TABLE 1.6 Japanese Oil Consumption in Fiscal Years 1971-1975*

	1973	1974	1975 1st ½	1975 2nd ½	1975
Crude Oil Imports (million barrels)	1814.6	1760.0	805.1	866.9	1672.0
% Change	+17.2	-3.0	-9.9	+0.1	-5.0
Cost ($ million)	8673	19997	9400	10600[a]	20000[a]
% Change	+108.8	+130.6	-5.5	+5.4	no change

*Fiscal 1973 ends 31 March 1974, etc.

[a]Estimates, excluding October 1975 OPEC price rise

consumed by industry.[16] Given the extent to which the country's industry is dependent on oil, Japanese technical and financial involvement in oil developments currently extends to Canada, West Africa, the Middle East, Australasia, the North Sea, China and the Soviet Union.[17] In the case of deliveries from China, the first sale consisted of 1 million tonnes of crude oil from the Taching field in 1973, which led to the conclusion of a contract in February 1974 for the delivery of 1.5 million tonnes in that year.[18]

The origins of the USA's energy problems are complex. Since

---

[16]Tsumuri op.cit. p.113.

[17]For a description of Japanese involvement in these areas see R P Sinha "Japan and the Oil Crisis" The World Today August 1974, pp.339-341.

[18]ibid. p.339.

1970 oil production has declined whilst demand has grown rapidly, as outlined in table 1.7. With the exception of Alaska, which has however not yet played a significant part in production, discoveries of new oil reserves have been unimpressive. The refining sector has been operating at near capacity and production of natural gas, whilst increasing, has not kept pace with growth in demand. In 1967, when the Arab members of OPEC declared an embargo on deliveries to the USA, there was scope for diverting Middle East oil to other destinations and re-exporting refined products. There was also the opportunity of substituting oil from certain non-participants in the embargo, notably from Iran, to counteract the loss. At the time under-utilised refinery capacity provided the flexibility required to cope with differences in oil processing characteristics, where these occurred.

By 1970 this flexibility had been lost. The first problem to manifest itself was a shortage of fuel oil. In the first six months of 1970 demand for fuel oil was 14.9 per cent above that for the corresponding period in 1969.[19] The inability of the gas industry to compensate had been impaired by the maintenance by the government of artificially low "ceiling prices" for gas, which had discouraged investment in the industry. Gas consumption was close to production capacity and demand for gas was expected to remain high since the effect of rising costs in the domestic oil industry and of the oil import quota system was to force up prices of refined products. One analyst has put forward

---

[19] Petroleum Press Service November 1970, p.402.

TABLE 1.7. Production and Consumption of Oil and Natural Gas Liquids in the USA, 1960-1975 (M tonnes)

		1960	1965	1970	1971	1972	1973	1974	1975
Production:	Crude Oil	350.3	387.6	478.6	469.9	470.1	457.3	436.8	415.9
	NGL	33.8	43.6	58.9	60.1	62.1	61.7	59.9	58.0
	Total (A)	384.1	431.2	537.5	530.0	532.2	519.0	496.7	473.9
Consumption (B)		473.0	549.0	694.6	719.3	775.8	818.0	782.6	765.9
C. A as % of B.		81.2	78.5	77.4	73.7	68.6	63.4	63.5	61.9

Source: BP Statistical Review of the World Oil Industry 1970, pp.18, 20.
1976, pp.18, 20.

the view that ceiling prices were imposed in order to "protect consumers against exploitation at the hands of the natural gas (pipeline) companies".[20] What however is more likely is that there has been a politically influential lobby of gas consumers enjoying a relatively low-cost fuel, who favour maintenance of such prices.[21] The USA gas industry therefore experienced low profitability, an absence of investment incentive and falling reserves. Companies involved in the production and distribution of gas were prompted to seek additional supplies from outside the USA, including the Soviet Union.[22] This is not however expected to make any impact on the short-term position in the USA gas industry. Even if the Soviet-American joint projects currently under discussion do come to fruition, their contribution to the USA's energy supply will not be felt before the early eighties. Table 1.8 shows the development of the USA gas industry from 1950 to 1975.

Accustomed to near self-sufficiency in energy, to continuous economic growth and to the role of economic and political

---

[20] Richard B Mancke "Genesis of the US Oil Crisis" in J S Szyliowics, B E O'Neill (eds.) "The Energy Crisis and US Foreign Policy" New York: Praeger 1975, p.59.

[21] Park op.cit. p.56; Petroleum Economist March 1976, pp.84-86.

[22] American companies are currently discussing possible imports of gas from Canada, Alaska, Venezuela, Trinidad, Ecuador, Algeria, Nigeria, Australia, Indonesia and East and West Siberia. See Patricia E Starratt, Robert M Spann "Alternative Strategies for Dealing with the Natural Gas Shortage in the United States", in E W Erickson, L Waverman (eds.) "The Energy Question: An International Failure of Policy" Toronto: University of Toronto Press 1974, Vol. 2, p.39.

TABLE 1.8 The USA natural Gas Industry 1950-1975
(billion cubic feet)

Year	Marketed Production	Imports	Consumption	Proved Reserves (Year end)
1950	6282	-	6026	148585
1955	9405	11	9070	222483
1960	12771	156	12509	262326
1965	16040	456	16033	286469
1970	21921	821	22046	290746[a]
1971	22493	935	22677	278806[a]
1972	22532	1019	23009	266085[a]
1973	22648	1033	22966	249950[a]
1974	21600	959	22111	237132[a]
1975	20100	995	n.a.	n.a.

[a]Including Alaska (26000 billion).

Source: Petroleum Economist March 1976, p.85.

superpower, the US government launched 'Project Independence 1980' in the immediate aftermath of the 1973 Middle East crisis. The objective was to regain self-sufficiency by the stated year: some two years later it was estimated that by 1980 approximately 40 per cent of the USA's oil demand would be met by imports from the Middle East and North Africa.[23] It was eventually admitted by the Director of the US Federal Energy Administration that the economic loss in attempting to fulfil the requirements of 'Project Independence' was acknowledged to be more severe than potential

---

[23]R El Mallakh "American-Arab Relations: Conflict or Cooperation?" Energy Policy September 1975, p.172.

disruption of supply.[24] In the oil sector, as in gas but for different reasons, diversification of source of supply had become a pressing issue.

Cheap energy was the base on which Western European industry grew in the fifties and sixties. This was mainly in the form of imported oil, the price of which declined substantially through the sixties. As early as 1972 Odell stressed Europe's vulnerability in the face of increased taxes imposed on the oil companies, the companies' ability and intention to pass these on to consumers and the possible disruption of supply in the event of negotiating difficulties.[25] These difficulties would be considerable, he argues, if the price of OPEC oil were to rise to 4 dollars per barrel by 1975.[26] At this time also the Chairman of the British National Coal Board, Derek Ezra, sensing the growing difficulties that might be caused by the lack of cohesion in US energy policy, drew attention to the possibility of the USA and Western Europe's competition for oil that could be subject to supply restrictions.[27] Ezra outlines how Western Europe's dependence on energy imports greatly exceeded that of the USA and were likely to grow more rapidly, given the higher general rate

---

[24] F G Zarb "US Energy Policy" The World Today January 1976, p. 1.

[25] P R Odell "Europe's Oil" National Westminster Bank Quarterly Review August 1972, p.6.

[26] ibid. p.12.

[27] Derek Ezra "Possibilities of a World Energy Crisis" National Westminster Bank Quarterly Review November 1972, p.31.

of industrial growth compared with the USA.[28] Bearing in mind also the increasing demands of Japan and the Third World, Ezra, like Odell, argues the case for Europe's reducing her dependence on imported energy, advocating (understandably) investment in the coal industry on the grounds that coal would be fully competitive with oil and gas in the eighties.[29]

In contrast Odell argues the case for a Western European energy economy based on indigenous gas, there being in his view no opportunity in the short term to exploit oil reserves at a level sufficient to have a marked effect on the energy balance.[30] He notes that as long as Middle East oil production costs remain at around 25 cents per barrel there is scope for OPEC to revise prices downwards and to increase output.[31] His suggestion, based on the argument of the American energy economist M A Adelman that there is no physical or economic factor which might rule out such a possibility,[32] as to government reaction if faced with this problem, is simply that they should "avoid... further entanglement with such insecure oil" and "leave it for

---

[28] ibid.

[29] ibid. pp.32-33.

[30] P R Odell "European Alternatives to Oil Imports from OPEC Countries", in F A M Alting von Geusau (ed.) 'Energy in the European Communities' Leiden: Sijthoff 1975, p.65. Note also that prior to the OPEC price rises of 1973-1974 Odell argued the case for European self-sufficiency based on North Sea gas. See "Indigenous Oil and Gas and Western Europe's Energy Options" Energy Policy June 1973, pp.47-64.

[31] Odell "European Alternatives..." (1975), p.71.

[32] M A Adelman "Is the Oil Shortage Real?" Foreign Policy No.9 (Winter 1972-73), pp.69-107.

the poor, oil-importing countries of the Third World, where... cheap energy is much more important for ensuring development".[33] Bearing in mind the pressures brought to bear on the US government by energy-intensive industry to ease import controls when faced with increasing competition in world markets, it is hardly likely that a West European government would impose other than a temporary tariff or quota system, since, as the USA came to discover, the overall economic loss from such a policy can be great.[34]

An OECD report, published in 1974,[35] re-assessed the Organisation's forward energy requirement in the light of the 1973-1974 oil supply crisis, underlining the economic difficulties that a policy aimed at self-sufficiency would cause. The direction of investment into developing energy reserves possessed by certain OECD members would, the report indicates,[36] limit the member-countries' prospects for economic growth.

The problem faced by the EEC and OECD in attempting to determine a common energy policy is the intrinsic disparity of

---

[33] Odell "European Alternatives..." (1975), p.71.

[34] "Had the (European Economic) Community confronted the issue, it would have realised that the price paid for increased security would be the increased domestic production of energy - an expensive policy. The United States was already paying this price, but the European coal lobby was too weak to impose it..." A Prodi, R Clo "Europe", in Daedalus Vol.104. No.4 (Fall 1975), p.105.

[35] OECD "Energy Prospects to 1985" Paris: OECD 1974 (2 Vols.)

[36] ibid. Vol.1, p.4.

objectives and opportunities amongst their members. For example Britain seeks to maximise the benefits of North Sea oil and gas in relation to her balance of payments problems and the government, at times in conflict with the industry, wishes to retain a measure of independence from EEC and OECD bodies in determining depletion and trade policy. France seeks to achieve as high a level of energy autarchy as possible, to the extent of non-participation in the 1974 Washington energy conference.[37] One feature which the EEC member-countries now have in common is substantial over-capacity in oil refining, whose expansion was undertaken prior to the 1973-1974 crisis, when it was anticipated that demand for refined products in Western Europe would continue to grow at the same rate as had been recorded in the sixties. Therefore one of the prime objectives of the oil companies operating in Western Europe is to employ these facilities more fully.[38] The possibility that the Soviet Union might prove to be an alternative to OPEC prompted several approaches by Western concerns.

The third major influence in the world petroleum market is the Organisation of Petroleum Exporting Countries (OPEC). From its inauguration in 1960 "as a defensive mechanism to form a commoh front vis-a-vis expatriate oil firms and major oil-

---

[37]The diversity of objectives in EEC is discussed by G F Ray, A Dean "Possible Approaches to a Common European Energy Policy" in Alting von Geusau (ed.) op.cit. pp.167, 169.

[38]The background to Western European overcapacity is summarised in Petroleum Economist September 1976, pp.340-342.

importing countries",[39] with as its objective "not regional integration of members' economies and societies, but mainly the coordination of members' policies in one commodity, petroleum, and solely in the export market",[40] OPEC sought throughout the sixties to maintain oil prices "with due regard to the interests of securing a steady income to the producing countries, an efficient, economic and regular supply of this source of energy to consuming nations and a fair return on capital to those investing in the petroleum industry".[41] It has been pointed out that relations between OPEC, the oil companies and their domestic governments are most appropriately regarded as the result of a bargaining process rather than of trade and commercial competition.[42] Study of the changing role of OPEC in the world market shows the shift in emphasis from preoccupation with prices in 1960 to desire for self-determined growth via complete ownership and control over output and pricing decisions.[43] The

---

[39] Z Mikdashi "The Community of Oil-Exporting Countries: A Study in Governmental Cooperation" London: Allen and Unwin 1972, p.69.

[40] ibid.

[41] Resolution 1.1 of the Baghdad Conference of OPEC, held from 10-14 September 1960, recorded in M S Al-Otaiba "OPEC and the Petroleum Industry" London: Croom Helm 1975, p.58.

[42] Edith T Penrose "The Large International Firm in Developing Countries: The International Petroleum Industry" London: Allen and Unwin 1968, p.260.

[43] "...circumstances have changed, and nowhere do governments accept the role of a sleeping partner. They want to have a direct role in the management and the exploitation of national resources, so as to get know-how and to develop national expertise in the Production and marketing of oil." N Al-Pachachi (then Secretary-General of OPEC) in The Times 9 November 1971, p.21.

event that confirmed the turning point in the bargaining process was the successful imposition by Libya's Colonel Gadafy of production cutbacks, increased port charges at Libyan terminals and, effective from 1st September 1970, an increase of 30 cents on the current price of $2-23 per barrel, plus increased royalty rates.[44]

In response to Gadafy's unilateral success an extraordinary meeting of OPEC, held in Tehran in February 1971, imposed price rises averaging 33 cents per barrel on crude oil delivered from the Persian Gulf.[45] The following month at a further meeting prices for crude oil delivered from Mediterranean terminals were raised proportionally to the Gulf prices.[46] Subsequent meetings of OPEC in January 1972 and June 1973 led to further price rises to compensate for the devaluation of the US dollar.[47] Despite these price rises demand for Middle East oil continued to grow and investment decisions were made by the oil companies that provided for the expansion of refining and distribution in Western Europe.

Prior to October 1973 there were genuine negotiations between the producer countries and the operating companies, though Western inflation and the falling value of the dollar strained the agreements concluded. The Yom Kippur War quickly

---

[44]The background to the Libyan price rise is given in Edith T Penrose "The Development of Crisis"..., pp.41-42. See also Petroleum Press Service January 1971, p.10.

[45]Petroleum Press Service March 1971, pp.82-83.

[46]Petroleum Press Service May 1971, pp.162-163.

[47]Penrose "The Development of Crisis"..., pp.44, 46.

fused the economic and political dimension of international oil trade, as OPEC abandoned the will to negotiate and exercised the oligopolistic power it had gradually acquired.[48]

The effects of the OPEC price rises, in addition to the aforementioned impact on demand in consuming countries, were those of confirming OPEC as the driving force in the world petroleum market and of bringing about a radical shift in world distribution of wealth largely at the expense of industrialised nations, though this did work to the disadvantage of the oil-importing developing countries. It is not an objective of the present study to analyse the international financial impact of this transfer: its relevance is that it confers on OPEC members a substantial level of flexibility, which has not escaped the notice of Soviet policymakers. Whilst there has been some optimism that the international system can be brought into balance again by recirculating oil revenues through Western financial institutions, thus easing currency transfer problems and providing through OPEC's increased purchasing power the means by which the health of Western economies can be preserved, it has been pointed out that many of the OPEC member-countries do not need high levels of Western capital, since they are not

---

[48]Note that the discussions on the first doubling of prices took place in OAPEC and not OPEC meetings. Likewise discussions on the possible use of embargo. It was the Arab members who carried through these measures: some producers were hesitant. See Z Mikdashi "The OPEC Process" Daedalus Vol.104, No.4 (Fall 1975), p.208.

experiencing a revolution of rising expectations.[49] The Soviet response to OPEC's enhanced financial power has been to sound repeated warnings that the petrodollar re-cycling process merely contributes to the capacity of certain Western countries to support the Israeli cause. A recent feature of discussions between the Middle Eastern member-countries of OPEC and the Soviet Union has been the negotiation of dollar loans out of surplus oil income and the possibility of Arab investment in the Soviet bloc.[50] This may become gradually more attractive to the Soviet Union, given the questions surrounding Soviet and East European indebtedness being posed in some quarters of the Eurocurrency market.

As long as OPEC maintains its solidarity it enjoys the status of superpower in the economic sense. Granted, there are differing objectives within OPEC. On the one hand the "industrialising" members, such as Iran, Iraq and to a lesser extent Nigeria and Algeria, have an interest in acquiring quickly hard currencies that can be used to purchase goods and services to facilitate economic growth: their preferred strategy is to maximise the short-term inflow of such currencies. On the other hand the "desert state" members, where the majority of oil and gas reserves are located, have small populations, few opportunities for industrialisation, apart from petrochemicals, and a

---

[49] P R Odell "The World of Oil Power in 1975" The World Today July 1975, p.276.

[50] M C Kaser "Oil and the Broader Participation of IBEC" International Currency Review 1974 No. 6, p.25.

strong interest in the maintenance of political influence as long as the Arab-Israeli conflict remains unsolved: their strategy is to secure long-term consumption of oil by avoiding a pricing policy that would lead to an undesirably high level of development of alternative energy sources.[51] It is admitted by the Saudi Minister of Petroleum that OPEC has difficulty in determining and sustaining a unified policy.[52] However member-countries realise that unity confers strength: the strength of OPEC is the breadth of its choice of strategy.

This study is concerned with the development of oil and gas in the Soviet Union and Eastern Europe, this being the fourth influence on the world petroleum market. The trend from coal to hydrocarbon fuels took place at a later stage in Comecon than elsewhere in the industrialised world. The expansion of the oil industry commenced in the fifties, that of the gas industry in the sixties. During this time the Soviet Union resumed exports of oil and commenced exports of gas not only within Comecon but also in world markets.

The ninth Soviet Five-Year Plan for the oil and gas industries had to take into account that reserves were

---

[51] OPEC does encourage the consumer countries to diversify into alternative energy sources (See esp. Sheikh Yamani, Saudi Minister of Petroleum, in E J Mitchell (ed.) "Dialogue on World Oil" Washington DC: American Enterprise Institute for Public Policy Research 1974, p.93). The point is that OPEC as a group now has and uses power to influence decisions on substitution levels.

[52] ibid. p.99.

predominantly located in Eastern areas. The same is true, though to a lesser extent, in the coal sector. According to a Soviet estimate published in 1975 some 90 per cent of total energy reserves are located East of the Urals, whereas 70 per cent of consumption is in European Russia.[53]

It was intended at the outset of the ninth Plan that Siberia would account for the major part of the increase in Soviet oil production: in fact Siberian operations had to overfulfil their original objectives in order to compensate for production shortfalls elsewhere. In the gas industry production increases were scheduled for each area, including the substantial expansion of Siberian operations. As a result of a general shortfall against the original Plan the Siberian share of Soviet production recorded in 1975 was as envisaged in 1971.

With the exception of Romania the Eastern European countries are poorly endowed with oil and gas reserves and have hitherto been dependent on the Soviet Union as almost the sole supplier of each. The trend to hydrocarbon fuels in Eastern Europe, Romania again excepted, took place at a later stage than in the Soviet Union and accelerated during the sixties. However in the late sixties it was suggested that the Soviet Union was beginning to face problems in the oil and gas industries, which might result in her being unable to meet Comecon requirements, if rates of

---

[53]The Siberian share of total Soviet energy reserves was put at 65 per cent in 1968 (A E Probst (ed.) "Razvitie toplivnoi bazy raionov SSSR" Moscow Nedra 1968, p.38), and at 90 per cent in 1975 (Editorial to Planovoe khozyaistvo 1975 No.2, p.5).

growth in consumption recorded in the sixties were to continue.[54] At this time each country negotiated with OPEC producers a number of small oil supply contracts, largely on the basis of barter trade.

The Soviet Union enjoys substantial earnings from trade in oil and gas. In view of the apparent need of the Soviet Union to import goods from the developed capitalist world the marked increase in energy prices has worked to Soviet advantage. However this has coincided with increasing economic and logistic problems in the Soviet oil and gas industries, necessitating a difficult choice between the opportunities presented by the Western countries' need for energy and the desirability of maintaining the economic cohesion of Comecon, whose hard currency reserves are believed to be limited, as is the capacity of the Eastern European members to expand bilateral trade with non-Soviet hydrocarbon producers.

The Soviet Plan for 1976-1980 was formulated in the light of shortfalls in the previous Plan in both the oil and gas industries, rising demand in Comecon and a much-increased import price for OPEC oil. Given that the development of Siberia is now regarded as the basis of Soviet oil and gas development, there exist considerable economic and technical problems in raising

---

[54](i) J G Polach "The Development of Energy in East Europe", in 'Economic Developments in Countries of Eastern Europe' Washington DC: US Government, Joint Economic Committee 1970, pp.348-433.

(ii) S. Wasowski "The Fuel Situation in Eastern Europe" Soviet Studies July 1969, pp.35-51.

production. Soviet oil and gas production and transportation is subject to increasing costs. Consequently their role in the domestic energy balance and as export commodities in relation to alternative energy sources has been re-assessed.

If Comecon can remain self-sufficient in energy, then the rising world price for oil and gas and the desire of the developed Western countries to diversify their sources of supply work to the advantage of the Soviet Union. Thus OPEC's pricing policy would deserve active support. If on the other hand increased imports are inevitable, then Soviet interests might have been better served by attempting to dissuade OPEC from raising prices. Alternatively if the Soviet Union felt powerless to influence OPEC on the question, then, recognising the inevitable, she might have to re-adjust the domestic energy balance in relation to restricted ability to import and enhanced opportunity for export. These issues are complicated by the fact that the principal oil producing area, the Middle East, has been an arena of superpower rivalry long before domestic energy questions could have been thought to influence the foreign policy of either.

The objective of this study is to examine the development of the oil and gas industries in Comecon, primarily in the 1970-1980 period, having regard for questions of energy provision within the bloc, of constraints and opportunities in hydrocarbon trade and of Soviet action and reaction in the world market.

Accordingly the second chapter, dealing with the development

of hydrocarbon production and trade from the Second World War to 1970, has been kept short: however an appreciation of the major trends is essential for understanding the issues that have influenced policy in the seventies. A number of Western publications deal with this period. The analysis of Demetri B Shimkin[55] traces the development of Soviet fuels production from 1928 to 1958 and provides in a number of statistical tables the trends in output, employment and labour productivity. Robert E Ebel's work entitled "The Petroleum Industry of the Soviet Union"[56] is essentially a report of a visit to the Soviet Union made in 1960 by a delegation from the US petroleum industry and government officials. It provides particularly detailed information on refining and production, but the interest of the work is technical rather than economic. The major analytical work of the pre-1970 period is that of Robert W Campbell, published in 1968.[57] This provides a detailed account of the economics and technology of the Soviet oil and gas industries, tracing their development to 1967. The work contains an excellent bibliography of Soviet publications dealing with development in the fifties and sixties, some of which is included in the present study. The growth, decline and re-emergence of the Soviet Union as an oil trader and the commencement of gas trade is outlined in a

---

[55] D B Shimkin "The Soviet Mineral-Fuels Industries 1928-1958" Washington DC: US Department of Commerce 1962.

[56] R E Ebel "The Petroleum Industry of the Soviet Union" New York: American Petroleum Institute 1961.

[57] R W Campbell "The Economics of Soviet Oil and Gas" Baltimore: Johns Hopkins Press 1968.

further work of Ebel, published in 1970.[58] This work covers the period from the origins of the Russian oil industry in the late nineteenth century to 1967. Chapter 2 of the present study relies on the aforementioned publications.

I F Elliot's study of the development of Soviet energy,[59] published in 1974, gives a detailed historical exposition of each of the Soviet fuel industries to 1973, and includes some data on fuel consumption patterns. A further work of Campbell[60] advances the analysis of his 1968 work and provides a valuable assessment of the factors which have led a number of Western observers to conclude that the Soviet Union now faces an "energy crisis". Western analysis of the energy position in Eastern Europe is somewhat sparse, and confined to a few short articles cited in the text of the present study.

The work of Jochen Bethkenhagen,[61] published in 1975, gives a detailed account of growth and prospects in Soviet trade in coal, oil and gas, covering the period from 1960 to 1980. However the most recent data on which the work is based are for early 1973. Consequently the impact of OPEC's action of 1973-1974 is not discussed. Bethkenhagen's work has nonetheless been

---

[58] R E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970.

[59] I F Elliot "The Soviet Energy Balance" New York: Praeger 1974.

[60] R W Campbell "Trends in the Soviet Oil and Gas Industry" Baltimore: Johns Hopkins 1976.

[61] Jochen Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin: Duncker & Humblot 1975.

a useful basis for chapter 6 of the present study.

There is now a substantial amount of published work on Soviet-Middle East relations, some of which includes analysis of the energy question in relation to Soviet policy in the area. The work of Jeremy Russell,[62] published in 1976, seeks to establish whether there is a link between domestic energy problems and the conduct of foreign policy. Valuable though the work is as a general historical account of trade developments, it overlooks the single important factor determining the recent changes in the world market and international energy relations, namely the enhanced power of OPEC and its ability to influence not only energy policy but also economic and political relations between the established superpowers. This work, along with other publications of the late sixties and early seventies, is examined and re-assessed in chapter 7 of the present study. The Soviet response to developments by non-Middle East hydrocarbon producers, particularly Norway, is also discussed.

Two significant aspects of hydrocarbon development in Comecon have been omitted, namely the questions of labour supply in the development of remotely-located resources and of infra-structure development. The aforementioned works allude to these issues: however in the light of the author's unsuccessful application to study at the Institute of Economics and Organisation of Industrial Production in Novosibirsk it was agreed to

---

[62] Jeremy Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976.

abandon this line of enquiry. Nevertheless some suggestions as to basic material and possible further research on these topics are given in Appendix D.

Chapter 2. The Postwar Development of the Soviet Oil and Gas Industries to 1970.

It is convenient to divide the years from 1945 to 1970 into two periods in examining the development of the Soviet oil and gas industries. The first dates from 1945 to 1955 in which the oil industry recovered from the severe decline experienced in the Second World War, regaining its status as a net exporter, the second dating from 1955 to 1970, in which the oil industry expanded steadily, providing the bulk of the Soviet Union's growing energy requirement and forming the basis of the Soviet chemicalisation drive initiated by Khrushchev. During this period also the potential of the gas industry was realised and decisions were taken concerning its rapid development. Towards the end of this latter period there arose a number of problems in the oil industry which caused doubt in some quarters as to the future role of oil within the Soviet energy balance and as a leading export commodity and which obliged Soviet planners to reconsider the relative importance of oil against coal and gas and the possibility of the emergence of natural gas as an export fuel.

During the Second World War the problems of a declining rate of growth in output of crude oil experienced since the mid-thirties were intensified as the Krasnodar oilfields were lost to the advancing Germans and operations in Groznyi, though not entirely lost, were closed down. Between 1941 and 1945 there

was a decline in actual output of crude oil from 33 to 19.4 million tonnes.[1] Through the Lend-Lease system the USA came to the aid of the Soviet Union in providing supplies of refined products, primarily aviation gasoline, and these shipments were continued in 1946 and 1947. Table 2.1. shows the pattern of Soviet production and imports from 1942 to 1945.

The concentration of production in Caucasian fields proved to be a liability during the War (the geographical distribution of Soviet oil production is outlined in Table 2.2.), since the Northern fields were eventually overrun. However this fact in itself prompted the Soviet Union into undertaking exploratory work in the Volga-Ural area, though it was not until late in 1946 that a substantial discovery, that of the Tuymazy field, was made.[2]

The potential of the Volga-Ural area had been appreciated during the thirties, and championed by the geologist I M Gubkin.[3] However even the modest targets set for oil production in this area during the thirties were underfulfilled. In his study of

---

[1]The circumstances leading to the decline in crude oil production are outlined in:

(i) R E Ebel "The Petroleum Industry of the Soviet Union" Washington D C: American Petroleum Institute 1961, pp.62-65.

(ii) R W Campbell "The Economics of Soviet Oil and Gas" Baltimore: Johns Hopkins Press 1968, p.122.

(iii) R E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970, pp.28-29.

[2]Ebel "Communist Trade..." (1970), p.27.

[3]Campbell op.cit. p.126.

TABLE 2.1. Soviet Oil Production and Imports from the USA 1941-1945. (M tonnes)

Year	Production	Index	Imports
1941	33.0	100	0.301
1942	22.0	66.7	0.149
1943	18.0	54.5	0.362
1944	18.3	55.5	0.609
1945	19.4	58.8	0.539

Source: R E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970, pp.28-29.

TABLE 2.2. Regional Distribution of Soviet Oil Production at End of 1940.

Region	Production (M tonnes)	% of Total
Caucasus (Baku and Groznyi)	27.05	87.1
Volga-Ural	1.85	6.0
Kazakhstan and Central Asia	1.50	4.8
Others (Ukraine, North, Far East)	0.70	2.1
Total	31.10	100.0

Source: M M Brenner "Ekonomika neftyanoi promyshlennosti" Moscow Nedra 1962, p.51.

the development of the Soviet oil and gas industries written in 1968 Robert Campbell attributes this delay in appreciation and exploitation of the Volga-Ural fields to disbelief on the part of Soviet central administrators of the extent of reserves, lack of confidence in available drilling technology and, above all, the sheer inflexibility of planners' attitudes, all of which, in his view, needed the catalysing effect of the Second World War to evoke real interest.[4] There may have been some rationale in the planners' policy of non-development of the Volga-Ural fields during the thirties on technical grounds. For example it is known that at this time the absence of appropriate technology to maintain wellhead pressures resulted in very low extraction rates for individual wells.[5] It is also recorded that in 1937 only 8207 out of a total of 12623 wells drilled in the Soviet Union were operational, the remainder being under repair or awaiting refurbishment.[6] By 1940 output per well had dropped, as had labour productivity.[7] Given this, the risk of channelling valuable material and labour resources into the Volga-Ural area was judged too high.

---

[4] ibid. pp.127-128.

[5] V M Baryshev, in Azerbaidzhanskoe neftyanoe khozyaistvo 1938 No.12, p.8.

[6] I M Gubkin "Zadachi neftyanoi geologii na Yuzhno-vostochnom Kavkaze v tret'ei pyatiletke" Azerbaidzhanskoe neftyanoe khozyaistvo 1938 No.12, p.12.

[7] D B Shimkin "The Soviet Mineral-Fuels Industries 1928-1958: A Statistical Survey" Washington D C: US Government Printing Office 1962, p.41.

The development of the Volga-Ural fields gathered pace in the immediate postwar period, facilitated by the availability of improved and in some cases imported technology. By 1955 the requirement in number of wells in a given unit area had been reduced to one-sixth of the prewar level[8] and depths of 1400 metres were attained in production drilling, this giving access to the major oil-bearing layers of the area. As Campbell has indicated,[9] the nature of Volga-Ural crude oil posed considerable problems in the refining industry: the majority of the oils were found to be heavy, of high sulphur and paraffin wax content and the gasoline fractions derived therefrom tended to be of low octane rating, needing further processing to bring them to the required standard. According to a Soviet source of the late fifties the capital costs for oil refining at that time rose with the sulphur content of the oil, such that by taking the index of refining cost of oil with a sulphur content of less than 0.5 per cent as 100 the corresponding index for oil with a sulphur content of 0.6 to 1.9 per cent was 150 to 200 and that for oil with a sulphur content of 2.0 and over 220 to 300.[10] Despite the fact that the majority of Volga-Ural crude oils belonged to the latter category the economics of scale in

---

[8] V A Kalamkarov "Rezervy dak'nego razvitiya neftyanoi promyshlennosti" Neftyanoe khozyaistvo 1955 No.5, p.2.

[9] Campbell op.cit. p.126.

[10] V P Sukhanov "Puti razvitiya neftepererabatyvayushchei promyshlennosti v SSSR" Neftyanoe khozyaistvo 1958 No.9, p.2.

production eventually outweighed the additional refining cost, especially after the development of the Romashkino field in the Tatar republic, discovered in 1948 and brought fully on stream in the early fifties, at which time it was thought to be the world's largest single field.

The Romashkino field accounted for the rapid expansion of output and growth in the Volga-Ural region's share of Soviet production to 29 per cent in 1950 and 58 per cent in 1955.[11] The other major area for expansion in oil production between 1946 and 1955 was the Bashkir ASSR, and the Azerbaidzhan republic had gone some way by 1955 towards regaining its prewar peak production level of 21.4 million tonnes, recorded in 1937. The pattern of Soviet oil production by region from 1945 to 1955 is detailed in table 2.3. The (by world standards) low level of sophistication of refinery technology gave rise to a pattern of product output and final consumption which had to be reversed from the latter part of the eighth Five-Year Plan. During the fifties Soviet refineries were designed and geared to maximal output of fuel oil. As a result the initial conversion of the Soviet rail network from coal was to fuel oil rather than to diesel oil, whilst at the same time the quality of Soviet motor fuel was particularly low, ranging from 50 to 70 octane.

Writing in 1962, the American analyst Demetri Shimkin notes that the structure of Soviet fuel output changed very little

---

[11] Ebel "The Petroleum Industry..." (1961), p.65.

TABLE 2.3. Soviet Oil Production by Region 1945-1955.
('000 tonnes)

	1945	1950	1955
Soviet Total	19436	37878	70793
RSFSR	5675	18231	49263
Volga-Ural	2833	10990	41220
Tatar ASSR	10	1020	14600
Bashkir ASSR	1300	5250	14200
Kuybyshrv oblast'	1020	3480	7250
Stalingrad oblast'	n.a.	n.a.	2300
Saratov oblast'	n.a.	440	1900
Orenburg oblast'	n.a.	n.a.	510
Perm oblast'	190	300	570
West Siberia	-	-	-
North Caucasus	n.a.	6310	6540
Krasnodar krai	700	3000	3890
Chechen-Ingush ASSR	890	2500	2120
Dagestan ASSR	550	920	520
Stavropol krai	n.a.	-	neg.
Sakhalin	n.a.	620	950
Komi ASSR	n.a.	330	550
Belorussia	-	-	-
Ukraine	250	293	531
Turkmenia	629	2021	3162
Fergana Valley (Uzbekistan)	517	1409	1128
Georgia	36	43	43
Kazakhstan	788	1059	1397

(- = zero, neg. = negligible, n.a. = not available)

Source: R W Campbell "The Economics of Soviet Oil and Gas" Baltimore: Johns Hopkins Press 1968, p.124.

between 1928 and 1958. He expresses the view that such a rigid policy placed considerable strain on the economy as a whole, and in the transportation sector in particular, preventing substantial savings in conversion from steam to internal combustion engines and from large wood-fired to oil-fired furnaces. This occurred despite cost-price relations that strongly favoured the use of oil and gas in preference to coal and other solid fuels.[12]

As Alec Nove has indicated,[13] the system of planning by material balances was based inevitably on past experience, ignoring the often substantial effect of change in the period immediately preceding the Plan legislation and the need to make adjustments in the short term in the light of further changed circumstances. Specifically in the case of energy planning the Stalinist system applied in the postwar period operated on the basis of the extrapolation of a simple energy to NMP coefficient, the result being translated into standard fuel units and subsequently into physical units in accordance with unchanging relativities between fuels. Not only was there a substantial economic loss in the fuel economy, but also a delay in the development of the Soviet chemical and petrochemical industries. Irrational fuel prices served only to complicate the issues further. Shimkin's analysis points to the fact that in 1955 delivered prices for hard and brown coal covered only 71 and 91

---

[12] Shimkin op.cit. p.45.

[13] A Nove "An Economic History of the USSR" Harmondsworth: Penguin 1972, pp.315-316.

per cent of costs respectively, whereas the average selling price of petroleum products was some 90 per cent above cost, but included substantial price discrimination between consumers.[14] Shimkin does however note that the "uneconomic outlook" of planners became modified after 1950.[15]

On the question of the difficulties encountered in determining an optimal energy balance Campbell expresses the view that the planning system "has erected too many partitions within the problem, and hampered joint consideration of interrelated problems".[16] Though indeed the plans for economic growth during the period of Soviet reconstruction were broadly fulfilled in the quantitative sense, the energy economy was far from healthy, and was characterised by relatively inefficient conversion processes, reflected in high levels of energy consumption compared with final output.

By the time of the sixth Five-Year Plan it was evident that considerable rethinking had taken place concerning the role of oil and gas within the Soviet energy economy. In an article

---

[14] In fact the coal industry failed to break even until the price reform of 1967 (see Narodnoe khozyaistvo SSSR 1968, p.745, 1970, p.705). On the question of prices for oil products, industrial consumers, for example, paid 393 rubles per tonne for lighting kerosene, general consumers 782: the Oil Ministry charged its own transport network 40 per cent less than other consumers for all types of fuel and lubricant.
Shimkin op.cit. p.44.

[15] ibid. p.45.

[16] Campbell op.cit. p.18.

published in March 1956 the Soviet analysts Agukin and Shakhmatov indicate the need to expand the use of oil and gas in preference to other energy sources.[17] They indicate that in 1955 the average production cost of 1 tonne of standard fuel in the form of oil was less than one quarter of that of coal, one eighth of that of shale and one twelfth of that of peat. Production of 1 tonne of naphtha from oil is stated to be almost three times cheaper than by the liquefaction and hydrogenation of coal.[18] Gas is stated to have even greater advantages, the average production cost being on a standard fuel basis one twelfth of that of Moscow coal and shale, one seventh of that of peat and less than half that of oil.[19]

Despite these advantages, which it is reasonable to suppose must have been appreciated earlier, the gas industry was comparatively underdeveloped. Agukin and Shakhmatov point to inadequate prospecting and delays in the construction of production centres when useful deposits were in fact found.[20] Accordingly the directives of the sixth Plan reflected a sharp rise in the production of gas, envisaging a 3.9-fold increase on the 1955 production level and reaching 35 billion cubic metres in 1960. At the same time the target for discovery of new reserves

---

[17] P Agukin, A Shakhmatov "Neftyanaya i gazovaya promyshlennost' v shestom pyatiletii" Planovoe khozyaistvo 1956 No.3, p.32.

[18] ibid.

[19] ibid. p.40.

[20] ibid.

in the A+B+C1 categories represented an increase of 85 to 90 per cent for the five-year period.[21]

It is not within the scope of this study to explore the reasons for the abandonment of the sixth Plan or for the non-acceptance of the seventh: suffice it to note, as Nove has indicated,[22] that a major reason given for the preparation of a Plan covering the seven-year period from 1959 to 1965 was the discovery of new fuel reserves and Khrushchev's desire to develop rapidly the chemical and petrochemical industries. It is interesting to note that the gas production figure for 1958 was 29.9 billion cubic metres and rose to 45.3 billion in 1960, this latter figure being well in excess of the level envisaged by Agukin and Shakhmatov when the sixth Plan was current.[23]

The discovery and development of the Volga-Ural oilfields prior to the Seven-Year Plan facilitated the rapid growth of the production of oil in the Soviet Union to 1965. As Campbell has noted,[24] the earliest fields to be exploited in the Volga-Ural area were comparatively large and concentration of effort in exploration meant that by 1959 some 80 per cent of Soviet oil reserves in the A+B categories were reckoned to be located in the area. Additionally the oilfields were located close to one

---

[21] ibid. p.41.

[22] Nove op.cit. pp.352-353.

[23] ibid. p.353; Narodnoe khozyaistvo SSSR 1975, p.204; Agukin, Shakhmatov op.cit. p.41.

[24] Campbell op.cit. p.125.

another, enabling a rapid rate of reserve accumulation to be attained at relatively low cost, and the output per well proved to be initially higher than the national average, minimising the cost of production drilling.[25]

There was also a shift in the regional pattern of gas production. The major part of the 9 billion cubic metres of gas produced in the Soviet Union in 1955 came from fields located in European Russia and the Ukraine. During the Seven-Year Plan the priority areas were the Volga fields, the North Caucasus, the Ukraine and Central Asia.[26] As Ian Elliot has indicated in his study of the historical development of the Soviet energy balance written in 1974,[27] the storage of gas is considerably more complicated and expensive than that of other conventional fuels and consequently early Soviet production policy provided for the exploitation of fields located close to potential consumers, even when the reserves of individual deposits were comparatively limited. The benefit of developing natural gas very rapidly during the sixties is illustrated by the fact that the coal and oil industries provided a return of 48 tonnes of standard fuel per thousand rubles invested, compared with 296 tonnes in the gas industry. Output per worker in the coal industry in the late sixties was 38 tonnes of standard fuel

---

[25] M M Brenner "Ekonomika neftyanoi i gazovoi promyshlennosti" Moscow Nedra 1968, p.31.

[26] ibid. p.36.

[27] I F Elliot "The Soviet Energy Balance" New York: Praeger 1970, pp.36-37.

annually compared with 330 tonnes in the oil industry and 2100 tonnes in the gas industry.[28]

During the Seven-Year Plan the oil industry fulfilled its objectives, recording a production level of 243 million tonnes in 1965 against a Plan of 230-240 million. However the gas industry underfulfilled its objective, reaching a level of 129 billion cubic metres against Plan of 150. This tightening in the supply of hydrocarbon energy was exacerbated by the underfulfilment of Plan by the coal industry, necessitating periodic revisions of annual targets.[29] This was compounded by a declining rate of growth in output of the major fuels during the eighth Plan, when the average annual rate was approximately 5.5 per cent compared with 7.3 per cent between 1961 and 1965. Rising demand for energy and depletion of conveniently located reserves, resulting in the need to develop more remote deposits, especially of oil and gas, caused stagnation in oil exports and gave rise to the commencement of gas imports. In 1969 the lowest annual rate of increase in oil production (6.1%) since the Second World War was recorded: this was however rectified in 1970 when the rate was 7.6 per cent, bringing total production to 353 million tonnes. In 1969 gas production totalled

---

[28] A V Aleksandrov "Osnovnye tendentsii nauchno-tekhnicheskogo progressa v gazovoi promyshlennosti" Gazovaya promyshlennost' 1970 No. 1, pp.25-26; Elliot op.cit. p.37.

[29] Nove op.cit. p.353; see also J Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976, p.74.

181 billion cubic metres, a shortfall against Plan of 3 billion, this constituting a 7.2 per cent increase on the previous year. As a result the initial target for 1970 of 200 billion cubic metres was lowered to 196, which was 'fulfilled', the final figure being 198 billion, a 9.4 per cent increase on 1969.[30]

By the start of the eighth Plan the importance of Siberian reserves of oil and gas for the development of the Soviet energy economy was appreciated, though the inevitability of their exploitation had been accepted some ten years earlier.[31] The 23rd Party Congress, held in 1966 decreed that a major economic complex would eventually be created in Siberia on the basis of oil, gas and timber resources and that the effect of the development of oil and gas would be felt by the end of the ninth Plan.[32]

Table 2.4. details the growth of fuel production in the Soviet Union between 1955 and 1970, showing the steady increase in production of each of the major fuels and the expanding share of the production balance held by oil and gas at the

---

[30]An analysis of the performance of the Soviet oil and gas industries during the eighth Plan is given by J R Lee in "The Fuels Industries", in 'Economic Performance and the Military Burden in the Soviet Union' Washington D C: US Congress, Joint Economic Committee 1970, pp.33-37.

[31]Agukin, Shakhmatov op.cit. p.35.

[32]Reported in V S Varlamov "Problemy transportnogo osvoeniya Zapadno-Sibirskoi nizmennosti v svyazi s formirovaniem na ee territorii novogo narodnokhozyaistvennogo kompleksa" Izvestiya AN SSSR, Ser. geograficheskaya 1967 No. 3, p.48.

TABLE 2.4.A. Soviet Fuels Production 1955-1970

Fuel	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Coal (Mt)	391.3	429.2	463.5	496.1	506.6	509.6	506.4	517.4	531.7	554.0	577.7
inc. Hard	276.6	304.0	328.5	353.0	365.2	374.9	377.0	386.4	395.1	408.9	427.9
Brown	114.7	125.2	135.0	143.1	141.4	134.7	129.4	131.0	136.6	145.1	149.8
Oil (Mt)	70.8	83.8	98.3	113.2	129.6	147.8	166.1	186.2	206.1	223.6	242.9
Gas (billion cub. metres)	9.0	12.1	18.6	28.1	35.4	45.3	59.0	73.5	89.8	108.6	127.7

% Gain over Previous Year	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Coal	9.7	8.0	7.0	2.1	1.3	-0.6	2.2	2.8	4.2	4.3
inc. Hard	9.9	8.1	7.5	3.5	2.7	0.6	2.5	2.2	3.5	4.6
" Brown	9.2	7.8	5.9	-1.2	-4.7	-3.9	1.2	4.3	6.2	3.2
Oil	18.3	17.3	15.2	14.5	14.1	12.3	12.1	10.6	8.5	8.6
Gas	34.4	53.7	51.1	26.0	28.0	30.2	24.7	22.2	20.9	17.6

TABLE 2.4.A. (cont.)

Fuel	1966	1967	1968	1969	1970
Coal	585.6	595.2	594.2	607.8	624.1
inc. Hard	439.2	451.4	455.9	467.3	476.4
Brown	146.4	143.8	138.3	140.5	147.7
Oil	265.1	288.1	309.2	328.4	353.0
Gas	143.0	157.4	169.1	181.1	197.9

% Gain over Previous Year	1966	1967	1968	1969	1970
Coal	1.4	1.6	-0.2	2.4	2.7
inc. Hard	2.6	2.8	1.0	2.5	1.9
Brown	-2.3	-1.8	-3.8	1.2	5.1
Oil	9.2	8.7	7.3	6.1	7.5
Gas	12.0	10.1	7.4	7.2	9.3

Sources: Narodnoe khozyaistvo SSSR, 1958, p.213; 1960, pp.257, 262, 267; 1965, pp.175, 177-178; 1970, pp.184-185, 187; 1975, pp.240-242.

J R Lee "The Fuels Industries", in 'Economic Performance and the Military Burden in the Soviet Union' Washington D C: US Congress, Joint Economic Committee 1970, p.36.

expense of other primary energy sources. Writing in 1970, the American analyst J R Lee points to the decline in production of coal in 1961 compared with 1960 and in 1968 compared with 1967.[33] However he omits to mention that the shortfall was recorded only in the production of brown coal, whose calorific value is roughly half of that of hard coal, whose production rose throughout the sixties. Soviet statistics of the changing production balance, expressed in units of standard fuel, present a more accurate picture, and are presented in table 2.4.B.

However this is not to deny that the Soviet coal industry faced a number of difficulties in the eighth Plan. There were considerable delays in the commissioning of new productive capacity. Lee indicates that in 1968 only 12 million tonnes of new capacity was provided, compared with an average of 17 million tonnes per year between 1961 and 1967, but adds the proviso that refurbishment of the industry in the latter half of the eighth Plan should render the 1970 production target of 618 million tonnes readily attainable.[34] In the event this target was exceeded by just over 6 million tonnes.

In 1968 oil replaced coal as the major fuel produced in the Soviet Union, its share of the production balance having risen from 21.1 per cent in 1955 to 39.2 per cent. In 1970 this share had risen to 41.1 per cent. Between 1955 and 1970 the share of gas in the production balance rose from 2.4 to 19.1 per

---

[33] Lee op.cit. p.35.

[34] ibid.

TABLR 2.4.B. Soviet Fuel Production Balance 1955-1970
(M tonnes std. fuel)

Year	Total	Oil (inc. gas cond.)	Gas	Coal	Peat	Shale	Wood
1955	479.9	101.2	11.4	310.8	20.8	3.3	32.4
1956	514.0	119.8	15.2	325.1	18.4	3.5	32.0
1957	574.6	140.6	23.2	351.7	22.5	3.7	32.9
1958	616.4	161.9	33.9	362.1	21.1	4.5	32.9
1959	659.4	185.3	42.5	370.0	23.0	4.6	34.0
1960	692.8	211.4	54.4	373.1	20.4	4.8	28.7
1961	732.7	237.5	70.8	370.7	19.5	5.2	29.6
1962	778.6	266.5	84.6	379.7	12.9	5.8	29.1
1963	847.1	294.7	105.1	388.4	21.7	6.5	30.7
1964	912.2	319.8	127.0	403.3	22.2	7.1	32.8
1965	966.6	346.4	149.8	412.5	17.0	7.4	33.5
1966	1033.1	379.1	170.1	420.1	24.4	7.5	31.9
1967	1088.4	411.9	187.4	428.6	22.4	7.5	30.6
1968	1126.6	442.1	201.2	428.7	18.3	7.6	28.7
1969	1177.4	469.6	215.5	439.6	16.7	8.0	28.0
1970	1221.8	502.5	233.5	432.7	17.7	8.8	26.6

Sources: 1956-1959 Narodnoe khozyaistvo SSSR, 1960, p.253.
1961-1964 Narodnoe khozyaistvo SSSR, 1972, p.209.
1955, 1960 and 1965-1970 Narodnoe khozyaistvo SSSR, 1975, p.239.

TABLE 2.4.C. Soviet Fuel Production Balance 1955-1970 (%)

Year	Total	Oil (inc. gas cond.)	Gas	Coal	Peat	Shale	Wood
1955	100	21.1	2.4	64.8	4.3	0.7	6.7
1956	100	23.3	3.0	63.2	3.6	0.7	6.2
1957	100	24.5	4.0	61.2	3.9	0.7	5.7
1958	100	26.3	5.5	58.8	3.4	0.7	5.3
1959	100	28.1	6.4	56.1	3.5	0.7	5.2
1960	100	30.5	7.9	53.9	2.9	0.7	4.1
1961	100	32.4	9.7	50.5	2.7	0.7	4.0
1962	100	34.2	10.9	48.8	1.7	0.7	3.7
1963	100	34.8	12.4	45.9	2.5	0.8	3.6
1964	100	35.1	13.9	44.2	2.4	0.8	3.6
1965	100	35.8	15.5	42.7	1.7	0.8	3.5
1966	100	36.7	16.5	40.7	2.3	0.7	3.1
1967	100	37.8	17.2	39.4	2.1	0.7	2.8
1968	100	39.2	17.9	38.0	1.6	0.7	2.6
1969	100	39.9	18.3	37.3	1.4	0.7	2.4
1970	100	41.1	19.1	35.4	1.5	0.7	2.2

Sources: 1956-1959 Narodnoe khozyaistvo SSSR, 1960, p.253.
1961-1964 Narodnoe khozyaistvo SSSR, 1972, p.205.
1955, 1960 and 1965-1970 Narodnoe khozyaistvo SSSR, 1975, p.239.

cent. Production of oil by individual republic is detailed in table 2.5., showing the predominance of the RSFSR, which includes the Volga-Ural fields and the emerging West Siberian deposits, which began to contribute in the latter years of the eighth Plan. The trend in the older areas, Uzbekistan, Azerbaidzhan and Turkmenia, shows a plateau in production after 1965, this being counterbalanced by steady growth in the Ukraine, Belorussia, Kazakhstan and Turkmenia.

The corresponding pattern of gas production is given in table 2.6., and evidences continuous growth in each republic. The share of the RSFSR was provided by the Krasnodar and Stavropol krais and the Volgograd and Saratov oblasts, supplemented by the contribution of the Tyumen' oblast' after 1967. However, as Elliot has indicated,[35] it was appreciated that in all but the Tyumen' and Volgograd oblasts the rate of discovery of new reserves in the eighth Plan did not keep pace with the increase in production, signifying the likelihood of falling production after 1970 in areas so affected.

Table 2.7. details the development of the Soviet energy balance to 1970, reflecting the effect of changes in the production of major fuels on consumption and illustrating the emergence of hydrocarbon energy after 1950. The rates of development of the oil and gas industries gave planners cause for confidence that despite the problems encountered towards the

---

[35] Elliot op.cit. p.47.

TABLE 2.5. Soviet Oil Production by Republic 1955, 1960 and 1965-1970
('000 tonnes, inc. gas condensate)

	1955	1960	1965	1966	1967	1968	1969	1970
USSR Total	70793	147859	242888	265125	288068	309150	328299	352574
RSFSR	49263	118861	199929	217982	234950	251545	265653	284753
Ukraine	531	2159	7580	9288	10969	12130	13351	13909
Belorussia	-	-	39	208	817	1718	2760	4234
Uzbekistan	996	1603	1800	1721	1755	1848	1799	1805
Kazakhstan	1397	1610	2022	3103	5602	7429	10124	13161
Georgia	43	34	30	30	32	30	26	24
Azerbaidzhan	15305	17833	21500	21729	21605	21138	20420	20187
Kirghizia	115	464	305	311	310	306	286	298
Tadzhikistan	17	17	47	81	104	127	155	181
Turkmenia	3126	5278	9636	10672	11924	12879	13725	14487

Sources: Narodnoe khozyaistvo SSSR, 1956, p.75.
1960, p.264.
1965, p.175.
1968, p.234.
1970, p.184.

TABLE 2.6. Soviet Natural Gas Production by Republic 1955, 1960 and 1965-1970 (million cubic metres)

	1955	1960	1965	1966	1967	1968	1969	1970
USSR Total	8981	45303	127666	142962	157445	169101	181121	197945
RSFSR	4291	24412	64257	69042	74781	78347	80993	83321
Ukraine	2928	14286	39362	43617	47443	50942	55403	60887
Belorussia	-	-	-	-	-	-	-	178
Uzbekistan	103	447	16474	22566	26638	28988	30769	32094
Kazakhstan	25	39	29	46	83	321	680	2092
Azerbaidzhan	1494	5841	6180	6173	5771	4993	4938	5521
Moldavia	-	2	-	-	-	-	-	-
Kirghizia	-	41	155	163	256	291	341	367
Tadzhikistan	-	-	52	90	245	366	438	388
Turkmenia	141	234	1157	1265	2226	4843	7535	13107

Sources: Narodnoe khozyaistvo SSSR, 1958, p.213.
1960, p.267.
1963, p.156.
1965, p.177.
1968, p.236.
1970, p.185.

TABLE 2.7. The Soviet Energy Balance 1913-1970 (%)

Energy Source	1913	1950	1955	1960	1965	1970
Coal	45.0	64.3	62.5	52.1	41.5	35.0
Oil	24.2	17.0	21.0	29.5	34.7	41.0
Natural Gas	-	2.3	2.3	7.6	15.3	19.0
Other	30.8	16.4	14.2	10.8	8.5	5.0

Sources: I F Elliot "The Soviet Energy Balance" New York: Praeger 1974, p.7.

P Hanson "The Soviet Energy Balance" Nature Vol.261, May 1976, p.3.

end of the eighth Plan oil and gas would be the prime contributors to incremental energy demand in the following decade, potentially accounting for over 60 per cent of the Soviet fuel and energy balance by 1980.[36]

The Development of Oil and Gas Trade.

Robert E Ebel's "Communist Trade in Oil and Gas", published in 1970, provides a detailed history of the Soviet Union as exporter and importer of oil and gas from the pre-Revolutionary origins of the oil industry to the development of the oil and gas industries in the 1960s, and contains detailed statistical information up to and including 1968. The material contained in this section is derived to a great extent from Ebel's, but the prime purpose of the present analysis is to outline the background to Soviet export policy as a study in action and reaction within the context of the world petroleum market, so as to illustrate the nature of the Soviet commitment and its impact on forward trade policy.

As indicated previously, imports of certain oil products were essential during the Second World War as part of the Soviet oil industry fell into enemy hands. Exports recommenced in 1946 but these were counterbalanced by continuing imports of oil and products, such that trade served primarily to optimise the refining balance within Comecon. The Soviet Union imported

---

[36] N V Mel'nikov "Voprosy razvitiya toplivnoi promyshlennosti" Voprosy ekonomiki 1969 No. 1, p.17.

kerosene and middle distillate fuels from Romania and East Germany. Though it was not until 1954 that the role of foreign trade was re-evaluated in the process of de-Stalinisation and in the gradual easing of the Cocom embargo, exports of oil and products to Western countries were resumed in 1951,[37] directed predominantly to Italy and Finland.

By 1954 Sweden had become an importer of Soviet oil under terms which were to become characteristic of the Soviet Union's commercial strategy during the sixties. Sweden was one of the first countries to appreciate the potential vulnerability of high dependence on Middle East oil. As Odell has pointed out,[38] Sweden faced a short-lived supply crisis in 1951 as a result of production shortfalls in Iran during that country's nationalisation of part of the assets of the British Petroleum Company. Sweden was able to offer what the Soviet Union needed at that time, namely large-diameter steel pipe to develop the oil delivery system. Unencumbered by membership of NATO, which disapproved of the sale by any of its members of steel pipe to the Comecon bloc, and impervious to pressure from neighbouring European states, Sweden built up her barter trade with the Soviet Union to the extent of becoming dependent on her for some 15 per cent of oil supplies by the mid-fifties. The Soviet oil trade balance between 1946 and 1955 is detailed

---

[37] Ebel op.cit. p.33.

[38] P R Odell "Oil and World Power: Background to the Oil Crisis" Harmondsworth: Penguin 1975 (4th edit.), p.52.

in table 2.8., showing the emergence of the Soviet Union as a net exporter, though still importing some refined products to compensate for the technological backwardness of domestic refineries in relation to the changing pattern of demand.

In the latter half of the fifties the Soviet Union was able to compound her initial success in export trade with reorientation towards an optimal refining balance, reducing the need to import refined products. As the Volga-Ural fields were brought into production the need to import crude oil likewise declined. The revival of Comecon coincided with the Soviet Union's resumption of oil exports, and trade within the bloc was re-evaluated, to the extent of cancelling Polish indebtedness on certain credits and the extension of new credit facilities to each of the Eastern European countries, the termination of postwar reparations from East Germany in 1954 and the agreement in principle to base future trade in all commodities on prices relating to those in world markets.[39] Henceforward as demand for oil grew in Eastern Europe the Soviet Union became the major supplier to all countries except Romania, who was also a net exporter of oil and refined products.

The period from 1956 to 1965 saw the expansion of Soviet oil deliveries to the West at a time when, after the reopening of the Suez Canal and the restoration of production in the

---

[39]Discussed in some detail in Nove op.cit. pp.348-350.

TABLE 2.8. Soviet Oil Trade Balance 1946-1955 ('000 tonnes)

		1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Exports:	Oil	0	0	0	100	300	900	1300	1500	2100	2900
	Products	500	800	700	800	800	1600	1800	2700	4400	5100
	Total	500	800	700	900	1100	2500	3100	4200	6500	8000
Imports:	Oil	9.1	74.9	74.0	131.9	336.6	59.9	197.6	104.6	193.0	574.8
	Products	900	500	800	1700	2300	2600	3600	4600	3800	3800
	Total	909.1	574.9	874.0	1831.9	2636.6	2659.0	3797.6	4704.6	3993.0	4374.8
Balance (net export+ net import-)											
	Oil	-9.1	-74.9	-74.0	-31.9	-36.6	+841.0	+1102.4	+1395.4	+1907.0	+2325.2
	Products	-400.0	+300.0	-100.0	-900.0	-1500.0	-1000.0	-1800.0	-1900.0	+600.0	+1300.0
	Total	-409.1	+225.1	-174.0	-931.9	-1536.6	-159.0	-679.6	-504.6	+2507.0	+3625.2

Source: R E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970, p.32.

Middle East to previous levels, there arose a substantial surplus of oil on the open market. This resulted in the commencement of a downward trend in oil and refined product prices in Western Europe, which, coupled with the increasing presence of Soviet oil, caused some measure of concern. Italy was in the forefront of negotiations with the Soviet Union. The Italian government discovered that by allowing the state oil company ENI to negotiate freely for supply of crude oil Soviet oil could be obtained as a delivered cost well below that of Middle East oil supplied through the production and distribution system of the major oil companies. The Soviet Union was prepared in principle to offer an outlet for Italian manufactured goods, and the negotiations eventually led to a large-scale bilateral agreement in 1963, which provided for the delivery of 25 million tonnes of Soviet oil over a five-year period in return for steel pipe and later the materials and know-how to build an automobile factory.

However no export agreement concluded at this time was as dramatic as that negotiated with Cuba shortly after Castro's assumption of power in 1959. At that time Cuba's oil and petroleum products were supplied by three of the major oil companies from their operations in Venezuela. Castro queried the high delivered cost of $3 per barrel in relation to the f.o.b. cost in Venezuela of $2. Castro gained Khrushchev's agreement to supply one-third of Cuba's requirement at a delivered cost of $2.10 per barrel. When the oil companies (Shell, Esso and Texaco) exercised their legal right to refuse

to refine and distribute any oil other than that produced by their own affiliates, Castro succeeded in negotiating with Khrushchev for 100 per cent Soviet supply. Following a directive from Castro to the refineries to process Soviet oil, the companies withdrew their staff and embargoed deliveries to Cuba.[40] The reasons why the companies chose to act in this way are obscure. Perhaps they were acting in alliance with the American government in order to bring pressure to bear on Cuba, whose path of socio-economic development could scarcely have been regarded as attractive. On the other hand the companies might well have underestimated the capacity of the Soviet Union to supply the whole of Cuba's requirements. Whatever the reason, the companies and the American government lost in the outcome.

On a different plane the emergence of Soviet oil in the world market necessitated a defensive commercial strategy on the part of the major oil companies. The case of the Soviet offer to India is a good illustration of this. By 1960, the end of India's second Five-Year Plan, the balance of payments and the international value of her currency were giving cause for concern. Limited success had been achieved by the Indian government in persuading the oil companies operating in India to import crude oil rather than higher-cost refined products, but rising demand threatened further drain on an already hard-

---

[40]The background to the Soviet Union's trade agreement with Cuba is given in Odell op.cit. pp.59-62.

pressed currency. In preference to suppressing demand, investing in the development of limited domestic hydrocarbon resources or seeking recourse to further international loans, the Indian government sought either to import crude oil and refined products on a barter basis or to negotiate a price reduction for the oil delivered by the major companies to their affiliates. In mid-1960 the Soviet Union offered crude oil to India at a price some 25 per cent below that being charged by the oil companies. The three companies operating in India lowered their price to counteract the Soviet bid. Since the Soviet Union had just assumed responsibility for supplying Cuba, the companies wished to avoid the consequences of yielding further to market pressure. Additionally the companies were able to convince the Indian government that they could influence the World Bank and other financial institutions to view favourably subsequent approaches by India for aid.[41]

The presence of the Soviet Union in the world petroleum market caused some consternation in American circles, culminating in the publication of a somewhat alarmist report in 1962 on the so-called Soviet "oil export offensive".[42] The report concluded that the Soviet oil export drive had five objectives; protection

---

[41] See M Tanzer "The Political Economy of International Oil and the Underdeveloped Countries" London: Temple Smith 1970, pp.178-193.

[42] National Petroleum Council of America "The Impact of Oil Exports from the Soviet Bloc" (2 Vols.) Washington D C: American Petroleum Institute 1962. (A supplement to the report was added in 1964.)

of the domestic economy against foreign competition, isolation of the currency from the influence of foreign exchange markets, provision of a strengthening bargaining position opposite capitalist countries, development of the ability to discriminate amongst purchasers and to sell in foreign markets without regard for normal commercial considerations or internal costs and lastly securing flexibility to adjust trade to serve political interests.[43] The problematic issues were seen to be the last two perceived objectives. Ebel indicates that price-cutting on the Soviet part was a feature of strategy, but only to the extent necessary to secure a contract and that no opportunity was wasted to maximise the revenue from existing business.[44] On the much-publicised question of discriminatory pricing against Eastern Europe, who during the fifties and early sixties were paying more in unit ruble values for Soviet oil and refined products than Western buyers, Ebel rightly draws attention to the fact that as the prices of all commodities in intra-Comecon trade were being brought into line with those of the world markets, the declining price of oil was reflected in the prices charged during the sixties, when relative prices of many other goods in intra-Comecon trade were also being re-evaluated.[45]

---

[43] ibid. Vol.2, p.418.

[44] For example when the Suez Canal was closed in 1967, resulting in disruption in supply from the Middle East and oil shortages in Western Europe and Japan, the Soviet Union raised her oil prices in these markets. Ebel "Communist Trade..." (1970), p.63.

[45] ibid. p.64.

As for the issue of pricing without regard to cost, what Western company has not at times priced in relation to marginal cost in order to secure export business? In this sense, as Peter Wiles has indicated,[46] the Soviet Foreign Trade Ministry behaves no differently from the export department of a multi-divisional company. This goes some way towards putting into perspective the 'political' aspect of Soviet oil trade. Political relations are governed by a set of mutual perceptions of policy. If, for example, the USA believed that the Soviet offer of oil to Cuba was made for the purpose of gaining a political foothold, then American policy towards the Soviet Union may be influenced by this perception, overlooking the fact that the commercial policy of the oil companies at that time left Castro no alternative. In the Italian case, the Soviet Union had by virtue of a different financial structure of its oil industry and the ability to absorb Italian goods as part payment a commercial advantage over the established traders. The subsequent development of such trade has been limited not so much by political considerations, which might be loosely defined as an attempt to diminish the influence of the USA in Italy in the form of decreasing the market share held by the American oil companies, but by the capacity of the Soviet Union to absorb what Italian industry was prepared to offer in barter payment. The outcome is a function of relative

---

[46] P J D Wiles "Communist International Economics" Oxford: Basil Blackwell 1968, p.40.

competitiveness of bids in the market. The lifting of the NATO embargo in 1966 on deliveries of steel pipe to the Comecon bloc enabled the Soviet Union to compete more effectively for a share of the West German petroleum market from the mid-sixties.

In the late sixties there was a fall in deliveries of Soviet oil to non-Comecon markets, which gave rise to the view that the Soviet Union's oil export drive was losing momentum. Much of the slowdown in the growth of net exports was due to a natural delay before the effect of production shortfalls in oil and gas prompted planners to adjust the rate and pattern of growth in domestic demand. It is likely that Soviet oil export policy was constrained in the late sixties by rising costs of exploration and production, growing demand both domestically and within Eastern Europe and falling prices in the world market due to intense competition between the oil companies. The fear of Western Europe's possible engulfment in a sea of Soviet oil, expressed in the American National Petroleum Council's 1962 report had not been realised and the future trend of Soviet oil exports appeared uncertain.

Table 2.9. details the Soviet trade balance in crude oil and refined products from 1956 to 1970, showing the declining import requirement as the Soviet oil production and refining industries underwent considerable expansion and the peak of exports as a percentage of production, reached in 1966, and the slight decline in the latter to 1970.

Despite the consistent failure of the Soviet gas industry to fulfil Plan targets since 1965 the Soviet Union has taken

TABLE 2.9. Soviet Oil Trade Balance 1956-1970
(M tonnes, Oil and Refined Products)

Year	Production*	Exports	Imports	Net Exports	Net Exports as % of Prodn.
1956	83.8	10.6	5.6	5.0	6.0
1957	98.3	16.3	4.5	11.8	12.0
1958	113.2	18.9	4.6	14.3	12.6
1959	129.6	26.5	4.7	21.8	16.8
1960	147.8	34.5	4.7	29.8	20.2
1961	166.1	42.7	3.8	38.9	23.4
1962	186.2	47.1	3.0	44.0	23.6
1963	206.1	53.1	3.0	50.1	24.3
1964	223.6	58.3	2.3	56.0	25.0
1965	242.9	66.2	2.1	64.1	26.4
1966	265.1	75.6	1.8	73.8	27.8
1967	288.1	81.0	1.5	79.5	27.6
1968	309.2	86.2	1.1	85.1	27.5
1969	328.4	90.8	1.1	89.7	27.3
1970	353.0	95.8	1.1	94.7	26.8

(* inc. gas condensate)

Sources: 1956-1967 R E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970, p.40.

1968-1970 Narodnoe Khozyaistvo SSSR, 1975, p.240.
Vneshnyaya torgovlya SSSR 1969, pp.25, 38, and 1970, pp.26, 39.

advantage of the availability of gas to enter the expanding market in Eastern Europe. The factors determining the development of the Western European gas market were the development of the Groningen gas field in the Netherlands, which supplied that country plus West Germany and France, the expansion of Algerian and Libyan deposits, shipped as liquefied petroleum gas to France and Italy respectively, and the development of the Norwegian and British gas reserves in the North Sea, the former providing fuel and feedstock with the possibility of export, given Norway's excess of hydrocarbons over demand, the latter consumed almost entirely domestically.

The first agreement between the Soviet Union and a Western country for the sale of natural gas was that signed with Austria in 1968. In return for Austrian steel plate, rolled into pipe in West Germany, the Soviet Union extended the 'Bratstvo' trunk pipeline, completed in 1967, over the Czech border into Austria and deliveries of Soviet gas commenced by the end of 1968.[47] The other Soviet export outlets for gas were Poland and Czechoslovakia. Small quantities of liquefied gas had been delivered to Poland since 1950,[48] but a substantial volume was supplied after the completion of the Northern branch of the 'Bratstvo' pipeline to Warsaw in 1966. Supply of Soviet gas to Czechoslovakia, commencing in 1967, helped to alleviate the strains imposed by

---

[47]The background to this agreement is given in Ebel "Communist Trade..." (1970), pp.135-137.

[48]ibid. p.138.

relatively rapid economic development and a poor indigenous resource base, which had been supplemented by supplies of Soviet oil, whose production for export was becoming increasingly problematic. During the late sixties the Soviet Union opened negotiations with Italy, West Germany and Japan concerning the possibility of future supply of gas in return for assistance, material and financial, in developing Siberian resources.[49] There were no deliveries of Soviet gas to these countries prior to 1970.

At the same time as concluding gas export contracts in Western and Eastern Europe the Soviet Union undertook to import gas from Iran and Afghanistan.[50] In each case deliveries constituted repayment for Soviet development aid. Imports from Afghanistan commenced in 1967 and from Iran in 1970. The gas trade balance from 1955 to 1970 is detailed in table 2.10., showing the movement towards a net import position during the late sixties. Despite this trend the potential for domestic and export substitution of gas for coal was not in doubt. As Ebel indicates,[51] imports beyond the quantities stipulated in the original agreements with Iran and Afghanistan were not foreseen, and it was expected that in the course of the ninth Plan the Soviet Union would again become a net exporter.

---

[49] ibid. pp.140-142, 149-155.

[50] ibid. pp.155-163.

[51] ibid. p.164.

TABLE 2.10. Soviet Gas Trade 1955-1970
(Billion cubic metres)

Year	Production	Exports	Imports	Net Exports
1955	9.0	0.139	-	0.139
1960	45.3	0.242	-	0.242
1965	127.7	0.392	-	0.392
1966	143.0	0.828	-	0.828
1967	157.4	1.290	0.207	1.083
1968	169.1	1.729	1.500	0.229
1969	181.1	2.664	2.030	0.634
1970	197.9	3.300	3.551	-0.251

Sources: Table 2.4.A.

R E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970, p.138.

Vneshnyaya torgovlya SSSR 1968, pp.26,213.
1969, pp.26,211.
1970, pp.26,215.

Towards the end of the sixties increasing logistic difficulties obliged the Soviet Union to approach Iraq to secure oil supplies. Such imports could either be delivered via the Black Sea into the Southern area of the Soviet Union to compensate for declining production in the Baku area, or directly to established export markets. The relatively late commencement of the development of the Soviet gas industry coincided with the deterioration of economic, technical and logistic conditions in the oil industry. Though not without problems of its own the gas industry's potential enabled planners to make a substantial adjustment in forward estimates of energy supply and consumption.

In January 1969 the Soviet Oil Minister, V D Shashin, declared that because of rising domestic and Eastern European consumption exports of Soviet oil to non-Communist markets would not continue to rise significantly.[52] In interpreting this statement much depends on the meaning of the word 'significantly'. Ebel takes this to indicate that the growth of net Soviet exports would be very slight in the future.[53] However neither Ebel nor the Soviet Oil Minister discuss the potential impact of gas.

In the aftermath of the Six-Day War of 1967 and the closure of the Suez Canal the Soviet Union undertook a commitment that had been common practice in the international oil industry but which represented a new departure for the Soviet oil export authority Soyuznefteeksport. Faced with increasing difficulties in supplying her own oil to established markets in the Far East and Japan, the Soviet Union negotiated the exchange of oil and refined products at the Black Sea ports for delivery into the outlets of the international oil industry in return for an equivalent quantity at Persian Gulf ports for delivery to Soviet customers. The convenience of such arrangements became increasingly important to the Soviet Union as the distribution of her own oil grew more costly.

Concluding his study, written in 1968, Robert Campbell notes that Soviet reserves of oil and gas would not constitute a

---

[52]Reported in the New York Times, 11 January 1969, p.C-39.

[53]Ebel "Communist Trade..." (1970), p.104.

constraint on future export levels, but that the prime factor was cost.[54] He identifies the crucial issue, namely that Soviet gas might prove to be a more advantageous substitute for coal in the domestic energy balance, freeing oil for export, but he confines his forward view to stating that "success in expanding gas output...(was)...bound to have an important influence on oil export policy".[55] At the outset of the ninth Plan the prospects for the success of such a policy seemed promising.

---

[54] Campbell op.cit. p.251.

[55] ibid. pp.252-253.

Chapter 3. Soviet Oil and Gas 1971-1975.

There is a marked difference in the development of the Soviet energy economy in the ninth (1971-1975) Five-Year Plan compared with the previous fifteen year period. From 1955 to 1965 the growth in the share of oil and gas in the Soviet energy balance was brought about by the development of reserves located in the European part of the USSR, relatively close to centres of consumption, namely the Volga-Ural region, the North Caucasus and the Ukraine. From 1955 to 1965 production of oil and gas condensate in the Soviet Union grew by 192.1 million tonnes, of which European areas accounted for 150.3 million, 87 per cent of the total growth. In the same period gas production grew by 118.7 billion cubic metres, over 70 per cent of which was provided by European operations, mainly in the same areas which accounted for the majority of growth in oil production.[1] The position in the coal industry differed from that of oil and gas in that between 1955 and 1965 less than half (44 per cent) of incremental production was derived from European operations. The overall position was that European Russia's contribution to total fuel production rose from 66 per cent in 1955 to 72 per cent in 1965.[2]

---

[1] A E Probst "Puti razvitiya toplivnogo khozyaistva SSSR" Planovoe khozyaistvo 1971, No. 6, p.54.

[2] ibid.

Development prospects and plans for the 1971-1975 period show the increasing importance for the Soviet energy economy of regions to the East of the Urals. Opportunities for increasing the production of oil and gas in the European part of the Soviet Union were seen to be limited by a declining rate of discovery of new reserves. The objective was therefore to maintain or increase slightly production levels in fields operational during the eighth Plan, though in certain areas production was scheduled to decline. In European Russia the areas that were scheduled to increase oil production were certain fields in the Urals, the North-West and new fields in Belorussia. The European area as a whole was scheduled to provide one fifth of incremental production during the ninth Plan, with the balancing four fifths to be provided by operations in West Siberia,[4] where the production level in 1975 was planned to be 120 to 125 million tonnes.[5] Table 3.1. details the planned changes in regional production of oil (excluding gas condensate) in 1975 compared with 1970.

The development of the oil industry in the ninth Plan is paralleled by that of the gas industry. In the course of the ninth Plan one fifth of the increase in production was scheduled

---

[3] ibid.

[4] ibid., and also 'Gosudarstvennyi pyatiletnii plan razvitiya narodnogo khozyaistva SSSR na 1971-1975 gody', Moscow: Politika 1972 p.97. (This is referred to hereafter as Pyatiletnii plan 1971-1975.)

[5] Pyatiletnii plan 1971-1975, p.103.

TABLE 3.1. Changes in the Regional Pattern of Soviet Crude Oil Production (1975 Plan compared with 1970 Actual)

	1970		1975P		1975P as %
	Mt	% share	Mt	% share	of 1970
USSR	348.8	100	496	100	142.2
European Area plus Urals	285.2	81.8	314.5	63.4	110.3
of which:					
Tatar ASSR	101.9	29.2	101	20.4	99.1
Bashkir ASSR	39.2	11.2	40	8.1	102
Kuybyshev obl.	35	10	35	7.1	100
Orenburg obl.	7.4	2.1	14	2.8	189.2
Perm obl.	16.1	4.6	21.5	4.3	133.5
Komi ASSR	5.6	1.6	10	2	178.6
Regions to E of Urals	63.6	18.2	181.5	36.6	290
of which:					
West Siberia	31.4	9	125	25.2	400
Turkmen ASSR	14.4	4.1	22	4.4	152.8
Kazakhstan	13.1	3.8	30	6	230

Source: Pyatiletnii plan 1971-1975, p.103.

to be provided by European operations, the balance being provided by West Siberia and Central Asia. The rapid development of gas fields in the Komi Autonomous Republic and the Orenburg oblast', discovered and prepared for development during the eighth Plan, was expected to be counterbalanced by a decline in production in other European fields.[6] Table 3.2. details the planned changes in regional production of gas in 1975 compared with 1970. The year-by-year growth pattern planned for the oil and gas industries

[6]Probst op.cit. p.54, Pyatiletnii plan 1971-1975 p.107.

TABLE 3.2. Changes in the Planned Regional Production of Gas 1975 compared with 1970 (billion cubic metres)

	1970		1975P		1975P as %
	Prodn.	% share	Prodn.	% share	of 1970
USSR	198	100	320	100	161.6
European Area plus Urals	139	70.2	164.1	51.3	118
of which:					
Orenburg obl.	1.3	0.7	26	8.1	X 20
Komi ASSR	6.9	3.5	16.1	5	X 2.3
Regions East of Urals	59	29.8	155.9	48.7	X 2.6
of which:					
West Siberia	9.3	4.7	44	13.8	X 4.7
Turkmen ASSR	13.1	6.6	65.1	20.3	X 5

Source: Pyatiletnii plan 1971-1975, pp.106-107.

for the term of the ninth Plan is outlined in table 3.3.

In the oil refining industry the objective was to increase the capacity of individual processing units rather than to install large-scale new refineries. It is stated in the Plan that the average capacity of primary distillation units should rise by 62.5 per cent from 3.2 million tonnes per year recorded in the eighth Plan to 5.2 million in 1971-1975, of catalytic power-formers, used to manufacture motor gasoline and petrochemical feedstock, from an average capacity of 384 thousand tonnes per year during the eighth Plan to 566 thousand, of hydrofiners, used to remove sulphur from middle distillate fuels, from 1.12

TABLE 3.3. Planned Soviet Oil and Gas Production 1971-1975

	1971	1972	1973	1974	1975
Oil, excl. gas condensate (M tonnes)	371.3	395.1	429	461	496
Natural Gas (billion cubic metres)	211	229	250	280	320

Source: Pyatiletnii plan 1971-1975, p.346.

million to 1.85 million tonnes per year.[7] In total oil refining capacity was scheduled to rise by 40 per cent during the ninth Plan,[8] this requiring an increase in capital investment of 62.1 per cent.[9] To achieve these objectives capacities in refineries operational at the end of the eighth Plan would be increased by 20 per cent, the balance being provided by the construction of new refineries at Lisichansk (Ukraine), Mozyr (Belorussia), Jurkarkas (Lithuania), Arkhangelsk (on the White Sea), Pavlodar and Chimkent (Kazakhstan), Chardzhou (Turkmenia), Achinsk (West Siberia) and Khabarovsk (Far East). Given that some 70 per cent of new capacity was scheduled to be provided by the four refineries planned for European Russia and around 30 per cent by the remaining five Asiatic plants, it will be seen that the European refineries will be some three times larger than the Asian.[10]

---

[7] Pyatiletnii plan 1971-1975, p.108.

[8] ibid.

[9] ibid.

[10] ibid. pp.108-109; Economist Intelligence Unit 'Soviet Oil to 1980' London: EIU 1973 p.37.

The above is complicated by the fact that fuel consumption is centred predominantly in European Russia. Additionally, as the centre of exploration and production moves Eastwards, long-range criteria in integrating oil and gas into the total energy balance may differ from short- and medium-range, and considerations of minimum financial outlay at the initial stage of development cannot serve as the sole basis for the evaluation of available alternatives. Factors stated to be taken into consideration by Soviet planners include estimates of forward price parities, reliability of supply, feasibility of demands made by the fuel and energy sectors on related industries such as machine-manufacturing, civil engineering and metallurgy, and the impact of energy development on the environment.[11]

However the basic factors that influence the formulation of energy policy are the discovery of new fuel reserves, judged on the basis of the best available information to be economic, and the cost of transporting fuels in processed form to the point of final consumption. It is known that by the mid-point of the ninth Plan the targets for the discovery of new oil reserves had been underfulfilled by some 50 per cent,[12]

---

[11] A Vigdorchik et al. "Metody optimizatsii dolgosrochnogo razvitiya toplivno-energeticheskogo kompleksa SSSR" Planovoe khozyaistvo 1975 No. 2, p.30.

[12] Sotsialisticheskaya industriya 29 September 1973, p.2; P P Galonskii "Bol'shie perspektivy, vazhnye zadachi" Neftyanik 1972 No. 2, p.2.

necessitating some degree of re-thinking on the part of Soviet planners as to the general future direction of the energy economy. On another plane, the short-term impact of delays experienced in exploiting reserves declared to be economically attractive goes beyond that of causing shortages of a given fuel. Thus, for example, delays in bringing on stream oil reserves scheduled for development during the ninth Plan, compounded with a refining policy aimed at maximising the output of non-substitutable fuels and petrochemical feedstock, not only causes a shortfall in the availability of residual fuel oil,[13] but also stimulates demand on the part of industrial consumers faced with a fuel shortage for change in the priorities of the refinery balance. The longer-term impact of the effect of a delay of this nature is that of obliging planners to direct a greater proportion of natural gas to fuel end-uses than had been previously considered optimal, and in so doing tightening the supply of gas as petrochemical feedstock. Towards the end of the ninth Plan the problems encountered in the oil industry were compounded by the commencement of similar short-falls in the discovery of new reserves of other fuels.[14]

A recent feature of Soviet development policy has been to limit the construction and expansion of energy-intensive industry

---

[13] M A Styrikovich "Nauchno-tekhnicheskie problemy razvitiya energetiki SSSR" Izvestiya AN SSSR, Ser. energetika i transport 1974 No. 3, p.8.

[14] A Mel'nikov, V Shelest "Toplivno-energeticheskii kompleks SSSR" Planovoe khozyaistvo 1975 No. 2, pp.10-11.

in European Russia and to site such enterprises closer to the new centres of fuel production, where, according to Gosplan's Committee for the Study of Productive Resources, fuel can be delivered to the enterprise at between one fifth and one half the cost of delivery in European Russia.[15] This is gradually becoming the preferred policy of Gosplan, since it acknowledges the great difficulties that would be encountered in attempting in the short term to eliminate the fuel and energy deficit in European Russia by expanding fuel production there, given the long lead-times in construction[16] and the complicating factor of a wide disparity in the delivered cost of fuels, as shown in table. 3.4. Two leading Soviet energy specialists define the problem of the Soviet energy economy as being that of the interaction of three factors: Soviet policy of concentration of productive capacity, creating pockets of very high energy demand; defining and achieving an optimal variant amongst available fuels; intrinsic inertia and changing capital intensity of the fuels industries.[17] Prior to analysing in detail the development of the Soviet oil and gas industries during the ninth Plan it is useful to consider the current system of energy planning as a whole in order to establish the background to decisions taken in

---

[15] Editorial "Uskorenno razvivat' toplivno-energeticheskuyu bazu strany" Planovoe khozyaistvo 1975 No.2, p.5. The Ministries of the Chemical and Petrochemical and Metallurgy industries are criticised for not having advanced this policy.

[16] Probst op. cit. p.58.

[17] L A Melent'ev, A A Makarov "Osobennosti optimizatsii razvitiya toplivno-energeticheskogo kompleksa" Izvestiya AN SSSR, Ser. energetika i transport 1974 No.3, p.12.

TABLE 3.4. Comparison of Cost of Fuels Delivered to Selected Consumption Points in European Russia. (Rubles per tonne of Std. fuel).

Consumption Point	Donets Coal	Kuznetsk Open-cast Coal	Tyumen' Gas	Central Asian Gas	Fuel Oil	Peat
Leningrad	20.3	17.3	10.8	-	4.4	-
Moscow	18.4	16.1	10.0	13.3	8.1	11.6
Minsk	18.6	-	11.4	-	9.3	10.2
Gor'kii	18.8	15.0	10.0	-	7.7	-
Saratov	17.5	15.2	13.3	10.4	7.3	-
Donetsk	15.6	-	-	12.9	10.8	-

Source: A E Probst "Puti razvitiya toplivnogo khozyaistve SSSR" Planovoe khozyaistvo 1971 No. 6, p. 56.

respect of the development of these two industries.

Table 3.5. details the planned fuel production targets for 1971 to 1975 and the results achieved. The targets for discovery of new fuel reserves were less precise, these being planned to rise by 33.7 per cent.[18] The Plan envisaged that the share of oil and gas in the overall energy balance would rise from 60.4 per cent in 1970 to 67.4 per cent in 1975.[19] Taking into account the directive to increase the share of open-cast mined coal from 26.7 to 30.9 per cent of total coal produced, the result is that Soviet planners expected the use of "economic fuels" ('ekonomicheskie vidy topliva') to rise from 68 to 75 per cent of fuel consumed in this period.[20] Despite a preference on the Soviet part for increasing the share of oil and gas within the energy balance, coal has remained a significant contributor, particularly in electricity generation and preferentially in this end-use in European Russia.[21] In the Soviet Union as a whole electricity generation accounts for approximately one-third of energy consumption, and some 60 per cent of electricity is generated in coal-fired power stations.[22]

Since the ratio of proved reserves to production is less favourable for oil than for other conventional fuels and the

---

[18] Pyatiletnii plan 1971-1975, p.98.

[19] ibid. p.99.

[20] ibid.

[21] M I Rostovtsev, T G Runova "Dobyvayushchaya promyshlennost' SSSR" Moscow Mysl' 1972, p.16.

[22] Mel'nikov, Shelest op.cit. p.13.

TABLE 3.5. Soviet Fuel Production 1971-1975, Plan and Performance.

		1971	1972	1973	1974	1975
Oil (M tonnes)	Plan	371	395	429	461	496*
	Actual	372	394	421	451	491
Gas Condensate (M tonnes)	Plan	n.a.	n.a.	n.a.	n.a.	9
	Actual	5.3	6.6	7.6	8.3	n.a.
Gas (billion cubic metres)	Plan	211	229	250	280	320
	Actual	212	221	236	261	289
Coal (M tonnes)	Plan	620	634	652	670	695
	Actual	641	655	668	685	701

Sources: Pyatiletnii plan 1971-1975, pp.28, 98, 346.

Pravda 1 February 1976, p.1.

Narodnoe khozyaistvo SSSR 1974, p.183.

Narodnoe khozyaistvo SSSR 1975, p.205.

n.a. = not available.

*Note that Nar. khoz. 1975 did not record separate figures for production of oil and gas condensate: this figure includes both.

transportation problems more severe, oil has come to be regarded as the scarce resource in relation to which the energy balance as a whole should be optimised. On the one hand there must be produced a certain quantity of light fractions for which no ready substitute exists, either in the technical or economic sense.[23] On the other hand there is a substantial degree of choice amongst boiler and furnace fuels and the option taken depends on the economic balance between production, transportation and conversion costs.[24] The decision-making process by which the final fuel balance is determined lies within the remit of the Collegium of Gosplan,[25] and final demand is worked out by aggregating reported demand by sector of the economy. Individual departments of Gosplan are responsible for verifying the sectoral analysis of energy demand: the Gosplan Collegium accordingly aggregates sectoral demand and allocates fuel.[26] Mathematical models are used to plan at three levels, the long-term (i.e. the next Five-Year Plan), the medium, (i.e. the remainder of the current Plan) and the annual Plan.[27] It appears that the use of linear

---

[23] A S Pavlenko, A M Nekrasova (eds.) "Energetika SSSR v 1971-1975 godakh" Moscow Energiya 1972, p.31.

[24] ibid. p.32.

[25] Murray Feschbach (Rapporteur) Report of a visit by delegation of US systems analysts to Moscow 1974. Mimeo. pp.5-6.

[26] Feschbach pp.6-7. Note also that research into the decision-making process of the Soviet energy sector as a whole is being carried out by D Wilson and Dr P Hanson of the Centre for Russian and East European Studies, University of Birmingham, UK.

[27] ibid. p.5.

programming techniques is a relatively recent feature of Soviet energy planning and that work on the development of an all-Union unified energy supply model is still incomplete.[28]

One of the early detailed works on the Soviet method of energy planning is that of the German economist Werner Gumpel.[29] In this analysis he points to four major difficulties faced by Soviet planners: firstly the worsening spatial dislocation between energy reserves, production and consumption, secondly the changing criteria determining levels of substitutability between fuels, thirdly the fluctuations in consumption patterns caused principally by the continental climate and fourthly the long lead-times for investment projects in the energy industries, which are often subject to overruns.[30] Gumpel sees the last of these features as the crucial issue. Perhaps the most important issue however is that of the uncertainty and changeability of the basic information on which decisions are made.[31] During the ninth Plan it was felt that forward estimates on reserves and production costs of coal were more reliable than those for oil and gas. More precisely, Gosplan's information was apparently less firm in

---

[28] ibid. p.7.

[29] W Gumpel "Energiebilanzen als Mittel der Energieplanung in der UdSSR" Jahrbuch der Wirtschaft Osteuropas, Munich 1972, Volume 2, pp.295-317.

[30] ibid. p.296.

[31] Melent'ev, Makarov op.cit. p.13. A particularly pressing problem is that of forward assumptions of prices in relation to costs, this allegedly posing difficulties in deriving an optimal balance.

respect of the comparative costs of production and transportation of Siberian oil and gas resources than that concerning the future exploitation of Kansk-Achinsk and Kuzbass coal.[32] Thus, as Melent'ev and Makarov argue,[33] it becomes optimal to favour an energy balance which slows the rate of increase of oil and gas in relation to coal, on the grounds of minimum uncertainty. On the other hand planners have to take into account the economics of conversion and the foreign trade implications of domestic production decisions, the more so after 1973, given the enhanced earning potential in hard currency markets afforded by the increased world price for oil. This has given rise to greater interest on the part of Soviet planners in coal and gas as fuels for electricity generation,[34] and in gas partly as fuel and partly as feedstock for a series of industries.[35] Therefore gas and coal can be used as substitute fuels for oil, and the relative decline in the share of the refining balance held by fuel oil, permitting a correspondingly higher share of the output of gasoline, naphtha and middle distillates, for which no ready substitute exists and which are in greater demand than fuel oil in export markets.

The optimum utilisation of fuel is a further objective of Soviet energy policy. On the basis of its conversion characteristics

---

[32] ibid. p.15.

[33] ibid.

[34] Styrikovich op.cit. p.8.

[35] The advantages in conversion efficiency that arise from the use of natural gas are outlined in I F Elliot "The Soviet Energy Balance" New York: Praeger 1974 pp.236-243.

natural gas is the most efficient of the three major primary energy sources,[36] and despite the apparent uncertainty surrounding reserves in the long term there has been considerable emphasis on gas as the preferred fuel for domestic and industrial use in the course of the ninth Plan. The 1975 consumption balance for gas is outlined in table 3.6. The striking feature of this balance is the low percentage share of gas directed to petrochemical manufacture and to export. These are the two sectors that Soviet planners most wish to develop in the immediate future. Conversion efficiency in general has become the subject of some attention in Soviet writing: it is admitted that despite considerable improvement over the 25 years to 1975 energy conversion efficiency is unacceptably low.[38]

In concluding his study written in 1974 Elliot observes that the Soviet Union "has no need to fear an absolute energy shortage".[39] Indeed there is no evidence to refute this statement, and the same could be said of a number of the world's industrialised countries. The point at issue is the nature, extent and implications of the politico-economic problems that are known and admitted to exist. Soviet analysts have been at pains to point out that the Soviet Union does not have an energy

---

[36] E Yudin "Effektivnoe ispol'zovanie toplivno-energeticheskikh resursov strany - obshchegosudarstvennaya zadacha" Planovoe khozyaistvo 1975 No. 6, p.60.

[37] ibid. p.63.

[38] V V Mikhailov "Problemy ekonomiki promyshlennogo energopotrebleniya" Promyshlennaya energetika 1976 No. 1, p.9.

[39] Elliot op.cit. p.263.

TABLE 3.6. Natural Gas Consumption by Economic Sector 1975.

Sector	% Share
Electricity Generation	14-15
Heat Raising	33
Industrial Manufacturing	29
Petrochemical Feedstock	7-8
Domestic Fuel	5-6
Agriculture	0.5
Other	1
Export	balance

Source: E Yudin "Effektivnoe ispol'zovania toplivno-energeticheskikh resursov strany - obshche-gosudarstvennaya zadacha" Planovoe khozyaistvo 1975 No. 6, p.61.

supply problem, nor is she affected by the type of 'energy crisis' that has adversely affected the capitalist world.[40] If the Soviet Union, and even the Comecon bloc as a whole, can remain economically self-sufficient in energy, and particularly in oil, then one might expect a different series of economic and political consequences arising from the recent price rises for oil imposed by OPEC, and allied rises in the price of other energy forms that might be imported, from those which would arise from growing import dependence, including, for example, constraints on general trade policy and bargaining power in international relations.

---

[40]See esp. Planovoe khozyaistvo 1975 No. 2, p.7, and Yu I Bokserman "Nekotorye tendentsii dal'neishego razvitiya toplivnoi promyshlennosti" Neftyanik 1975 No. 1, p.5.

As late as June 1973 one Western analyst, Professor Robert Campbell, was discussing as a major issue in Soviet energy policy whether the USSR could take advantage of "cheap Middle East oil", or "allow" Eastern Europe to do so.[41] The very rapidity with which the trading conditions of the world market changed, and the extent to which the new pricing levels affect the Soviet and Eastern European view of import possibilities were such that by 1976 the question was raised in Western analysis of how Comecon countries would be able to finance the import of OPEC oil at levels already reached.[42] It is the purpose of the remainder of this chapter to outline and analyse the major trends in the Soviet oil and gas industries from 1971 to 1975 in relation to set objectives and to the development of the Soviet energy balance in general.

The Soviet Oil and Gas Industries 1971-1975: Objectives and Achievements.

The oil industry's objective was to raise production of oil and gas condensate from 353 million tonnes in 1970 to 505 million in 1975 through maintenance of production levels achieved in the eighth Plan in existing operations in the Volga-Ural oil fields

---

[41] R W Campbell "Some Issues in Soviet Energy Policy for the Seventies", in 'Soviet Economic Prospects for the Seventies' Washington D C: US Congress, Joint Economic Committee, 1973, p.55.

[42] J Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976, p.200.

and by developing new deposits in West Siberia, the Komi Autonomous Republic, the Northern Caucasus, the Perm and Orenburg oblasts, the Udmurt Autonomous Republic, the Ukraine, Turkmenistan and the Caspian shelf.[43] Of these newly developed deposits West Siberia was planned to account for a growth of 90 to 100 million tonnes, Kazakhstan approximately 17 million, Turkmenia, the Orenburg oblast', the Komi ASSR and Belorussia approximately 30 million.[44] The eastward shift in explored ('razvedannye') reserves that influenced the setting of these priorities is detailed in table 3.7., in which gas reserves are also included.

The question of the extent of Soviet oil reserves and of success in their discovery is a prime factor in determining production policy not only in total but also in the regional distribution of production. Most Western analysts have pointed to the fact that since 1947 information on Soviet oil reserves has been regarded as a state secret,[45] and that Soviet sources are therefore non-committal about their extent. However there does exist a number of estimates of size and potential. One estimate

---

[43] P. Galonskii "Neftyanaya, gazovaya i neftepererabatyvayushchaya promyshlennost' v 1971-1975 godakh" Planovoe khozyaistvo 1972 No. 11, p.31.

[44] ibid. p.32.

[45] Elliot op.cit. p.80; Russell op.cit. p.40; J. Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin: Duncker & Humblot 1975 p.55; R. W. Campbell "The Economics of Soviet Oil and Gas" Baltimore: Johns Hopkins Press 1968 p.68.
(A definition of the Soviet method of classifying reserves is given in appendix C.)

TABLE 3.7. Geographical Shift in Location of Explored Reserves (%)

Area	1960		1973	
	Oil	Gas	Oil	Gas
USSR	100	100	100	100
European Russia	96	68.1	51	19.5
Eastern Regions	4	31.9	49	80.5

Source: Yu I Bokserman "Nekotorye tendentsii dal'neishego razvitiya toplivnoi promyshlennosti" Neftyanik 1975 No. 1, p.7.

puts explored reserves at 4.5 billion tonnes,[46] another at 3 billion,[47] the latter giving a ratio of explored reserves to production of 10 to 1 at the time of the estimate. One Soviet source notes that whilst production doubled during the years 1960 to 1968, discovery of explored reserves increased by only 51 per cent.[48] Elliot, writing in 1974, argues that since over 80 per cent of proved oil reserves lie at depths of less than 2000 metres extraction conditions are very favourable.[49] Even in the absence of precise data Western analysts agree that the level of reserves currently known to exist and anticipated to be amenable to

---

[46] Petroleum Press Service, August 1969, p.307.

[47] R E Ebel "Two Decades of Soviet Oil and Gas" World Petroleum Vol. 42, No. 5, pp.78, 84.

[48] Neftyanoe khozyaistvo 1969 No. 1, p.2.

[49] Of total reserves in categories A+B+C1 15 per cent lie at less than 1200 metres, 66.4 per cent at 1201-1800 metres, 11.2 per cent at 1801-2400 metres, 5.2 per cent at 2401-3000 metres and 4.3 per cent at more than 3000 metres. Elliot op. cit. pp. 81-82.

exploitation will not constitute a constraint on the levels of production envisaged in the short term.[50]

However as a result of developments in the oil exploration sector from 1960 to 1975 the location of reserves has undergone a substantial shift. During this time total oil reserves have doubled in European Russia, have increased twelvefold in the Volga-Ural area and fifteenfold in regions to the East of the Urals.[51] Granted that in the short term the major issue is not the extent of total reserves, but of economic reserves with supporting logistic systems, there were still in 1975 significicant reserves in European Russia, with the prospect of total reserves substantially above likely production levels, but concentrated in small fields, in contrast to Siberian reserves, which are for the most part to be found in extremely large fields.[52]

The importance of the development of West Siberia for the Soviet economy generally was stressed at the outset of the ninth Five-Year Plan. It was thought possible that West Siberia could be developed at a rate that would result in Siberia's providing as much as 30 per cent of the Soviet Union's energy requirement in 1980, rising to 40-45 per cent by the year 2000.[53] Table 3.8.

---

[50] ibid. p.82.

[51] A E Probst, Ya A Mazover (eds.) "Razvitie i razmeshchenie toplivnoi promyshlennosti" Moscow Nedra 1975, p.82.

[52] ibid.

[53] B P Orlov "O ratsional'nykh metodakh osvoeniya prirodnykh zapasov v novykh raionakh Sibiri" Ekonomika i organizatsiya promyshlennogo proizvodstva 1971 No. 2, p.26.

TABLE 3.8. Crude Oil Production in Geographic Zones, 1970–1975 Plan

Zone	1970		1973 Plan		1975 Plan	
	M tonnes	%	M tonnes	%	M tonnes	%
European Russia plus Urals	285.2	81.8	300.3	70.0	314.5	63.4
of which: Volga	184.4	52.9	188.1	43.8	182.6	36.6
Eastern Regions	63.6	18.2	128.7	30.0	181.5	36.6
of which: West Siberia plus Mangyshlak	41.8	12.0	104.9	24.5	155.5	31.3
Total USSR	348.8	100	429.0	100	496.0	100

Sources: Table 3.1.

A E Probst, Ya A Mazover (eds.) "Razvitie i razmeshchenie toplivnoi promyshlennosti" Moscow Nedra 1975, p.88.

details the changing importance of established oil-producing areas for Soviet oil production as a whole, illustrating the peak and decline of production in the Volga-Ural fields and the emergence of West Siberia (grouped here with offshore production around the Mangyshlak peninsula in the Caspian Sea). In addition to the fact that oilfields discovered to date in West Siberia have been particularly large, production costs are the lowest in the Soviet Union, as detailed in table 3.9.[54] However these advantages have been offset to some extent by the difficulties encountered and expense incurred in meeting drilling targets for new producing wells, especially in the Tomsk and Tyumen' oblasts, which along with the Middle Ob' area constitute the major proportion of West Siberian production and potential.[55] It has also been pointed out that (in theory) the siting of refineries and petrochemical plants in West Siberia and onward transportation of finished products can show capital cost savings of 12 to 14 per cent compared with siting the same complexes in European Russia and transportation there of energy and feedstock.[56]

---

[54]The production cost in the giant Samotlor oilfield is as low as 50 per cent of the all-Union average. See V P Maksimov "Perspektivy i zadachi razvitiya proizvoditel'nykh sil Tyumenskoi oblasti" Ekonomika i organizatsiya promyshlennogo proizvodstva 1972 No. 2, p.38.

[55]The late Soviet Oil Minister V D Shashin notes in "Puti povysheniya effektivnosti neftyanoi promyshlennosti" Planovoe khozyaistvo 1973 No. 4, p.21 that operations in the important Northern area of the Tyumen' oblast' have accounted for only 15 per cent of total drilling in West Siberia. He also notes that over the recent (unspecified) period not a single new oil field has been opened in the Tomsk oblast'.

[56]Orlov op.cit. p.26.

TABLE 3.9. Comparison of Oil Production Costs (All-Union average = 1)

Zone	Relative Cost
European Russia plus Urals	1.1-1.2
Siberia and Far East	0.7-0.8
Central Asia and Kazakhstan	1.5

Source: A E Probst, Ya E Mazover (eds.) op.cit. p.91.

Note that the characteristics of the three energy zones are stated to be as follows:

(i) European regions plus the Volga-Ural area have high consumption and the main component of the regional fuel balance is Donetsk, Moscow and Pechora coal, the highest cost fuel in the Soviet Union. Despite the availability of cheap hydroelectricity this zone has the highest electricity cost in the country.

(ii) Siberia and the Far East contain at present the majority of Soviet energy reserves and have very low energy consumption.

(iii) Central Asia and Kazakhstan are self-sufficient in energy, especially in gas, and are substantial contributors to the energy supply of zone 1.

Characteristics of these "energy zones" are discussed in detail in K M Zvyagintseva "O trekh zonakh toplivno-energeticheskogo khozyaistva Sibiri" Izvestiya SO AN SSSR Ser. obshch. nauk 1974 No. 1, pp.19-25.

In an analysis written at the end of 1974 it was acknowledged that the initial oil production target for 1975 for West Siberia of 125 million tonnes would probably be exceeded,[57] and in the event it was, the final figure being 148 million.[58] Production of

---

[57] Probst and Mazover (eds.) op.cit. pp.86-87.

[58] N Mal'tsev "Neftyanaya promyshlennost' strany v desyatoi pyatiletke" Neftyanik 1976 No. 2, p.1.

oil in West Siberia in 1970 totalled 31.4 million tonnes.[59] The success experienced in raising production during the ninth Plan led planners to set a target for the area of 300 to 310 million tonnes in 1980.[60]

A further issue affecting achievements and prospects in West Siberia is the fact that the main administrative organisation, Glavtyumenneftegaz, has to coordinate the efforts of a number of production enterprises sited at substantial distance one from another. The average distance from the administrative centre in Tyumen' is 300 to 400 kilometres and some fields are as much as 1000 kilometres apart.[61]

The size of fields discovered to date in West Siberia and their relatively low production costs are not the only feature that has prompted their rapid development. The chemical characteristics of the available oils are particularly well suited to the changing priorities of both the Soviet fuel and petrochemical industries, in that the majority of West Siberian crude oils are of light gravity, having a high yield of gasoline, naphtha and middle distillates.[62] Moreover there is no relative loss of

---

[59] E A Ogorodnov "Osvoenie mestorozhdenii nefti i gaza v Zapadnoi Sibiri" Stroitel'stvo truboprovodov 1971 No. 3, p.27.

[60] Izvestiya 14 December 1975, p.6.

[61] F G Arzhanov et al. "Nekotorye prakticheskie resheniya po avtomatizatsii operativnogo upravleniya neftyanoi promyshlennost'yu Zapadnoi Sibiri" Neftyanoe khozyaistvo 1974 No. 6, p.2.

[62] M A Mkhchiyan et al. "Nefti sredneobskoi neftegazonosnoi oblasti Zapadnoi Sibiri" Khimiya i tekhnologiya topliv i masel 1974 No. 4, p.3.

lubricant basestock and bitumen: the relative loss is in the percentage yield of fuel oil, which is the most readily substitutable product.[63]

However the development of the oil reserves of West Siberia has not been devoid of problems. In the early part of 1973 there appeared an article suggesting that Gosplan was unhappy about the return on investment in Siberia in general and in Tyumen' in particular.[64] The author of the article, V Bogachev, emphasises that Siberian construction costs were running at an average of 30 to 40 per cent, and in Tyumen' at 50 to 100 per cent above original estimates.[65] In Bogachev's view the main reason for the overrun on estimated cost was that all areas to the South of the 60th parallel, including West Siberia, were grouped for the purposes of cost estimation and budgeting in the same "cost belt" ('poyas') as the Baltic area and European Russia. However in reality wages and material transportation costs are substantially above the all-Union average and this results in underbudgeting for many of the sites, with consequent delays in completion of projects and cost overruns.[66] Bogachev argues that it is unrealistic not only to include West Siberia in the aforementioned cost belt, but also to attempt to programme rigidly in advance

---

[63] ibid.

[64] V Bogachev "K voprosu ob intensifikatsii osvoeniya prirodnykh bogatstv Sibiri" Kommunist 1973 No. 3, pp.89-100.

[65] ibid. p.91.

[66] ibid. p.92.

levels of investment in individual sectors of the Siberian development Plan. The question of uncertainty of information is most pressing in exploratory operation in this area,[67] and has been complicated by the fact that initial achievements in the Tyumen' oblast' were particularly impressive and in the event augured excessively favourably for future activity. For example the rate of discovery of oil reserves per metre of drilling in Tyumen' in the late sixties was six times the all-Union average.[68] However in the course of the ninth Plan the technical difficulties experienced in the development of West Siberia were more severe than had been (and probably could have been) anticipated.

In the Spring of 1969 a conference was held in Tyumen' to discuss short-term industrial development, with special reference to the oil industry. Central to the discussion was the question of determining an optimal oil production level for West Siberia to 1980. Estimates of this optimal level ranged from that of the oil industry ministry and management of Glavtyumenneftegaz, who advanced a figure of 75 to 80 million tonnes, to that of the Deputy Minister of Geology of the RSFSR, who put forward a figure of 150 million tonnes.[69] The consensus of the conference was

---

[67] ibid. p.99. Bogachev argues as follows: "Was it possible to fix precisely the costs of exploratory drilling in the lower Ob' area for 1971-1975? All exploration is uncertain and hence it is impossible to calculate forward costs even in promising areas with good indications of possible extraction levels."

[68] I Ognev "Postizhenie otkrytiya" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No. 4, p.174.

[69] ibid. p.175.

unclear. On the one hand the report of the conference showed in the section entitled 'Geological Exploration' an estimated production level in West Siberia of 150 to 200 million tonnes by 1975: on the other hand the section entitled 'oil industry' gave an estimated production level of 70 to 100 million tonnes in 1975, rising to 180 to 200 million in 1980.[70]

The difference between these early estimates and the final performance in the ninth Plan and target set for the tenth serve to put the development of the West Siberian oil industry during the ninth Plan into perspective. Inability to maintain production levels in European Russia and the Volga-Ural fields during the ninth Plan necessitated acceleration of the rate of development of West Siberia to the extent that Siberian operations accounted for almost the whole of the increment in production.[71] The relative importance of West Siberia to total Soviet production, and in particular the contribution of the Samotlor oilfield, is outlined in table 3.10. The discovery and development of the Samotlor oilfield has been one of the principal features of the oil industry in the ninth Plan, and has been the subject of recent articles by F G Arzhanov and Yu B Fain,[72] and R I

---

[70] ibid. p.176. Note that the full report of the conference proceedings was published under the title 'Neft' i gaz Tyumeni v dokumentakh' Sverdlovsk 1973.

[71] Pyatiletnii plan 1971-1975, p.258; Pravda 1 February 1976, p.2.

[72] F G Arzhanov, Yu B Fain "Samotlor - unikal'noe neftyanoe mestorozhdenie" Neftyanoe khozyaistvo 1975 No. 5, pp.38-44.

TABLE 3.10. Siberian Contribution to Soviet Oil Production. 1971-1975 (million tonnes).

Production		1971	1972	1973	1974	1975
Total USSR		377	400	429	459	491
West Siberia	Plan	44	61	82	104	125
	Actual	45	63	88	118	148
Tyumen' oblast'		28	n.a.	n.a.	111.4	143.2
Samotlor Oilfield		10.0	21.2	39.0	61.2	86.5

(Figures include gas condensate)

Sources: Narodnoe khozyaistvo SSSR 1974, p.183.
Pravda, 1 February 1976, pp.1,2.
Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No. 5, p.7, and 1976 No. 6, p.80.
Neftyanoe khozyaistvo 1975, No. 5, p.39.
Ekonomicheskaya gazeta 1975, No. 19, p.6.

(n.a. = not available)

Kuzovatkin.[73] Despite the severe climate and difficult communications Samotlor has been developed rapidly, and this has been achieved through the application of a number of new technologies such as cluster drilling, a process by which several wells can be drilled simultaneously from a single point, this facilitating high-speed extraction of the crude oil from the deposit.[74]

---

[73] R I Kuzovatkin "Front i tyl Samotlora" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No. 6, pp.78-87.

[74] It has been proved possible to sink up to 16 wells from a single platform. See Arzhanov, Fain op.cit. p.41 and Kuzovatkin op.cit. p.80.

Geologists estimate that the Samotlor field is the Soviet Union's largest and that it is likely to have a life of at least ten years. An ultimate production peak of 120 million tonnes per year is foreseen for this field.[75]

However this peak will be reached relatively quickly, and although in 1975 oil from the Tyumen' oblast' accounted for some 95 per cent of West Siberian production, output from the Middle Ob' area, including that from Samotlor, is expected to decline in the near future.[76] Consequently during the ninth Plan exploratory effort had begun to shift to the more remote oil fields of North Tyumen'. Development of these fields is expected to be fraught with severe logistic problems and rising costs.[77]

Cost escalation has been a problem of the oil industry of Central Asia and Kazakhstan during the ninth Plan. The area is predominantly one of mature fields, all of which have passed their production peak and which are expected to decline in the near future. In Turkmenia the rate of oil extraction had begun to exceed the rate of discovery of new reserves as early as 1970,[78] but production was nonetheless scheduled to rise from 15.4 million tonnes in 1970 to 22 million in 1975.[79] However

---

[75] Arzhanov, Fain op.cit. p.44. Also Pravda 11 June 1975, p.3.

[76] Probst, Mazover (eds.) op.cit. p.90.

[77] ibid. p.91.

[78] It is reported that Turkmenneft' and Republican geological organisations had failed to fulfil annual plans for reserve discovery "for years". Turkmenskaya iskra 23 May 1970, p.1.

[79] Turkmenskaya iskra, 5 September 1971, p.2.

the oilfields around the Mangyshlak peninsula have become the major area of importance in Central Asia and Kazakhstan during the ninth Plan. Mangyshlak operations were scheduled to provide 90 per cent of the increase in production sought from Kazakhstan from 1971 to 1975,[80] but by the middle of this period it became evident that the production association Mangyshlakneft' was facing difficulties. The 1972 production figure of 15 million tonnes was below target due to failure on the part of the construction sector to keep pace with the requirements for commissioned installations. Mangyshlakneft' itself was the source of some of the problems: disparate rates of production between wells, due to the fact that deposits in this area tend to be dispersed over a number of geological levels, compounded with substantial seasonal fluctuations in seasonal production accounted for the shortfall.[81]

At the outset of the ninth Plan it was intended to raise production in the European zones of the Soviet Union, predominantly in the Ural area (the Udmurt ASSR and the Perm and Orenburg oblasts), the Komi ASSR and Belorussia in accordance with the data presented in table 3.11. Production in the Udmurt ASSR commenced in 1969,[82] and by 1974 an output of 2.75

---

[80] Pravda, 20 October 1972, p.1.

[81] Kazakhstanskaya pravda, 31 August 1973, p.2.

[82] Editorial "Nekotorye itogi neftedobyvayushchei promyshlennosti v 1969 godu i zadachi na 1970 god". Neftyanoe khozyaistvo 1970 No. 2, p.2.

TABLE 3.11. Anticipated Change in Oil Production in European Russia 1970-1975 Plan

	1970		1975 Plan	
	M tonnes	% of USSR	M tonnes	% of USSR
European Russia	265.2	76.2	295.6	59.7
Volga-Ural	208.3	59.8	226.6	45.8
North Caucasus	34.0	9.8	34.1	6.9
Komi ASSR	5.6	1.6	10.0	2.0
Belorussia	4.2	1.2	8.5	1.7
Ukraine	13.1	3.8	16.4	3.3

Source: L I Suchkova, N M Faustova, V F Cherevadskaya "Effektivnost' razvitiya neftedobyvayushchei promyshlennosti evropeiskikh raionov strany v tekushchem pyatiletii" Ekonomika neftyanoi promyshlennosti 1973 No. 10, p. 7.

million tonnes was anticipated.[83] However the Udmurt fields are particularly difficult to exploit in that they are of complex, multi-layered structure, the yield per well is low, the oil is viscous, high in paraffin wax, thus making transportation in pipelines more difficult, and the major fields lie in marshy terrain at some distance one from another.[84] The Perm oblast', one of the oldest producing areas in the Soviet Union, was scheduled to increase production from some 16 million tonnes in 1970 to 27 million in 1975.[85] The 1975 production level turned out to be 22.3 million tonnes.[86] The major problem facing production teams in the Orenburg oblast' has been that of maintaining seam pressure in relatively deep layers, a necessary measure in the extraction of approximately 80 per cent of the oil.[87] The importance of the Komi ASSR rests on the development of the Timano-Pechora hydrocarbon area. A particular feature of the oil of this area is its variety: both light and heavy

---

[83] Vyshka, 11 June 1974, p.1.

[84] V I Kudinov "Segodnya i zavtra Udmurtskoi nefti" Neftyanoe khozyaistvo 1975 No. 7, p.4.

[85] N A Mal'tsev "Permskaya oblast'" Neftyanoe khozyaistvo 1971 No. 3, pp.33-35.

[86] S Fedorchenko "Na puti k novym rubezham" Neftyanik 1976 No. 6, p.5.

[87] To facilitate extraction it is sometimes necessary to maintain pressure in the oil-bearing layer by injecting steam or nitrogen. This process is difficult and adds to operating costs. Discussed in P D Alekseev "Orenburgneft' v devyatoi pyatiletke" Neftyanoe khozyaistvo 1976 No. 1, p.7.

types of crude oil can be extracted.[88] The majority are however paraffinic-based, have a high yield of light products at distillation and are low in sulphur content.[89] They are, like the West Siberian crude oils, particularly suitable for the refinery balance that the Soviet Union began to favour in the course of the ninth Plan. In the period from 1971 to 1975 the Komi ASSR produced a total of 53 million tonnes of oil, on the basis of which it is estimated that a peak output of 25 million tonnes per year can be achieved by 1980.[90] Discovery of new reserves in the Komi ASSR during the ninth Plan has shown a threefold increase, this contrasting sharply with the position in the Soviet Union as a whole.[91] Prospecting for oil in Belorussia commenced in 1961 and the first oil was struck in August 1964 with the discovery of the Rechitsa field.[92] Production has grown from some 40 thousand tonnes in 1965 to just over 8 million in 1975,[93] but significantly higher volumes are not expected.

---

[88] Probst, Mazover (eds.) op.cit. p.87.

[89] Z V Driatskaya et al. "Nefti Komi ASSR" Khimiya i tekhnologiya topliv i masel 1975 No. 4, p.7.

[90] N Kochurin "Chtoby vypolnit' zadaniya Partii" Neftyanik 1976 No. 5 , p.6.

[91] ibid.

[92] For a brief outline of Belorussian oil developments see Elliot op.cit. p.106.

[93] G. Topuridze, B Golenishchev "U neftyanikov Poles'ya" Neftyanik 1976 No. 6, p.8.

During the ninth Plan the Soviet Union came to realise the growing potential of offshore oil reserves in the Baltic, Caspian and Sakhalin areas. Whereas exploration in the Baltic commenced in 1959, so far only 10 fields have been discovered. Although the deposits are relatively shallow (1500 to 2500 metres), and the oil is almost free of sulphur, the light fractions obtained in refining are of disappointingly low octane.[94] Exploratory work carried out during the ninth Plan indicates that oilfields known to exist in the South-East of the Baltic off the Latvian and Lithuanian coast may prove attractive.[95] It is however the oilfields of the Caspian Sea that are judged to be potentially the major contributors to offshore developments on the basis of work carried out in the early seventies.[96] Despite the fact that the majority of the Caspian deposits are at depths in excess of 3500 metres, the fields are believed to be large enough to offset in potentially low unit production costs the high cost of drilling.[97] Exploration commenced in the Sakhalin area as early as 1927, and to date it has remained the sole oil-producing area of the Far East Economic Region. The quality of Sakhalin oil is such that it commands a

---

[94]This is discussed in N Zhmykova et al. "Nefti mestorozhdenii Pribaltiki" Neftyanik 1976 No. 6, p.19.

[95]A Namestnikovs, V Bergmanis "Kādas ir Baltijas dzĪles?" Cipa 19 December 1974 p.4.

[96]Vyshka 26 September 1973, p.2.

[97]Vyshka 22 February 1975, p.2.

premium in export markets, since it has a high yield of light products and its fuel oil fraction is low in sulphur. Middle distillates and naphtha derived from Sakhalin oils are exceptionally well suited as feedstock for the emerging petrochemical industry of the Far East Region.[98] Despite the technical attractiveness of the crude oil Soviet planners are not providing for a marked increase in production in Sakhalin. Exploration and production costs are more than twice the all-Union average,[99] but, used locally as feedstock, Sakhalin oils are more economic than those transported from the European and Siberian fields.[100] However larger-scale exploration and production under joint schemes with American and Japanese participation could alter Sakhalin's role in the medium to long term: this is discussed in Appendix A.

East Siberia is now considered to be an oil-bearing area of some significance, but in the course of the ninth Plan activity was confined to geological surveys and exploratory drilling.[101] The oil discovered to date resembles Sakhalin oil in respect of sulphur content and chemical composition. The

---

[98] B N Zykin, N E Podkletnov "O ratsional'nykh sposobakh ispol'zovaniya Sakhalinskoi nefti" Izvestiya SO AN SSSR Ser. obshch. nauk. 1970 No. 6, pp.109, 111.

[99] ibid. p.109.

[100] Probst, Mazover (eds.) op.cit. p.91.

[101] A brief history of the development of East Siberia is given in Elliot op.cit. p.106. An earlier work, V Conolly "East Siberian Oil" Mizan August 1971, pp.16-21, gives a little more detail.

long term potential of East Siberia was a subject of discussion as early as 1960:[102] by 1968 it was thought that East Siberia could contain almost half of the total fuel and energy reserves of the Soviet Union.[103] However towards the end of the ninth Plan these estimates had been revised downwards and a more modest share of total Siberian, and hence of all-Union reserves was allotted to East Siberia.[104] The data on distribution of the major primary energy reserves of West and East Siberia are given in table 3.12. As in the case of the development of Sakhalin, Soviet planners do not anticipate a marked impact on total production from East Siberian operations: however Japanese-Soviet joint projects currently under discussion could alter the status of the area in the medium term. These issues are likewise discussed in Appendix A.

It can be calculated from table 3.5. that the cumulative underfulfilment of the ninth Plan for production of oil and gas condensate was some 30 million tonnes. 1972 was the first year of the Plan in which an underfulfilment was recorded, resulting

---

[102] In 1960 East Siberia was estimated to contain over half the hydroelectric potential of the Soviet Union and about 80 per cent of coal reserves. 'Trudy konferentsii po razvitiyu proizvoditel'nykh sil Vostochnoi Sibiri' Moscow: AN SSSR 1960, p.6.

[103] A E Probst (ed.) "Razvitie toplivnoi bazy raionov SSSR" Moscow Nedra 1968, p.175.

[104] K M Zvyagintseva "O trekh zonakh toplivnogo energeticheskogo khozyaistva Sibiri" Izvestiya SO AN SSSR Ser. obshch. nauk. 1974 No. 1, pp.20-21.

TABLE 3.12. Distribution of Usable Fuel and Energy Reserves in Siberia (%).

	West Siberia	East Siberia
Hydroelectricity	15.0	85.0
Coal	69.3	30.7
Natural Gas	76.9	23.1
Total Fuel	76.6	23.4

Source: K M Zvyagintseva "O trekh zonakh toplivno-energeticheskogo khozyaistva Sibiri" Izvestiya SO AN SSSR Ser. obshch. nauk, 1974 No. 1, p.21.

in a revision of the original 1973 target to 424 million tonnes, a figure which in its turn was underfulfilled. The original 1974 target of 461 million tonnes was revised to 452 million and was fulfilled by a narrow margin: the 1975 target was revised from 505 million tonnes to 489, which was 'overfulfilled' by 2 million. Table 3.13. summarises the revisions to the original plan targets and table 3.14. records the trend in availability of crude oil and gas condensate in the Soviet Union from 1971 to 1975.

In addition to the difficulties encountered in oil exploration and production there have been a number of problems in associated industries that have contributed to the shortfall in production against original Plan. There have been periodic bottlenecks in the supply of equipment both for exploration and production. Towards the end of the Plan the Soviet Oil Minister stressed that despite a high level of success in developing improved equipment for the oil industry manufacturers had failed

TABLE 3.13. Original and Revised Annual Plans and Performance of the Soviet Oil Industry 1971-1975 (M tonnes)

		1971	1972	1973	1974	1975
Original Plan:	Oil	371	395	429	461	496
	Condensate	n.a.	n.a.	n.a.	n.a.	9
Revised Plan (Oil and Condensate)		-	-	-	451	489
Actual Production (Oil and Condensate)		377	401	429	459	491

Sources: Table 3.5.
A Nove in ABSEES July 1974, p.xviii.
(n.a. = not available)

TABLE 3.14. Availability of Oil in the Soviet Union 1971-1975. (M tonnes, oil and oil products, including gas condensate)

	1971	1972	1973	1974	1975
Domestic Availability	377	400	429	459	491
Plus Imports	7	9	15	5	8
Less Exports	105	107	118	116	130
Availability	279	302	326	348	369

Sources: Narodnoe khozyaistvo SSSR 1975, p.205.
Vneshnyaya torgovlya SSSR 1972, pp.27, 41.
1974, pp.29, 44.
1975, pp.25, 40.

repeatedly to produce and deliver an adequate quantity. In particular new designs for drilling bits were perfected: few have reached the production stage. The quality of drill-pipe was criticised and the under-supply of equipment for low-temperature exploration was cited as a major reason for difficulties in meeting targets for exploratory drilling and reserve discovery in West Siberia.[105] The problem of success indicators as a management control and assessment has itself caused some of the problems: for example, the criterion for Plan fulfilment is the number of metres drilled, with the result that on occasions drillers experiencing technical difficulties will leave a well unfinished and commence relatively easy drilling elsewhere so as to meet their target.[106] Difficulties have been encountered in providing pipeline in the required quantities to support development, especially in West Siberia.[107] High labour turnover has been experienced in Mangyshlak,[108] and in West Siberia[109] despite the fact that in the case of the latter area significant

---

[105] Trud 24 October, 1975, p.2.

[106] A Babakuliev "O sovershenstvovanii planirovaniya i material'nom stimulirovanii v geologorazvedochnykh predpriyatiyakh" Izvestiya AN Turkmenskoi SSR, Ser. obshch. nauk. 1969 No. 5, p.52.

[107] K K Smirnov "Dlya blaga rodiny" Stroitel'stvo truboprovodov 1974 No. 11, pp.2-3.

[108] Labour turnover in Mangyshlak was 93 per cent in 1970 due allegedly to poor working and living conditions. Narodnoe khozyaistvo Kazakhstana 1971 No. 10, pp.45-49.

[109] R N North "Soviet Northern Development: The Case of North-West Siberia" Soviet Studies, October 1972, p.188.

privileges have been granted to oil (and gas) industry workers based there.[110]

On 31 March 1975 a conference was convened in Moscow to discuss methods of raising efficiency in oil production.[111] In the opening paper the Soviet Oil Minister, concentrating on the perennial problem of irrational success indicators, called for closer integration of effort on the part of the many organisations involved in the productive process. He cites the instance of waterflooding of oil deposits* as an irrational indicator, in

---

[110] Workers are granted a one-off bonus of 4 times the average monthly wage in addition to having a regional wage coefficient of 1.7 times the average in European Russia. Rates of bonus rewards for fulfilment and overfulfilment of Plan are above the national average. These bonuses are enhanced as basic salaries and wages are increased in accordance with length of service. Paid leave is extended to 1-1½ months per year with one free return ticket to any point in the Soviet Union for each worker and his family. Data presented in: S A Orudjev, V I Muravlenko "Integrated Planning for Exploration, Development, Production and Transportation for Rapid Expansion of Oil Field Operations" Proceedings of the 9th World Petroleum Congress, Barking: Applied Science Publishers 1976 Vol. 3, p.336. Note that North (op.cit. p.188) points out that the bulk of labour turnover is experienced not in petroleum operations but in support activity, where the aforementioned benefits are not applicable.

[111] The conference was attended by senior officials of the CPSU Central Committee, Ministry of the Oil Industry, Ministry of the Gas Industry, Ministry of Oil and Gas Construction Enterprises, Trades Unions et al. The main papers are compiled in Ekonomika neftyanoi promyshlennosti 1975 No. 7.

* the injection of water into the oil-bearing layer under pressure in order to facilitate extraction as natural pressure in the well declines.

that performance is judged and rewarded on the basis of volume injected, which has led to excessive flooding in a number of fields, causing additional problems in preparing oil for refining. This indicator has been abolished for the tenth Plan, the sole criterion being the total amount of oil produced.[112] Several papers in this collection make reference to the delays caused by inadequate infrastructure development,[113] and the recurrent problem of availability of equipment.[114] It is however important to put these issues into perspective. Russell has rightly pointed out that complaints in the oil industry were as much a feature of the sixties, when the oil industry regularly fulfilled its targets, as of the seventies. In Russell's view the difference in the seventies has been that such criticism has been made by the industry's most senior officials, even from the Oil Minister himself.[115] The change in concern at so high a level probably stems from the fact of higher expenditures in development and growing technical difficulties in production encountered in

---

[112] V D Shashin "Povyshenie effektivnosti neftyanogo proizvodstva - glavnoe napravlenie razvitiya otrasli" Ekonomika neftyanoi promyshlennosti 1975 No. 7, p.6.

[113] For example V I Muravlenko in "O problemakh razvitiya neftyanoi promyshlennosti v Zapadnoi Sibiri" Ekonomika neftyanoi promyshlennosti 1975 No. 7, p.13. He adds that even if the authorities were successful in attracting an adequate number of people to work in West Siberia the provision of accommodation was insufficient.

[114] A A Asan-Nuri "O nekotorykh problemakh tekhnicheskogo progressa v oblasti burovykh rabot". Ekonomika neftyanoi promyshlennosti 1975 No. 7, p.19.

[115] Russell op.cit. p.51.

an area as complex logistically as West Siberia. Whereas in the sixties oilfields were located comparatively favourably in relation to consuming centres and to each other, such that the incremental expansion of the logistic systems was straightforward, in the seventies to bring on stream new productive capacity often involved the design and installation of substantial lengths of new pipeline and associated facilities. Considering the extent to which West Siberia has had to overfulfil its original targets during the ninth Plan to compensate for failure to meet targets elsewhere, the final Soviet production figure for 1975 of 491 million tonnes of oil and gas condensate compared with an original target of 505 million represents at 97.2 per cent fulfilment a considerable achievement.

The Soviet Gas Industry 1971-1975: Objectives and Achievements

The industry's objective for the ninth Plan was to raise production of natural gas from 198 billion cubic metres in 1970 to 320 billion in 1975, primarily through the development of gas fields in Tyumen' (West Siberia), Turkmenia, the Komi ASSR and the Orenburg oblast'. It was also planned to reduce wastage of wellhead gas associated with oil production, with the objective of securing utilisation of 85 to 87 per cent of such gas by 1975.[116] Of the total growth of 122 billion cubic metres, West Siberia was scheduled to account for 35 billion, Turkmenia 52,

---

[116] *Pyatiletnii plan 1971-1975*, p.106.

the Komi ASSR 9 and the Orenburg oblast' 25.[117] The production balance in 1975 compared with 1970 was intended to change in accordance with data given in table 3.15.

Information on the extent and distribution of Soviet gas reserves is a good deal more abundant than in the case of oil, and their distribution by location and depth is outlined in table 3.16. It has proved difficult for Soviet geologists to gauge the extent of gas reserves since the industry has developed relatively recently and very quickly. Many of the newly discovered fields have been amongst the world's largest, resulting in periodic revisions of reserve estimates as further geological information on each field is obtained. Authoritative estimates of total reserves in categories A+B+C1 were raised from 9.4 trillion (10^{12}) cubic metres in 1969[118] to 15.7 trillion at the beginnong of 1971.[119] By 1975 a senior specialist of Gosplan, Yu I Bokserman, indicated that reserves in these categories had increased in the period from 1969 to 1974 by 13.1 trillion cubic metres to a total of 22.5 trillion,[120] in accordance with data given in table 3.17. During the eighth Plan the rate of discovery of new gas reserves in West Siberia, Turkmenia, the Komi ASSR and the

---

[117] ibid. pp.106-107.

[118] Yu I Bokserman "Razvitie gazovoi promyshlennosti SSSR" Neftyanik 1970 No. 2, p.8.

[119] Probst, Mazover (eds.) op.cit. p.49. See also A K Kortunov "Uspekhi gazovoi promyshlennosti i perspektivy ee razvitiya" Gazovaya promyshlennost' 1971 No. 3, p.1.

[120] Yu I Bokserman "Puti povysheniya effektivnosti transporta topliva" Planovoe khozyaistvo 1975 No. 2, p.21.

TABLE 3.15. Planned Change in Soviet Gas Output by Producing Area 1975 Plan compared with 1970 (billion cubic metres)

	1970		1975 Plan	
	Prodn.	% of Total	Prodn.	% of Total
Total USSR	198	100	320	100
of which: European Russia + Urals	139	70.2	164.1	51.3
Orenburg obl.	1.3	0.7	26	8.1
Komi ASSR	6.9	3.5	16.1	5
Regions East of Urals	59	29.8	155.9	48.7
of which: West Siberia	9.3	4.7	44	13.8
Turkmenistan	13.1	6.6	65.1	20.3

Source: Pyatiletnii plan 1971-1975, pp.106-107.

TABLE 3.16. Distribution of Total Gas Reserves in the USSR (%) (1971 data)

	Distribution by Region (% of total USSR)			Distribution by Depth % of regional total)		
	Total	At depth of 5000m.	At depth of 5000-7000m.	Total	At depth of 5000m.	At depth of 5000-7000m.
USSR	100	100	100	100	90	10
of which:						
North-West	5.6	5.8	4.0	100	93	7
Urals	3.7	3.4	6.4	100	83	17
Volga	5.0	3.6	17.1	100	65	35
North Caucasus	2.3	1.6	9.0	100	59	41
Ukraine	4.1	2.8	15.0	100	61	39
Transcaucasia	0.8	0.5	4.0	100	50	50
West Siberia	32.5	36.1	-	100	100	-
East Siberia	13.9	15.4	2.1	100	98	2
Far East	14.2	15.8	-	100	100	-
Central Asia	10.7	10.0	17.1	100	83	17
Kazakhstan	7.2	5.0	25.3	100	64	36
European Russia plus Urals	21.5	17.7	55.5	100	57	43
Eastern Regions	78.5	82.3	44.5	100	94	6

Source: A E Probst, Ya E Mazover (eds.) op.cit. p.52.

TABLE 3.17. Accumulation of Soviet Natural Gas Reserves in Categories A+B+C1 1965-1974 (trillion cubic metres)

	1965	1969	1970	1974
Total USSR	3220	9423	12100	22500
of which: European Russia	1771	2152	2583	4400
West Siberia	315	5146	7116	14100
East Siberia and Far East	91	377	439	700
Central Asia and Kazakhstan	1043	1747	1962	3300

Sources: Yu I Bokserman "Razvitie gazovoi promyshlennosti SSSR" Neftyanik 1970 No. 2, p.8.

Yu I Bokserman "Nekotorye tendentsii dal'neishego razvitiya toplivnoi promyshlennosti" Neftyanik 1975 No. 1, p.5.

Yu I Bokserman "Puti povysheniya effektivnosti transporta topliva" Planovoe khozyaistvo 1975 No. 2, p.21.

Orenburg oblast', though reported to be impressive, was insufficient to compensate for a shortfall in discovery in areas close to consumption centres, where targets for reserve discovery were underfulfilled.[121] However the rate of appreciation of reserves in the latter part of the eighth Plan and earlier part of the ninth was higher than the rate of growth in production,[122] this being in direct contrast to the situation prevailing in the oil industry. By 1972 it was established that Siberian reserves in all categories extended to 12.6 trillion cubic metres, and those of European Russia and Central Asia to 3.7 trillion each.[123] Although this indicated that the medium and long term development of the gas industry depended on the utilisation of Siberian resources, there was not the same urgency as in the oil industry in bringing Siberian operations on stream, since the ratio of reserves to production in European Russia was still favourable. However at the outset of the ninth Plan it was feared that explored reserves in European Russia were being excessively rapidly exhausted. Approximately 70 to 80 per cent of reserves discovered prior to 1971 had been brought into production and it was felt that even though European Russia was likely to maintain production up to 1975, its capacity to do

---

[121] Galonskii op.cit. p.33.

[122] A K Kortunov "Gazovaya promyshlennost' Sovetskogo Soyuza" Gazovaya promyshlennost' 1970 No. 8, p.2.

[123] V E Orel, V P Stupakov "Ratsional'no ispol'zovat' zapasy gaza" Gazovaya promyshlennost' 1974 No. 3, p.31.

so beyond that time was somewhat limited.[124]

During the ninth Plan activity in the exploration sector was characterised by the need to drill deeper to discover new reserves. Moreover in three of the areas designated to be of prime importance in the ninth Plan, Tyumen', the Komi ASSR and the Orenburg oblast', the incidence of complex, multi-component gas mixtures has become more common, necessitating the installation of refining and separation facilities at the production centre.[125]

At the outset of the ninth Plan it was estimated that Siberia contained some 60 per cent of the Soviet Union's discovered reserves of gas in all categories, of which the substantial majority were located in West Siberia.[126] By 1974 it was established that explored reserves in the four principal gas fields, namely Medvezh'e, Zapolyarnoe, Urengoi and Yamburg, totalled 9 trillion cubic metres.[127] The authoritative estimate of V S Bulatov of the Tyumen' Gas Research Institute, of the amount of gas that could be extracted from the Tyumen' fields puts reserves within accessible depths at 40 trillion cubic metres. Within this figure, estimated reserves in

---

[124] Probst, Mazover (eds.) op.cit. p.50.

[125] ibid. p.53. In the Orenburg deposit, for example, ethane, propane and other heavy hydrocarbons are found along with methane gas.

[126] E N Altunin "Gaz i gazosnabzhenie Sibiri" Stroitel'stvo truboprovodov 1970 No. 9, p.6.

[127] V D Chernyshov et al. "Zadachi osvoeniya gazovykh mestorozhdenii na severe Tyumenskoi oblasti" Stroitel'stvo truboprovodov 1974 No. 6, p.12.

'industrial' categories totalled 11.8 trillion cubic metres, this believed to be one quarter of total world explored reserves and three fifths of Soviet. Bulatov indicates that the optimal annual rate of production should be 5 to 6 per cent of reserves in the aforementioned categories, this being in the case of the Tyumen' oblast' 600 to 700 billion cubic metres.[128] The increment in proved gas reserves per metre of exploratory drilling in the Tyumen' oblast' has been 8 times greater than the all-Union average, and whereas during the eighth Plan only 9 per cent of exploratory drilling was carried out in the area, it accounted for 70 per cent of the increase in discovery of reserves.[129] The fact that some 75 per cent of West Siberia's proved reserves of gas are concentrated into the four fields mentioned above affords the opportunity of centering production there for 15 to 20 years forward.[130] However Bulatov's estimate of possible production levels rests on the assumption that commensurate processing and transportation facilities become available. Probst and Mazover, taking into account problems already experienced in developing the region, suggest a likely peak annual production level of 350 to 450 billion cubic metres.[131]

---

[128] V S Bulatov "Analiz faktorov, opredelyayushchikh uroven' dobychi prirodnogo gaza na Tyumenskom severe" Izvestiya SO AN SSSR Ser. obshch. nauk. 1974 No. 1, p.12.

[129] ibid. p.13.

[130] ibid. p.14.

[131] Probst, Mazover (eds.) op.cit. pp.60-61.

The production potential of the Medvezh'e field alone was estimated at 100 billion cubic metres per year in 1970.[132] Production commenced in 1972 at a level of 1.5 billion cubic metres, rising to 8 billion in 1973, destined mainly for the Serov metallurgical combine and industrial plants of the Sverdlovsk area.[133] The most advanced technology available has been directed to the Medvezh'e field with the result that it has been possible to drill wells of greater than average diameter, producing by 1974 at a rate of 1.5 to 2 million cubic metres of gas per day compared with the all-Union average of 200 thousand.[134] As a result of development completed in the ninth Plan it is believed that the Northern gas-bearing area of the Tyumen' oblast' ought to contribute 90 to 95 per cent of planned growth in Soviet gas production.[135] However the importance of bringing on stream the Urengoi field in 1978 is acknowledged to be of prime importance for the continuing development of the gas industry in West Siberia.[136] During the ninth Plan production in the Tyumen' oblast' grew from 9.3 billion cubic metres in 1970

---

[132] Altunin op.cit. p.6.

[133] R Saifullin "Medvezh'e - gazovyi promysel" Gazovaya promyshlennost' 1975 No. 11, p.24.

[134] E N Altunin "Osnovnye voprosy bystreishego osvoeniya mestorozhdenii Zapadnoi Sibiri" Gazovaya promyshlennost' 1974 No. 8, p.11.

[135] Ekonomicheskaya gazeta 19/1975, p.6.

[136] V S Bulatov "Puti povysheniya effektivnosti gazodobychi na Tyumenskom severe" Izvestiya SO AN SSSR Ser. obshch. nauk 1975 No. 6, p.32.

to 35.5 billion in 1975.[137]

The gas fields of Central Asia and Kazakhstan were scheduled to reach peak production during the ninth Plan, which could be sustained for a few years.[138] This is the Soviet Union's oldest producing area, and the major supplier of gas to the industrialised central zone. Given the existence of a high-capacity delivery system from Central Asia to the Centre, exploratory work was intensified in the neighbouring areas of Turkmenia and Uzbekistan to provide a substitute for the anticipated decline in production in the more extensively developed areas. The Turkmen ASSR contains some 30 gas fields, of which the largest are the Shatlyk, Naip, Mary and Gugurtli gas fields and the Achak gas and gas condensate field. The latter field was the first to be discovered and its development dates from 1966. Uzbekistan possesses the huge Gazli field, where development commenced in 1959.

The contribution of the Turkmen gas industry has been a striking feature of the expansion of Soviet gas production during the ninth Plan. Whereas in 1970 only 2 out of 20 gas deposits discovered, namely the Achak and Maikop fields, had been brought into production, with potential output in that year of 11.6 billion cubic metres, or 88.5 per cent of Turkmen production,[139] by 1975

---

[137] R D Margulov, E K Selikhova, I Ya Furman "Razvitie gazovoi promyshlennosti i analiz tekhniko-ekonomicheskikh pokazatelei" Moscow: Ministerstvo Gazovoi Promyshlennosti 1976, pp.6, 38.

[138] Probst, Mazover (eds.) op.cit. p.61.

[139] Report by V Fedorov of a conference on the development of the oil, gas and petrochemical industries of Turkmenia, Gazovaya promyshlennost' 1970 No. 9, p.49.

it was thought likely that production would be over 4 times the 1970 level due to the commissioning of newly discovered fields in the Eastern part of Turkmenia, which in the event accounted for the bulk of Turkmengazprom's 1975 production of 47 billion cubic metres.[140]

The major contributor was the Shatlyk field, which was believed to contain a total of 1500 billion cubic metres of recoverable gas.[141] This field was brought into production in 1974, at which time Soviet officials predicted a production level of 35 billion cubic metres for 1975, based on extraction from 11 wells,[142] though this figure was eventually revised downwards to 32 billion.[143] The Naip field had the advantages of convenient location near the trunk pipeline connecting Central Asia to the Central region, which enables the gas to be fed under natural pressure directly into the delivery system, and of an absence of sulphurous and carbonic impurities. These factors prompted the decision to develop the field rapidly, increasing production from 2 billion cubic metres in 1972 to 15 billion in 1975.[144] The Naip field is believed to contain 1800

---

[140] A A Annaliev "Turkmengazprom na novom etape razvitiya otrasli" Gazovaya promyshlennost' 1976 No. 3, p.10.

[141] Turkmenskaya iskra, 29 May 1971, p.1; Kazakhstanskaya pravda 26 March 1972, p.1.

[142] Turkmenskaya iskra, 1 February 1972, p.2.

[143] Turkmenskaya iskra, 3 September 1972, p.2.

[144] Turkmenskaya iskra, 18 July 1974, p.1.

billion cubic metres of recoverable gas.[145]

Gas production in Uzbekistan reached 36.2 billion cubic metres in 1974, at which time it was estimated that recoverable reserves ran to 1180 billion cubic metres.[146] Continuous exploratory work in the ninth Plan in Western Kazakhstan resulted in the discovery of the Zapadno-Teplovskii gas field, situated very close to the main oil pipeline from Mangyshlak that joins the central distribution network in the Volga region.[147]

Though gas production in European Russia was scheduled to rise during the ninth Plan, its share of total production was to decline from 70.3 per cent in 1970 to 51.3 per cent in 1975.[148] The prime centres of interest were the Orenburg oblast' and the Komi ASSR. The discovery of extensive reserves of gas and gas condensate in the Orenburg oblast' has had implications for the general direction of Soviet economic development, in that towards the end of the eighth Plan a decision had been taken to centre a large industrial complex there. At the outset of the ninth Plan a production level for 1975 of 25 to 30 billion cubic metres of gas was foreseen.[149] This estimate was revised to 24 billion

---

[145] P O Tarakanov "Osvaivaya gazovye bogatstva Turkmenii" Stroitel'stvo truboprovodov 1975 No. 4, p.12.

[146] Editorial "Zadachi razvitiya gazovoi promyshlennosti Uzbekistana" Gazovaya promyshlennost' 1974 No. 2, p.2.

[147] Kazakhstanskaya pravda, 15 January 1974, p.2.

[148] Galonskii op.cit. p.34.

[149] G D Margulov "Orenburgskii gazopromyshlennyi kompleks - vazhnaya stroike devyatoi pyatiletki" Stroitel'stvo truboprovodov 1971 No. 3, p.37.

one year later,[150] and the actual level achieved in 1975 was 19.6 billion.[151] The particular value of Orenburg condensate is that in addition to providing methane for use as fuel, it is also possible to derive ethane, sulphur compounds and heavy hydrocarbons for use as feedstock in the chemical and petrochemical industries, which are priority sectors for local development.[152] However the first section of the production and processing complex was completed behind schedule, being finished in July 1974.[153] The delays experienced in commissioning new capacity in the Orenburg oblast' have contributed to the shortfall in gas production in the area, and it appears that the effect will continue to be felt during the first part of the tenth Plan, since the second stage of development, timed for completion in August 1975, which would increase the productive capacity of the area by 25 per cent, was well behind schedule by the early part of that year,[154] and the levels of local industrial development alone, based on fuel and feedstock from this deposit, are such that a potential consumption of 60 billion

---

[150] Stroitel'stvo truboprovodov 1972 No. 4, pp.5-6.

[151] Margulov, Selikhova, Furman op.cit. p.35.

[152] Yu V Zaitsev "Orenburgskii gazovyi kompleks i ego perspektivy" Gazovaya promyshlennost' 1975 No. 3, p.6.

[153] Vyshka, 11 July 1974, p.1.

[154] Report of a conference held on 29 February 1975 concerning the development of the Orenburg oblast'. ("Orenburgskii gazovyi kompleks: itogi, problemy, resheniya") Gazovaya promyshlennost' 1975 No. 5, p.53.

cubic metres is envisaged.[155] The discovery of the Vuktyl gas condensate field during the eighth Plan marked the beginning of the contribution of the Komi ASSR to Soviet gas production. In the medium term it is anticipated that the area will become second in importance to West Siberia as a gas-producing region. Production increased from 6.8 billion cubic metres in 1970 to 18.5 billion in 1975,[156] with total production between 1971 and 1975 of 77 billion.[157]

In the older producing areas, such as the Ukraine, the Volgograd oblast' and the Stavropol krai, slight increases or decreases were recorded during the ninth Plan, and their declining share of Soviet production is expected to continue. However it should be noted that the Ukraine was still the biggest single producing area during the ninth Plan, although its share in total gas output declined from 30.8 per cent in 1970 to 22.3 in 1975. Its significance lies in the fact that until the completion of the pipeline from the Orenburg field it will remain the principal supplier of gas to industrial consumers in the European zones of the Soviet Union and for export.[158]

---

[155] Probst, Mazover (eds.) op.cit. p.62.

[156] Margulov, Selikhova, Furman op.cit. p.6.

[157] Kochurin op.cit. p.6.

[158] V M Kuzenko et al. "Sostoyanie ispol'zovaniya proizvodstvennykh fondov v dobyche gaza i puti ego uluchsheniya (ob''edinenie 'Ukrgazprom')" Gazovaya promyshlennost' 1975 No. 12, p.7.

The contribution of individual areas to total Soviet production in 1975, compared with 1970, is detailed in table 3.18., and the performance of the production associations in table 3.19.

TABLE 3.18. Soviet Gas Production by Area 1970 and 1975

	1970	1975
Total USSR	197.9	289.3
(%)	(100.0)	(100.0)
of which:		
Krasnodar krai	16.42	11.37
% of total	8.3	4.0
Orenburg oblast'	1.31	20.07
% of total	0.66	7.0
Tyumen' oblast'	9.28	35.50
% of total	4.7	12.3
Komi ASSR	6.80	18.50
% of total	3.4	6.4
Saratov oblast'	3.41	1.02
% of total	1.7	0.3
Volgograd oblast'	4.02	2.92
% of total	2.0	1.0
Ukraine	60.87	68.20
% of total	31.0	23.6
Turkmenistan	13.11	52.34
% of total	6.6	18.1
Uzbekistan	32.10	37.13
% of total	16.2	13.0
Azerbaidzhan	5.52	9.26
% of total	3.0	3.2

Source: R D Margulov, E K Selikhova, I Ya Furman "Razvitie gazovoi promyshlennosti i analiz tekhniko-ekonomicheskikh pokazatelei" Moscow: Ministerstvo Gazovoi Promyshlennosti 1976, p.6.

TABLE 3.19. Soviet Gas Production by Major Association 1970 and 1975 (milliard cubic metres)

	1970	1975	1975 as % of 1970
Total USSR	197.9	289.3	146
of which: Kubangazprom	22.5	5.8	25
Stavropolgazprom	15.7	10.5	67
Ukrgazprom	55.0	58.5	106
Komigazprom	6.2	17.8	290
Uzbekgazprom	31.5	36.6	120
Turkmengazprom	11.8	47.0	400
Orenburggazprom	0.8	18.4	X 22.2
Tyumengazprom	9.2	33.5	360

Source: Margulov, Selikhova, Furman op.cit. pp.6, 29-38.

An area of activity which has grown in importance during the ninth Plan is that of production and utilisation of wellhead gas, found jointly with crude oil. At the outset of the ninth Plan there was a satisfactory rate of utilisation of this gas in the older oil-producing areas, such as Azerbaidzhan, the Ukraine, Tataria and Bashkiria, varying from 85 to 94 per cent of production. However in other areas, notably Turkmenia, the vast majority of wellhead gas was flared due to the lack of processing and transport facilities. In 1970 the Soviet oil industry flared some 14 billion cubic metres.[159]

---

[159] Galonskii op.cit. p.34.

The directives for the ninth Plan included guidelines for utilisation of wellhead gas. The percentage of such gas utilised in 1975 was to rise to 85-87 per cent of production compared with 61.1 oer cent recorded in 1970.[160] Of the 22.9 billion cubic metres utilised in 1970, 11.4 billion were processed by the Ministry of the Gas Industry for fuel and 11.5 directed into the petrochemical industry as feedstock.[161] By 1972 an increase in utilisation of 12.1 per cent on the 1970 level was recorded: however it was in the period from 1974 to 1975 that utilisation was to expand substantially when new capacity was to be commissioned.[162] At the end of the ninth Plan utilisation of wellhead gas showed an increase of 5 billion cubic metres on the 1970 level, reaching over 28 billion.[163] Six plants for processing this type of gas were constructed and commissioned between 1970 and 1975,[164] facilitating the development of the resources of Turkmenia and West Siberia. In the case

---

[160] Pyatiletnii plan 1971-1975, p.106. In 1970 production of wellhead gas was 37.5 billion cubic metres, utilisation 22.9 billion. See also V I Baraz "Sostoyanie i osnovnye napravleniya v ispol'zovanii neftyanogo gaza" Neftepromyslovoe delo 1973 No 10, p.3.

[161] Baraz op. cit. p.3.

[162] ibid. p.4.

[163] V I Baraz "Sostoyanie i osnovnye napravleniya uluchsheniya ispol'zovaniya neftyanogo gaza" Neftepromyslovoe delo 1976 No 7, p.52.

[164] These were: (i) Groznyi, capacity 3.1 billion cubic metres per year, (ii) Gnedintsev, 0.42, (iii) Kazakh, 1.0, (iv) Fifth unit of Minnibaev plant, 0.585, (v) Nizhnevartovsk, plant No 1, 2.0, (vi) Pravdinsk, 0.5. ibid. p.52.

of Turkmenia the multi-strata Kotur-Tepe field yielded over 300 cubic metres of wellhead gas per tonne of oil produced,[165] and by the end of the ninth Plan productive capacity had risen to 5 billion cubic metres per year.[166] West Siberian development is centered on the Nizhnevartovsk deposit. The extent of the availability of wellhead gas here is such that the expansion of the Tomsk and Tobol'sk petrochemical complexes is being planned on the basis of Nizhnevartovsk gas as feedstock.[167] Though precise data on levels of utilisation of wellhead gas achieved in relation to objective during the ninth Plan have not been disclosed, it appears that in at least ten oil-producing regions 80 per cent utilisation was obtained,[168] and in the Bashkir oil fields, which are at an advanced stage of exploitation, utilisation reached over 90 per cent.[169]

During the ninth Plan exploratory work has been carried out in West Siberia (North Tyumen'), East Siberia, offshore in the Baltic and Caspian Seas, and in Sakhalin. In view of the rapid discovery of gas reserves towards the end of the eighth Plan in the North Tyumen' area, the development of East Siberia is not critical in the short term. Maintenance of exploratory

---

[165] P Tarakanov "Ispol'zovanie neftyanogo poputnogo gaza na mestorozhdenii Kotur-Tepe" Neftyanik 1975 No. 3, p.12.

[166] Baraz(1976) p.52.

[167] G V Tukov et al. "O resursakh gaza v nefti Samotlorskogo mestorozhdeniya" Neftyanoe khozyaistvo 1975 No. 2, p.60.

[168] Baraz(1973) p.2.

[169] Ekonomicheskaya gazeta 43/1975, p.16.

effort has given rise to the Soviet claim that they possess the world's largest proven reserves of gas (40 per cent of total).[170] By 1975 there had been little work carried out in East Siberia. The first areas to have been explored were the Vilyuisk region and the Yakut ASSR. Ultimate development of the gas reserves of this area depends on the one hand on decisions concerning the future level of industrialisation of the area and its concomitant demand for fuel, and on the other on opportunities for export, primarily to Japan, via a possible pipeline to the Pacific coast at Nakhodka.[171] (The background to Soviet development of East Siberia with Japanese and American aid is outlined in Appendix A.)

The total offshore gas-bearing potential area of the Soviet Union was estimated at 3 million square kilometres in 1970, with potential reserves of 10 trillion cubic metres off the Soviet Northern coast and 1 trillion in the Azov Sea.[172] There have been some minor discoveries of offshore gas fields in the Baltic and Caspian Seas, though the prospects of discovery of oil seem more promising than of gas.

Analysis of performance against original Plan in the gas industry reveals a substantial shortfall between 1971 and 1975. Problems similar to those in the oil industry have been

---

[170] Gazovaya promyshlennost' 1974 No 11, p.2. (editorial) "Prognozirovanie perspektiv gazonosnosti"

[171] E Dmitriev "Razvitie geologorazvedochnykh rabot na neft' i gaz v Vostochnoi Sibiri" Neftyanik 1975 No. 4, p.11.

[172] S I Levin "Trebovaniya k podgotovke stroitel'stva morskikh truboprovodov" Stroitel'stvo truboprovodov 1973 No. 12, p.4.

encountered, namely shortage and poor quality of equipment, high labour turnover in the less hospitable areas of exploration and production and poor coordination between the production and distribution functions.[173] Table 3.20. outlines the growing divergence between Plan and performance from 1971 to 1975. It will be seen that the industry as a whole underfulfilled its target in the second year of the Plan and subsequently. The overall effect was that of creating a gas deficit of 71 billion cubic metres, or 85 million tonnes of standard fuel, against original Plan, as calculated from table 3.5. Severe depletion of reserves has been experienced in a number of producing areas, particularly the Ukraine and the North Caucasus, in addition to declining production in some fields, the Krasnodar krai showing a marked decline from 1971 to 1975. The problem of depletion is expected to be encountered increasingly in the immediate future in many of the Central Asian fields. This has meant increased demands on available capital in order to maintain production levels in existing operations. Although it will be seen from table 3.21. that there has been little change in the proportion of capital committed to offsetting depletion during the eighth and ninth Plans, the indication is that planners did not expect the provision for depletion to be so high latterly, especially given the anticipated higher processing costs associated with

---

[173] Russell op.cit. pp.62-66, catalogues the problems faced by the gas industry during the ninth Plan.

TABLE 3.20. Growth Pattern in Soviet Gas Production 1971-1975. (billion cubic metres)

Year		Plan	Actual
1971		13.1	14.45
1972		18.0	8.98
1973		21.0	14.94
1974		30.0	24.23
1975		30.0	28.70
1970-1975		123.1	91.4
1970-1975	Annual Average	24.6	18.3

Sources: Pyatiletnii plan 1971-1975, p.346.
Margulov, Selikhova, Furman op.cit. pp.5-6.

TABLE 3.21. Capital Utilisation in the Soviet Gas Industry 1966-1970 and 1971-1975. (million Rubles)

Indicator	1966-1970	1971-1975
Capital Investment Total	1019.1	3139.4
to compensate for depletion in existing operations	502.2	1591.0
to expand new production	516.9	1548.4

Source: Margulov, Selikhova, Furman op.cit. p.21.

the chemical characteristics of the gas produced in many of the more recently discovered fields.[174] A further important feature of development in the ninth Plan is that out of a total of 205.8 billion cubic metres' new capacity scheduled for completion some 145 billion, or 70 per cent, was to be concentrated in 6 gas fields.[175] Delays experienced in bringing this new capacity on stream could not be counterbalanced elsewhere, especially since the investment Plan for the industry as a whole was fulfilled.

The inability of the gas industry to fulfil the original targets of the Plan was due not only to the technical problems experienced in the production process: there have also been several difficulties encountered in the provision of pipeline transport, necessary for the integration into existing systems of projected new production. Study of the logistic support sector sheds further light on to the development of the oil and gas industries.

Developments in Transportation and Refining 1971-1975.

The predominant transport mode for Soviet oil and gas has become the long-distance large-diameter pipeline. Table 3.22. outlines the growth in length and load turnover on the system from 1970 to 1975. There are significant cost advantages in

---

[174] Margulov, Selikhova, Furman op.cit. pp.20-21.

[175] These were Medvezh'e, Shatlyk, Achak, Naip, Vuktyl and Orenburg. ibid. p.21.

TABLE 3.22. Installation and Utilisation of Soviet Oil and Gas Pipelines 1970-1975.

(a) Oil Pipelines

Year	Total Length Installed at Year-End ('000 kms)	Deliveries of oil and products (Mt)	Load Turnover (M tonne-kms)
1970	37.4	339.9	281.7
1971	41.0	352.5	328.5
1972	42.9	388.5	375.9
1973	47.2	421.4	439.4
1974	53.0	457.2	533.4
1975	56.9	497.6	665.8

(b) Gas Pipelines

	1970	1971	1972	1973	1974	1975
Length Installed at Year-End ('000 kms)	67.5	71.5	77.7	83.5	92.1	99.2
Gas Transmitted (billion cubic metres)	181.5	209.8	219.9	231.1	245.7	279.4

Source: Narodnoe khozyaistvo SSSR 1975, p.474.

transporting oil and gas by pipeline in preference to road, rail or, where possible, waterway. It was estimated at the beginning of the ninth Plan that transporting a given volume by pipeline was some 2 to 3 times cheaper on average than by rail, and 1.5 to 2 times cheaper than by waterway.[176] The recoupment period for

---

[176] Z S Prutyanova "Tekhniko-ekonomicheskie pokazateli razvitiya truboprovodnogo transporta" Ekonomika neftyanoi promyshlennosti 1970 No. 12, p.38.

capital investment is shorter in the case of pipeline installation than in expanding other forms of transport, this being achieved normally within 3 to 4 years of commissioning, and the operation of the pipeline system itself is a good deal less energy-intensive than the alternatives.[177] Throughout the sixties there was a trend in pipeline construction towards the greater use of large-diameter pipe: whereas in 1960 the upper limit on pipeline diameter was 500 millimetres, by 1970 diameters of 1020 and 1200 millimetres were common.[178] The fact that Siberia has become the Soviet Union's principal producing area in the course of the ninth Plan gas given rise to a fundamental change in the pattern of interregional oil flows. As early as 1967 it was foreseen that by the end of the seventies the Western boundary of Siberia would become the dividing line between Westward and Eastward oil flows, which was then drawn in the Volga-Ural area.[179] The probable distribution for West Siberian oil was seen to be Siberia itself, the Far East, North Kazakhstan, the Northern part of European Russia and the Eastern area of the Urals.

The importance of the development of the oil pipeline system can be judged from the fact that for the period 1971 to 1975 the

---

[177] ibid. pp.38-39.

[178] ibid. p.39.

[179] V S Varlamov "Problemy transportnogo osvoeniya Zapadno-Sibirskoi nizmennosti v svyazi s formirovaniem na ee territorii novogo narodnokhozyaistvennogo kompleksa" Izvestiya AN SSSR Ser. geog. 1967 No. 3, p.52.

level of capital investment was, at 3.9 billion rubles, three times that of the preceding Plan.[180] The rationale behind this decision relates to the need to exploit Siberian resources. The West Siberian oil and gas province is twice the size of the next nearest, the Volga-Ural. Unlike the latter area, which already had an industrial waterway and rail system prior to the commencement of energy developments, Siberia was almost entirely virgin territory and from the outset planners appreciated that the long-term significance for the economy as a whole was greater than the Volga-Ural area had been. The population density is lower in Siberia than in the Volga-Ural area and the construction of a pipeline of given capacity is considerably less labour-intensive than that of a rail system. On account of this, the harsh climate and difficulties in maintaining a regular supply of materials it was decided to minimise infrastructure development.[181]

Progress in the construction of oil and gas pipelines is outlined in Elliot's (1974) work:[182] the state of development at the end of 1975 is detailed in tables 3.23. (oil) and 3.24. (gas). During the ninth Plan some 51.2 thousand kilometres of new trunk oil and gas pipeline were constructed in the Soviet Union, expanding capacity by 50 per cent. In the oil sector the Usa-

---

[180] Pyatiletnii plan 1971-1975, p.103.

[181] Varlamov op.cit. p.54.

[182] Elliot op.cit. pp.55-59, and pp.109-117.

TABLE 3.23. Basic Specifications of Major Oil Pipelines Completed between 1960 and 1975

Year of Commissioning	From	To	Length (kms)	Diameter (inches)	Capacity (M tonnes/yr)
1963	Al'met'evsk	Mozyr (i) Brest (ii) Uzhgorod	5000	40/48	50
1964	Al'met'evsk	Irkutsk	3700	28	20
1969	Baku	Batumi	883	8	n.a.
1970	Uzen'	Kuybyshev	1500	40	n.a.
1973	Aleksandrovsk	Anzhero-Sudzhensk	820	40/48	n.a.
1973	Anzhero-Sudzhensk	Krasnoyarsk	500	40/48	n.a.
1974	Kuybyshev	Novorossiisk	1520	32	n.a.
1974	Samotlor	Al'met'evsk	2130	48	n.a.
1975	Usinsk	Yaroslavl'	1800	28	n.a.

Source: BEICIP/RRI "The Petroleum Industry of the Soviet Union" (1975)Part 2, p.115. (Geological/geographical consultancy report, made available by courtesy of The British Petroleum Company Ltd.)

Map 1: The Soviet Oil Industry at end-1975.

Source: Adapted from J Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin: Duncker & Humblot 1975, pp.62-63.

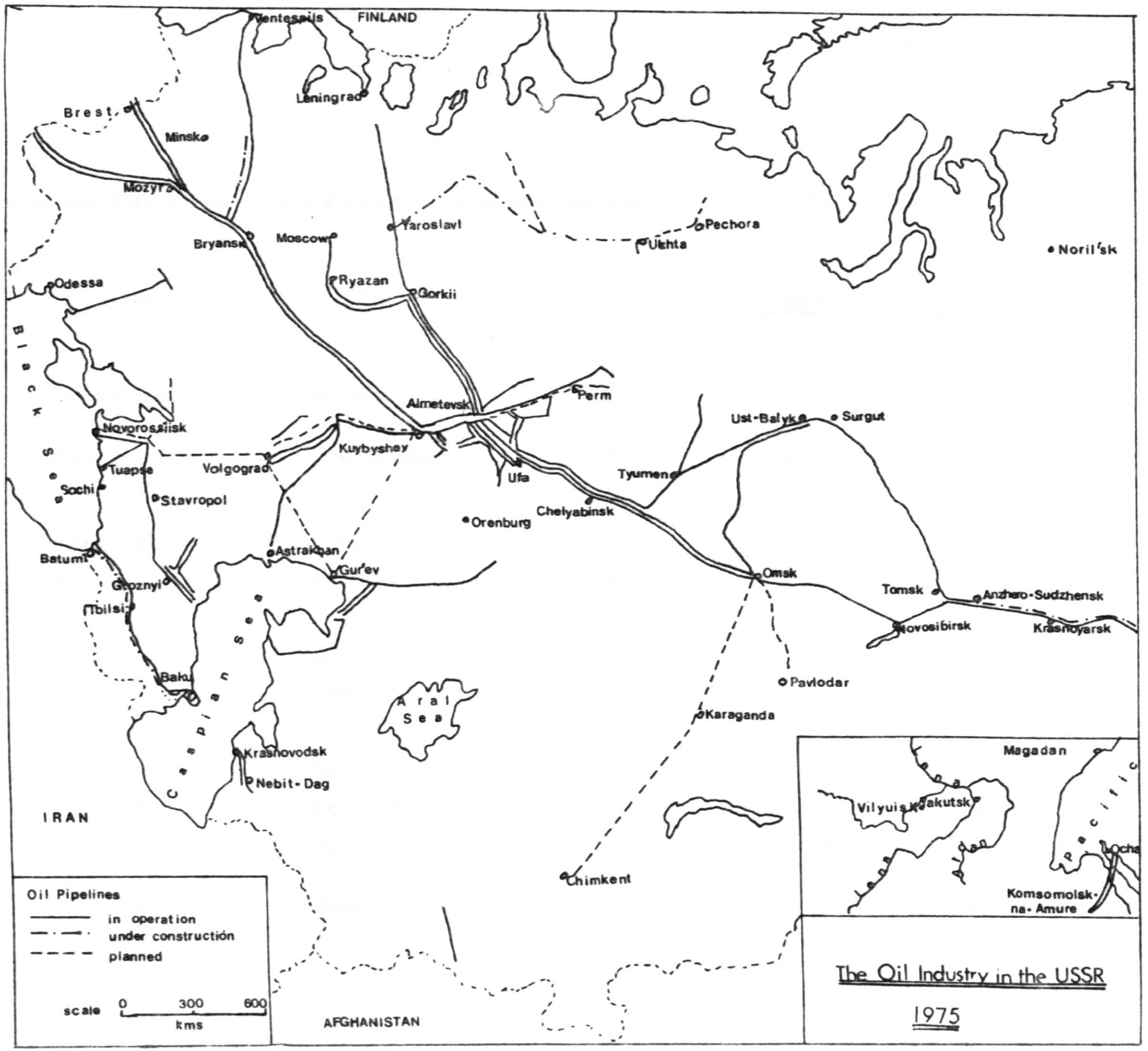

Ventspils
FINLAND
Leningrad
Brest
Minsk
Mozyr
Yaroslavl
Pechora
Bryansk
Moscow
Ukhta
Norilsk
Ryazan
Gorkii
Odessa
Black Sea
Almetevsk
Perm
Ust-Balyk
Surgut
Novorossiisk
Kuybyshev
Volgograd
Tuapse
Sochi
Stavropol
Ufa
Tyumen
Chelyabinsk
Orenburg
Astrakhan
Gur'ev
Batumi
Grozny
Tbilisi
Omsk
Tomsk
Anzhero-Sudzhensk
Novosibirsk
Krasnoyarsk
Baku
Caspian Sea
Aral Sea
Pavlodar
Karaganda
Krasnovodsk
Nebit-Dag
IRAN
Magadan
Lena
Vilyuisk
Yakutsk
Aldan
Okha
Komsomolsk-na-Amure
Chimkent
AFGHANISTAN
Oil Pipelines
in operation
under construction
planned
scale 0 300 600
kms
The Oil Industry in the USSR
1975

TABLE 3.24. Specifications of Major Gas Pipelines Completed between 1960 and 1975

Year of Commissioning	From	To	Length	Diameter	Capacity (billion cub. metres/yr)
1959/60	Shebelinka	Moscow	850	n.a.	10.5
1962 (expanded 1973)	Bukhara	Sverdlovsk	4973 (inc. branches)	40	19.5
1966	Berezova	Sverdlovsk	960	40	10.0
1969	Gazli	Moscow	3740 (inc. branches)	40	13.0
1969	Gazli	Moscow (2nd line)	3200 (inc. branches)	40/48/56	13.0
1970	Okarem	Ostrogozhsk, Voronezh	2510	21/28/40	13.5
1970	Shekhitli	Ostrogozhsk	3640	48/56	n.f.
1970 (expanded 1975)	Bukhara	Alma-Ata	3500	32/40	10.2 (1970) 25.0 (1975)
1970	Caucasus	Moscow	3000	48/56	49.0

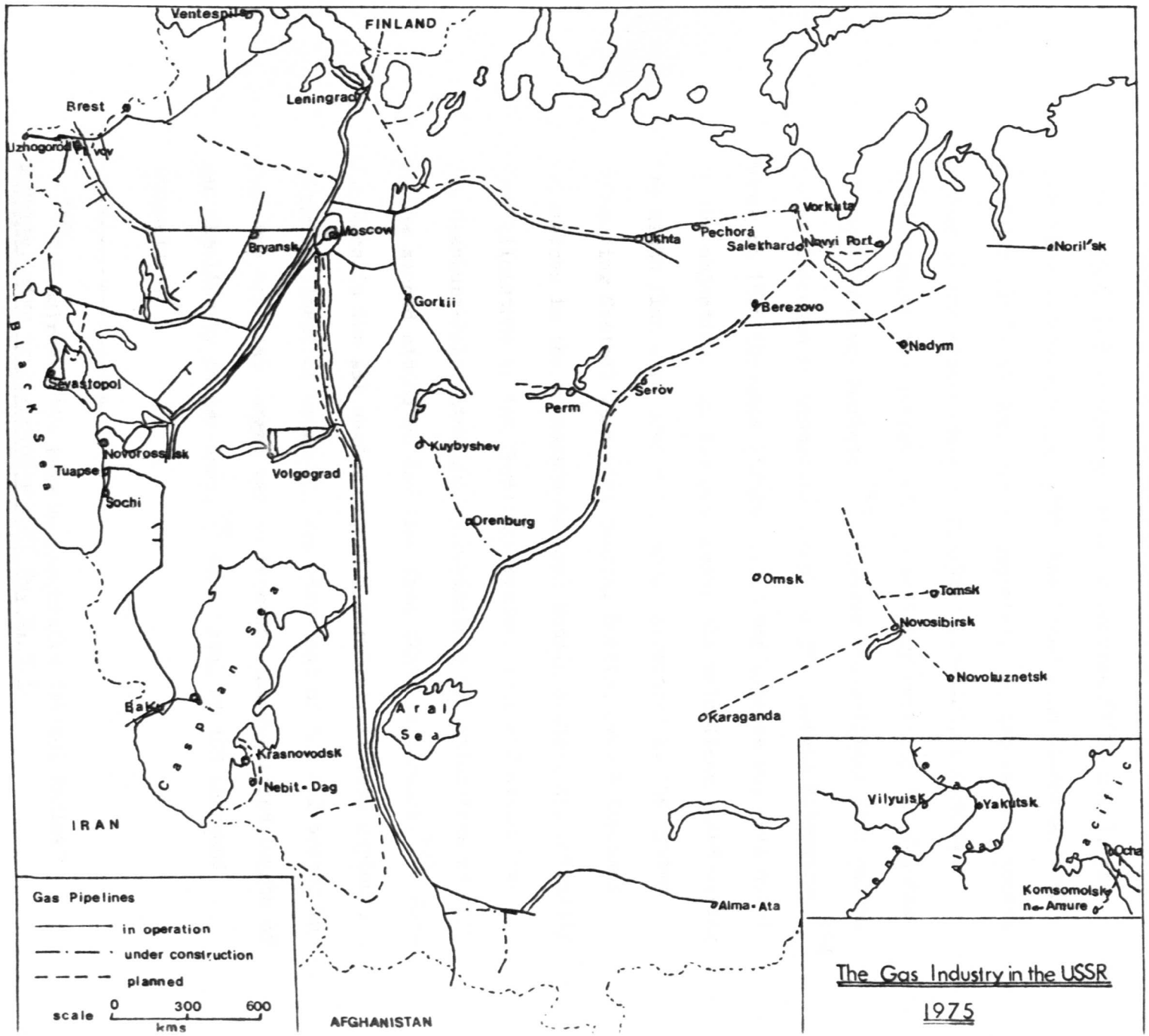
TABLE 3.24 (cont.)

Year of Commissioning	From	To	Length (kms)	Diameter (inches)	Capacity (billion cub. metres/yr)
1972 (expanded 1975)	Medvezh'e	Moscow	3000	48/56	38.0 (1972) 50.0 (1975)
1973	Shekhitli, Shebelinka	Moscow	3000+	n.a.	n.a.
1973	Shebelinka	Dolina	1115	40/48	12.3
1975	Medvezh'e	Brest	3400	48/56	n.a.

Sources: BEICIP/RRI op.cit. Part 2), p.112.

Map 2: The Soviet Natural Gas Industry at end-1975.

Source: Adapted from V A Smirnov "Gazovaya promyshlennost'" Ekonomika i organizatsiya promyshlennogo proizvodstva 1975 No 5, p.51.


FINLAND
Ventespils
Brest
Leningrad
Uzhgorod
Lvov
Moscow
Bryansk
Ukhta
Pechorá
Vorkuta
Salekhard
Navyi Port
Noril'sk
Gorkii
Berezovo
Nadym
Sevastopol
Black Sea
Novorossiysk
Tuapse
Sochi
Volgograd
Kuybyshev
Perm
Serov
Orenburg
Omsk
Tomsk
Novosibirsk
Novokuznetsk
Karaganda
Aral Sea
Caspian Sea
Baku
Krasnovodsk
Nebit-Dag
IRAN
AFGHANISTAN
Alma-Ata
Vilyuisk
Yakutsk
Pacific
Ocha
Komsomolsk
na-Amure
Gas Pipelines
in operation
under construction
planned
scale 0 300 600
kms
The Gas Industry in the USSR
1975

Moscow line (1855 kms.), the Samotlor-Al'met'evsk line (2313 kms.), that from Aleksandrovskoe to Irkutsk (1766 kms.), from Kuybyshev to Novorossiisk (1522 kms.) and from Nizhnevartovsk to Kuybyshev (1183 kms.) were completed. So too was the second string of the trans-Comecon 'Druzhba' pipeline, expanding substantially the Soviet Union's delivery capacity for Comecon and West European markets.[183] However the original Plan called for an increase in installed length of 30 thousand kilometres;[184] hence at 19.5 thousand (table 3.23.) performance was well short of the objective. In the gas sector the main lines added during the ninth Plan were over 8 thousand kilometres in the system connecting Central Asia with Central Russia, over 5 thousand kilometres in the Medvezh'e-Central Russia system, approximately 2500 kilometres in the Ukrainian system, over 800 kilometres of the Orenburg-Pskov line and approximately 600 kilometres as part of the second string of the line from Ukhta to Torzhok.[185] Performance in the gas sector showed a parallel, if less serious, underfulfilment of original Plan than that of the oil sector in that the original target was to increase the installed length of gas pipeline by 60 per cent,[186] to a total of 108 thousand kilometres.

---

[183] K K Smirnov "Vo imya mogushchestva Velikoi Rodiny" Stroitel'stvo truboprovodov 1976 No. 2, p.1.

[184] Pyatiletnii plan 1971-1975, pp.103, 216.

[185] Smirnov "Vo imya..." (1976), p.1.

[186] Pyatiletnii plan 1971-1975, p.204.

An additional problem that affected the underperformance of the gas-producing industry was that not all the increased capacity installed during the ninth Plan could be utilised for lack of equipment and control systems on the pipelines themselves. Thus whereas the pipeline from Medvezh'e to Nadym had a capacity of 56 billion cubic metres per year, only 40 billion could be transmitted in 1975, and the delivery system from the Punga storage complex had a capacity in 1975 of 42 billion cubic metres; only 30 billion were dispatched.[187] Delays in fully commissioning major pipelines not only limited delivery capacity but gave rise to relative over-utilisation of rail transport with higher transport cost than anticipated. Whereas on average transport costs constitute 10 per cent of the final cost of industrial products, in the case of oil and petroleum products this figure is 25 per cent.[188] Of the methods currently under discussion for lowering the transport cost element, delivery of oil, saturated with gas, by large-diameter pipeline is thought to be readily applicable in areas where both oil and gas are produced in close proximity. The transport cost for oil and gas can be reduced by up to 20 per cent by using this method, but the scope of its potential application is further limited by the fact that

---

[187] These and other shortfalls in delivery performance against design capacity are outlined in Margulov, Selikhova, Furman op.cit. pp.45-46.

[188] Z S Prutyanova "Rezervy v nefteprovodnom transporte i metodika ikh opredeleniya" Ekonomika neftyanoi promyshlennosti 1972 No. 3, p.24.

the point is quickly reached at which the incremental energy cost incurred in operating the system exceeds the transport cost saving.[189]

The refining sector has displayed a number of important developments during the ninth Plan. Though precise data on objectives are somewhat sparse, it is possible to discern the changing trends. It is significant that within the directives to expand refining capacity greater emphasis was to be put on the manufacture of motor gasoline, whose output in 1975 was to be 2.3 times that of 1970, low-sulphur distillate fuel, scheduled to rise in 1975 to 1.4 times the 1970 level, and winter grade diesel fuel, whose output was to rise 1.75 times.[190]

European Russia is characterised by a high demand for motor gasoline and fuel oil in relation to other refined products and hence the refinery balance is geared to maximum production of these two product groups. In the Eastern regions the greater part of demand is for diesel fuel and petrochemical feedstock, the refineries there seeking minimum output of fuel oil. Gas and coal, which are available in the latter area, are selected in preference to fuel oil. It is reported that in 1970 the refining balance of the Eastern regions showed little difference from that of European Russia. Relatively small quantities of light

---

[189]This issue is discussed, mainly from the technical standpoint, in P N Uskov "Sovershenstvovanie odnotrubnogo sbora nefti i gaza" Neftepromyslovoe delo 1972 No. 1, pp.31-35.

[190]Galonskii op.cit. p.36.

products were transported from European Russia to Central and Eastern areas, counterbalanced by deliveries of fuel oil from the latter area to the former.[191]

In accordance with the directives for the refining sector the refining balance as a whole was to alter during the ninth Plan in favour of maximum output of light (non-substitutable) products based increasingly on West Siberian crude oils, which are of low sulphur content and have a high yield of light products.[192] However the underfulfilment of Plan by the oil and gas industries caused a number of problems in oil refining. As a result of the substantial underfulfilment of the gas industry and of the inability of the coal industry to compensate by overfulfilment the level of fuel oil that had to be produced during the ninth Plan was excessive, and caused some measure of undersupply of gasoline, distillate fuels and bitumen stock.[193] Furthermore as a result of the suboptimal refining balance regional product supply was disrupted and undesired cross-hauls of products were necessitated.[194]

Siberia was designated a priority area for the refining industry during the ninth Plan. Demand for all products and

---

[191] Probst, Mazover (eds.) op.cit. p.151.

[192] The characteristics of West Siberian crude oils are given in M A Mkhchiyan et al. "Nefti Zapadnoi Sibiri" Neftyanik 1975 No. 12, pp.17-18.

[193] Editorial "Neftepererabatyvayushchaya i neftekhimicheskaya promyshlennost' v 1975 godu" Khimiya i tekhnologiya topliv i masel 1975 No. 1, p.6.

[194] Probst, Mazover (eds.) op.cit. p.151.

especially for gasoline and petrochemical feedstock was expected to rise. The output of these two product groups was to be maximised, using Kansk-Achinsk coal or Tyumen' gas locally rather than fuel oil.[195] The development of the Soviet refining industry has been characterised recently by growing concentration of capacity in a small number of plants. Over the period from 1951 to 1960 the share in total output of refineries whose capacity was 1 million tonnes per year or less fell from 17.5 to 5 per cent. The process of production concentration was particularly intense in the period from 1961 to 1970, when the average refinery capacity increased more than two fold. Current development policy favours refineries of capacity of at least 6 million tonnes per year, and in 1972 such refineries accounted for approximately half the number and three-quarters the capacity in the Soviet Union.[196] In the case of Siberia the development of the refining industry was centred on the Omsk and Angarsk refineries. By the end of the ninth Plan it was felt that these refineries had reached their optimum size, beyond which any benefits of economy of scale in refining would be offset by additional costs of transportation and storage. At that stage a decision was taken to expand the Achinsk refinery and to draw up plans for further plants, timed to coincide with the expansion of oil production in West Siberia.[197]

---

[195] ibid. p.152.

[196] ibid. p.167.

[197] ibid. p.157.

Central Asia and Kazakhstan are faced with a substantial gap between productive capacity and consumption levels of refined products. By the end of 1975 the local refining sector could satisfy less than 25 per cent of demand in these areas.[198] However the availability of gas has done much to alleviate this regional problem. European Russia has had adequate refining capacity throughout the post-war period and there has been an excess of capacity in the Volga-Ural area since the commencement of its development. The rate of expansion of capacity in European Russia during the ninth Plan was lower than in other regions and was confined to those areas experiencing a local product shortage.[199]

In the course of the ninth Plan the major problem affecting the refining industry was that of phasing in West Siberian crude oils. Such oils were refined not only in Siberia and the Far East but also in Bashkiria and the Kuybyshev oblast'. Plans were drawn up for the supply of West Siberian oils to refineries in Central and Southern Russia. The low sulphur and salt content of West Siberian oils makes them easier to refine than the standard Volga-Ural oils, and consequently puts them at a premium.[200] The latter factor compounds the loss incurred in having to overproduce fuel oil, in that in order to meet a higher demand than anticipated a

---

[198] ibid. pp.157-158.

[199] ibid. pp.158-159.

[200] Khimiya i tekhnologiya topliv i masel 1975 No. 1, p.5. (editorial).

proportion of products of higher value had to be downgraded into fuel oil blending. The importance of re-optimising the refinery balance in the tenth Plan was outlined at an early stage: refinery production targets for 1976 were geared to lessening the production of fuel oil relative to gasoline, middle distillates and naphtha.[201]

Financial Aspects of Soviet Oil and Gas Development 1971-1975

Study of pricing policy for crude oil and refined products sheds light on the Soviet objectives during the ninth Plan of optimising the use of oil in relation to coal and gas and of securing the desired movement of refined products to centres of consumption. Further objectives were the maintenance of the financial viability of individual enterprises and narrowing of price differentials between purchasing enterprises.[202] Thus on 1st January 1971 the price of Tyumen' oil was cut by 18 per cent with the result that consumption increased, as desired, and unit production costs decreased. At the same time the price of Bashkir crude oil was raised in order to offset increased production costs caused by reserve depletion and the consequent need to extract from deeper deposits.[203] The pricing policy for refined products has been re-appraised. Whereas up to the late sixties

---

[201] Editorial "Povyshenie effektivnosti proizvodstva" Khimiya i tekhnologiya topliv i masel 1976 No. 2, p.3.

[202] V K Vasil'eva "O tsenakh na neft'" Ekonomika neftyanoi promyshlennosti 1971 No. 11, p.22.

[203] ibid.

prices of all refined products were determined on the basis of a calorific comparison with other fuels, it was decided that such a policy would apply only in the case of fuel oil. Price levels for naphtha and middle distillates, and for crude oils designated for maximum output of these products, would subsequently reflect their desired competitiveness against alternatives, such as natural gas liquids (ethane and propane) as feedstocks as well as fuels.[204]

The pricing of wellhead gas illustrates the Soviet attempt to integrate the pricing mechanism with the policy of securing an optimal fuel balance. Despite directives for the ninth Plan to increase the utilisation of wellhead gas, no more than 60 per cent of available gas has been utilised due to lack of processing capacity.[205] The bottleneck is caused by the fact that at current prices for raw wellhead gas and its derivatives investment recoupment is well outside the norm and financial returns during the build-up of productive capacity are unattractive. Moreover production costs for wellhead gas are expected to rise in all areas except Tyumen'. Therefore it is suggested that production costs should be reckoned separately for oil and wellhead gas, implying that the latter carries unrealistically high costs,

---

[204] V K Vasil'eva "Sovershenstvovanie tsenoobrazovaniya v otrasli" Ekonomika neftyanoi promyshlennosti 1974 No 11, p.58.

[205] V K Vasil'eva, N N Kosinov, A Z Kuz'min "Nekotorye voprosy formirovaniya optovykh tsen na neftyanoi gaz" Ekonomika neftyanoi promyshlennosti 1976 No 2, p.7.

"subsidising" oil production, and that wholesale prices for well-head gas be lowered as a temporary adjusting measure to stimulate demand. Such prices could then be readjusted in relation to oil and natural gas once the desired equilibrium had been attained.[206]

However the pricing mechanism must reflect above all the rising average cost of oil production. Even the rapid development of Siberia, where production costs in 1972 were some 29 per cent below the all-Union average, cannot compensate for the upward trend recorded in 20 out of 26 oil-producing areas.[207] In the long term the oil and gas industry recognises that the problem of rising prime cost of production will become more severe. The upward trend in the prime cost of production of oil and gas compared with other raw materials is detailed in table 3.25., where it will be seen that coal is the sole raw material to exhibit falling costs of production. The position of coal has been reversed since 1973 as production has shifted increasingly to more difficult terrain.

The oil industry is comparatively capital-intensive. Capital allocated to the industry totalled (in 1973 values) 4.05 billion rubles during 1951-1955; by 1961-1965 this figure had increased to 6.7 billion and during the ninth Plan over 14 billion rubles were allocated for oil development, this figure approaching 10 per cent of total industrial investment.[208]

---

[206] ibid. pp.7-8.

[207] V K Vasil'eva "Sovershenstvovanie tsenoobrazovaniya..." (1974), p.59.

[208] G D Sokolov "Kapital'noe stroitel'stvo v neftyanoi promyshlennosti" Moscow Nedra 1973, p.3.; Narodnoe khozyaistvo SSSR, 1975, p.508.

TABLE 3.25. Changes in the Prime Cost of Selected Raw Materials. (2nd half of 1967 = 100)

Material	1965	1970	1973
Iron Ore	89	106	116
Manganese Ore	92	132	125
Bauxite	78	101	111
Coal	92	97	96
Oil (inc. gas condensate)	74	105	112
Natural Gas	35	115	127
Apatite Concentrate	116	109	114
Natural Sulphur	81	102	114
Phosphorus	99	98	119

Source: Yu Yakovets "Dvizhenie tsen mineral'nogo syr'ya" Planovoe khozyaistvo 1975 No. 6, p.4.

Although the amount of capital allocated to the oil industry during the ninth Plan constituted an increase of 60 per cent on the level of the eighth, the rate of growth of production and reserve appreciation declined substantially.[209] Moreover it seems that in the latter part of the ninth Plan the original allocation had to be increased. By mid-1975 it was reported that the planned investment level for the oil industry had been raised to 15.5 billion rubles and that the expected uptake by the end of the Plan could be as high as 16.7 billion.[210] More detailed

---

[209] G D Sokolov "K voprosu otsenki effektivnosti kapital'nykh vlozhenii v neftyanuyu promyshlennost'" Ekonomika neftyanoi promyshlennosti 1974 No. 7, p.3.

[210] A M Lalayants "O povyshenii effektivnosti proizvodstva i ispol'zovanii kapital'nykh vlozhenii v neftyanoi promyshlennosti" Ekonomika neftyanoi promyshlennosti 1975 No. 7, p.31.

information is available on the structure of capital investment in the gas industry in the ninth Plan than for oil, and is given in table 3.26. In this period the level of capital investment required to secure an additional unit of production and processing capacity increased by factors of 2.6 and 2.0 respectively.[211] The pattern of capital investment in 1975 compared with 1970 is shown in table 3.27. and the overall trend in investment in the fuels industries for the whole of the ninth Plan in table 3.28.

The Soviet Oil and Gas Industries 1971-1975: An Overview.

In the course of the ninth Plan the rate of growth in the Soviet oil and gas industries showed a decline that was characteristic of many industrial sectors of the economy. Both industries underfulfilled their original targets and the coal industry was unable to produce at a compensatory level. In the case of the oil industry only the intensive development of the new, remotely located fields could stave off a serious shortfall, but a faster rate of extraction than originally envisaged gave rise to a greater need to prove new reserves in the short term, and this has in itself been a problem area. However the underperformance of the economy as a whole generated a lower energy demand than planned. The fact that the Soviet Union was able to cope with increasing economic and technical difficulties in exploiting vast but remote reserves of oil and gas, and at the

---

[211] Margulov, Selikhova, Furman op.cit. p.18.

TABLE 3.26. Structure of Capital Investment in the Soviet Gas Industry 1970 and 1971-1975 (million rubles)

	1970	1975	1971-1975
Gas Ministry total	1189.61	2966.9	10903.5
%	100	100	100
Geological exploration	10.9	78.0	335.0
%	0.9	2.6	3.1
Production	332.7	878.5	3139.4
%	28.0	29.6	28.8
including: production drilling	114.9	170.62	701.9
gasfield construction	217.8	707.9	2437.5
transportation	695.78	1718.45	6445.8
%	58.5	57.9	59.1
Processing	36.73	102.77	478.0
%	3.1	3.5	4.4
Underground Storage	7.2	62.04	116.9
%	0.6	2.1	1.0
Machine Manufacture	22.7	57.2	131.4
%	1.9	1.9	1.2
Other	83.6	69.92	257
%	7.0	2.4	2.4

Source: Margulov, Selikhova, Furman op.cit. p.17.

TABLE 3.27. Analysis of Growth in Capital Requirement of Soviet Gas Industry
(All figs. are rubles per 1000 cubic metres)

	1970	1966-1970 Annual Average	1975	1971-1975 Annual Average	Average 1971-1975 as % of Average 1966-1970	1975 as % of 1970
Capital Investment for 1000 cubic metres' new capacity	12.2	7.81	13.96	15.3	196	114
Capital Investment for 1000 cubic metres' production growth	22.3	15.8	35.7	40.8	258	160
of which: production drilling	7.71	5.1	6.93	9.1	178	90
Construction cost for 1000 cubic metres gas extracted	2.64	1.56	3.78	3.25	208	143

Source: Margulov, Selikhova, Furman op.cit. p.19.

TABLE 3.28. Capital Investment in the Soviet Fuels Industries 1970 and 1971-1975 (million rubles, constant prices)

	1970	1971	1972	1973	1974	1975	1971-1975 Total
Industry Total	28597	30275	32400	34112	36630	39852	173269
%	100	100	100	100	100	100	100
Oil Industry	2527	2759	3003	3080	3491	3853	16186
%	8.8	9.1	9.3	9.0	9.5	9.7	9.3
Gas Industry	1041	1122	1229	1482	1738	1798	7369
%	3.6	3.7	3.8	4.3	4.7	4.5	4.3
Coal Industry	1541	1624	1713	1743	1728	1759	8577
%	5.4	5.4	5.3	5.1	4.7	4.4	5.0

Source: Narodnoe khozyaistvo SSSR 1975, p.508.

same time to react to the substantial increase in the import price of Middle East oil without incurring the sort of recession experienced in the rest of the industrialised world, does at least illustrate some of the practical flexibility of Soviet energy planning.

Chapter 4. The Oil and Gas Industries of Eastern Europe to 1975.

There is a marked difference in exploration, production and utilisation of fuel resources in Eastern Europe compared with the Soviet Union. Some countries are well provided in relation to domestic needs with reserves of one or more fuels, others are poorly endowed. This would give rise to different priorities in energy policy, were each member country of the Council for Mutual Economic Assistance (Comecon) to pursue independent lines of development. However a major element of the 1971 Complex Programme of Economic Development is that of working towards an integrated energy policy optimal to the bloc as a whole. Central to this policy is the objective of securing a (relatively belated) shift from a predominantly coal-based energy economy towards greater utilisation of oil and gas.

In Eastern Europe the trend towards oil and gas commenced in the mid-sixties. This trend was scheduled to gain momentum and to continue into the seventies.[1] In 1970 the share held by oil and gas in the consumption balance of Eastern Europe was as follows: the GDR 15.1 per cent, Poland 14.9 per cent, Czechoslovakia 20.5, Hungary 43.7 and Bulgaria 45.8 per cent. Only in the case of Romania, the sole Eastern European country to possess

---

[1] Yu S. Shiryaev, S M Iovchuk (eds.) "Proizvodstvennaya integratsiya stran-chlenov SEV" Moscow Nauka 1972, pp.129-130.

substantial reserves of oil and gas, was the major share accounted for by hydrocarbon fuels, the corresponding figure being approximately 72 per cent.[2]

It should be stressed that in the sixties the Eastern European members of Comecon were not facing the problem of an absolute energy shortage: the problem was that of securing an improved fuel and energy balance which would involve all countries except Romania becoming dependent on external sources of oil and eventually gas. An additional problem was that the development of industries using hydrocarbon feedstock was beginning to generate stronger links between the economies of the Eastern European countries, though to a different extent in each case. In the process of coordinating development plans in the energy sector there arose issues such as the extending of financial assistance by one country to another, optimal size and location of energy conversion plants of varying types and, not least, the nature of production specialisation in fuels within the bloc in the movement towards integration.[3] The essence of the aforementioned issues is that an energy policy aimed at integrated planning of the development of disparate and widely dispersed resources, particularly when the preferred resources are as flexible as oil and gas, involves shifts in macroeconomic and geopolitical relations within the bloc.

---

[2]H Ufer "Wachstums- und Strukturprobleme der Energiewirtschaften der RGW-Länder" Wirtschaftswissenschaft 1975 No. 8, p.1128.

[3]I D Kozlov, E K Shmakova "Sotrudnichestvo stran-chlenov SEV v energetike" Moscow Nauka 1973, pp.14-15.

In the early sixties the debate on problems of energy provision in Eastern Europe for the period from 1960 to 1980 was centered on the estimate that in this period aggregate GNP of the member-countries would increase fivefold and that within this the output of the industrial sector would increase sixfold.[4] The pattern of energy consumption in Eastern Europe from 1950 to 1970, together with an estimate for 1980, is given in table 4.1. The trend towards oil and gas was planned to differ in individual countries. In the case of Hungary and Bulgaria estimates made in early 1973 foresaw a share in the total energy balance for oil and gas of 60 to 65 per cent by 1980, possibly rising to 75 per cent by the year 2000. In the GDR, Czechoslovakia and Poland the share of oil and gas would be significantly lower, in the range of 30 to 38 per cent in 1980, given each country's access to indigenous reserves of brown coal (the GDR and Czechoslovakia) and hard coal (Poland).[5]

The emergent role of oil and gas in the Eastern European energy balance during the sixties is shown in table 4.2., and the developing trend in fuel production in table 4.3. The trend towards greater use of oil and gas was brought about by the influence of two factors. Firstly it became evident during the sixties that the more thermally efficient hydrocarbon fuels could be supplied to a consumer at a lower delivered cost in

---

[4] I V Popov "Sotrudnichestvo sotsialisticheskikh stran v oblasti energetiki" Voprosy ekonomiki 1963 No. 10, p.111.

[5] Kozlov, Shmakova op.cit. p.29.

TABLE 4.1. Consumption of Energy in Eastern Europe 1950-1970 and Estimate for 1980 (million tonnes of std. fuel)

Country	1950	1960	1970	1980Est	1960 as % of 1950	1970 as % of 1960	1980Est as % of 1970
Bulgaria	2.2	9.7	27.7	55.5	441	286	200
Hungary	9.1	21.4	34.8	45.0	235	163	129
GDR	47.6	87.8	100.0	120	184	114	120
Poland	52.2	97.3	142.3	181-186	186	146	127-131
Romania	7.3	36.1	58.6	96-98	495	162	164-167
Czechoslovakia	37.3	61.9	90.6	112	166	146	124

Sources: I D Kozlov, E K Shmakova "Sotrudnichestvo stran-chlenov SEV v energetike" Moscow Nauka 1973, p.25.

A Alekseev, Yu Savenko "Ekonomicheskaya integratsiya v razvitii toplivno-energeticheskikh otraslei stran-chlenov SEV" Voprosy ekonomiki 1971 No. 12, pp.49-52.

TABLE 4.2. Energy Balance of Eastern Europe 1960-1970 (%)

Fuel	Year	Bulgaria	Hungary	GDR	Poland	Romania	Czechoslovakia
Coal	1960	64.0	72.3	96.0	90.0	17.0	84.0
	1965	61.2	65.0	90.4	86.1	17.1	81.7
	1970	53.7	47.8	81.4	82.0	18.7	78.2
Oil	1960	14.0	12.0	3.0	4.0	29.0	7.0
	1965	27.9	19.6	7.0	6.5	22.0	11.8
	1970	43.3	29.7	14.9	9.7	22.0	18.3
Gas	1960	-	2.5	-	1.0	46.0	-
	1965	0.6	6.0	0.1	3.0	50.0	-
	1970	2.5	14.0	0.2	5.2	54.0	2.2
Other	1960	22.0	13.2	1.0	4.1	8.0	9.0
	1965	10.3	9.4	2.5	4.4	10.9	6.5
	1970	0.5	8.5	2.5	3.1	5.3	1.3

Source: H Ufer "Wachstums- und Strukturprobleme der Energiewirtschaft der RGW-Länder" Wirtschaftswissenschaft August 1975, p.1128.

TABLE 4.3. Production of Major Fuels in Eastern Europe 1960-1970

	1960	1965	1970	1970 as % of 1960
Hard Coal (million tonnes)				
Bulgaria	0.6	0.6	0.4	67
Hungary	2.8	4.4	4.2	150
GDR	2.7	2.2	1.0	37
Poland	104.4	118.8	140.0	134
Romania	3.4	4.7	6.4	188
Czechoslovakia	26.4	27.8	28.2	107
Brown Coal (million tonnes)				
Bulgaria	15.4	24.5	29.0	188
Hungary	23.7	27.1	24.0	101
GDR	225.5	250.8	261.0	116
Poland	9.3	22.6	33.0	355
Romania	3.4	5.6	14.0	412
Czechoslovakia	57.9	72.3	81.0	140
Oil (million tonnes)				
Bulgaria	0.2	0.22	0.33	165
Hungary	1.2	1.80	1.84	153
GDR	-	-	-	-
Poland	0.19	0.33	0.42	220
Romania	11.5	12.5	13.37	116
Czechoslovakia	0.14	0.18	0.20	143
Natural Gas (billion cubic metres)				
Bulgaria	-	0.7	0.47	-
Hungary	0.34	1.1	3.48	X 10
GDR	-	-	-	-
Poland	0.55	1.3	4.97	X 9
Romania	9.80	16.7	23.9	244
Czechoslovakia	1.44	0.9	1.14	79

Source: Kozlov, Shmakova op.cit. pp.36-37, 48.

standard fuel units than coal, fuelwood or other energy materials. This gave rise to a natural process of substitution that manifested itself in decisions to fuel new productive capacity with oil and gas and in certain cases to invest in the conversion of existing coal-burning plant to these fuels. Secondly the growth of industry needing oil and gas as a feed-stock compounded the substitution process, the major sectors being road transport, air freight and the petrochemical industry. This gave rise to a gradual change in growth rates in production and utilisation of each energy source and a decline in net consumption of energy per unit of output.

The fundamental issue affecting energy planning for the bloc as a whole is the coincidence of Eastern Europe's move from coal to oil and gas with increasingly difficult economic and logistic problems experienced by the Soviet Union, historically the bloc's largest supplier and in both the medium and long term the preferred source. This chapter seeks to outline recent perceptions of the question of energy provision in Eastern Europe, to outline the development of the Eastern European oil and gas industries to 1975 and to examine their part in the changing Eastern European energy balance.

It has been estimated that in 1970 total East European reserves of fuel in all categories were 150 billion tonnes of standard fuel, of which Poland possessed 67.5 per cent (101.2 billion), Czechoslovakia 11.6 (17.4), the GDR 8.7 (13.1),

Romania 3.4 (5.1), Bulgaria 1.4 (2.1) and Hungary 1.2 (1.8).[6] One must bear in mind that these figures relate to total reserves and hence include substantial quantities that will not be recoverable, and also that the majority of the reserves consist of coal, which is becoming less favoured than oil and gas. Eastern Europe as a whole, though each country to a different extent, was thought at the outset of the 1971-1975 Plans to be facing the problem of increasing dependence on imported energy. It was estimated that Bulgaria's energy demand would rise from 27.7 million tonnes of standard fuel in 1970 to 41.5 million in 1975, 55.5 million in 1980, 75 million in 1990 and 110-120 million in the year 2000. At the same time it was estimated that import dependence would rise from 60 per cent in 1960 to 74 per cent in 1980, a level which would be maintained until the end of the century. In Hungary it was expected that energy demand would rise from 34.8 million tonnes of standard fuel in 1970 to 45 million in 1980, the corresponding change in import dependence being from 37 to 50 per cent. Energy demand in the GDR was a little over 100 million tonnes of standard fuel in 1970 and this was expected to rise to 120 million in 1980, with the possibility of reaching 140-150 million by the year 2000. It was estimated that Poland's energy demand would rise from 142.3

---

[6] V P Maksakovskii "K voprosu o tempakh rosta proizvodstva i potrebleniya topliva v sotsialisticheskikh stranakh" Voprosy ekonomicheskoi geografii, Moscow 1970, p.94, cited in the author's work "Toplivnaya promyshlennost' sotsialisticheskikh stran Evropy" Moscow Nedra 1975, p.22. (The balance of 6.2 per cent (9.3 billion tonnes) is the Yugoslav share.)

million tonnes of standard fuel in 1970 to 181-183 million in 1980, whereas in the case of Romania the corresponding rise would be from 78-80 million tonnes to 96-98 million, during which time her status as a net exporter of energy would be altered to that of 80 per cent self-sufficiency. Czechoslovakia was expected to record growth in energy consumption from 90.6 million tonnes of standard fuel in 1970 to 112 million in 1980 with the likelihood that this would reach 149 million in 1990 and 205 million in the year 2000. It was estimated that Czechoslovakia's dependence on imported energy would rise from 20 per cent in 1970 to 40 per cent in 1980.[7]

In the early seventies Eastern European analysts and planners anticipated that the trend from consumption of solid fuels and hydroelectricity towards oil and gas would continue to 1980, along with a relatively minor contribution from nuclear power. However the anomalous position of Romania, where the share of the energy balance held by oil and gas was expected to decline, calls for comment. The development of the oil and gas industries of Romania commenced at a relatively early stage with the result that by 1950 these two fuels accounted for some 75 per

---

[7](i) A Alekseev, Yu Savenko "Ekonomicheskaya integratsiya v razvitii toplivno-energeticheskikh otraslei stran-chlenov SEV" Voprosy ekonomiki 1971 No. 12, pp.49-52.

(ii) S M Lisichkin "Energeticheskie resursy i neftegazovaya promyshlennost' mira" Moscow Nedra 1974, pp.58, 64, 70.

(iii) V P Maksakovskii "Toplivnaya promyshlennost' sotsialisticheskikh stran Evropy" Moscow Nedra 1975, pp.23-26.

cent of Romanian energy consumption.[8] By 1970 the rate of growth of production of each fuel had declined, especially that of oil, whereas plans for the further rapid development of the economy still required an increasing supply of energy. Accordingly it was realised that alternative energy resources would have to be exploited, including the use of nuclear fuels. In addition it was appreciated that the domestic coal industry would have to maintain, and even possibly expand, its share of the energy balance, if necessary supplemented by increased imports.

The formation of energy policy in Comecon is presented by Soviet and East European analysts as an example of integrated planning and production specialisation: however because of the very distribution of energy reserves the Soviet Union plays the leading role. At the outset of the 1971-1975 Plan period the problems surrounding the provision of oil and gas in Eastern Europe were seen to be threefold. Firstly the inevitability of increased imports by Eastern Europe (Romania excepted) from the Soviet Union would have to be facilitated by the expansion of the trans-Comecon 'Druzhba' pipeline, involving the commissioning of a second line parallel to the original, whose Northern branch would supply Poland, and the GDR, the Southern branch Czechoslovakia and Hungary. Oil deliveries to Bulgaria would continue to be made by tanker via the Black Sea. It was intended to increase the share of natural gas in the Eastern European energy

---

[8] V P Maksakovskii "Toplivnye resursy sotsialisticheskikh stran Evropy" Moscow Nedra 1968, p.10.

balance by extending the 'Bratstvo' pipeline, by which Poland and Czechoslovakia had been supplied since 1967. Plans provided for the extension of this pipeline such that deliveries to the GDR via the trans-Polish branch and to Hungary and Bulgaria via a new southern branch could commence in 1974.[9]

Secondly the Soviet Union was viewed by the Eastern European countries as the prime agent in assisting them to develop such resources of oil and gas as they had through the provision and exchange of technical expertise and, where appropriate, of basic production equipment.[10] In 1969 it was estimated by the East German analyst W Siegert that by taking into account trends in economic growth in Eastern Europe the demand for Soviet oil in each of the Eastern European countries in 1980 (Romania again excepted) would have risen to twice the 1970 level.[11] A level of production in the Soviet Union of 600 to 700 million tonnes was forecast, and aggregate demand in Eastern Europe minus Romania was put at 80 to 100 million tonnes.[12] The question of the role of gas exports and their substituting effect on the pattern of oil exports is not discussed in Siegert's analysis: however at the time it was already possible to detect

---

[9] E Taeschner "Tendenzen und Probleme der Energiewirtschaft der RGW-Länder" Zeitschrift für den Erdkundeunterricht 1970 No. 6, p.218.

[10] ibid. p.219.

[11] W Siegert "Die wirtschaftliche Bedeutung des Erdöls sowie Fragen des Erdölbedarfs und der Erdölbereitstellung in den sozialistischen Ländern Europas" Energieanwendung 1969 No. 7, p.168.

[12] ibid.

a change in attitude on the Soviet part towards developing the gas industry rapidly not only as a contributor to the domestic energy balance but also as an export fuel to complement oil and refined products, given the increasing difficulties of maintaining rates of growth in oil production.

The third problem was seen to be that of optimising the investment pattern for the bloc's fuel industries, and allied with this the extension of trading credits and appropriate bilateral arrangements facilitating Soviet supply. The issue of investment is regarded as being a problem of scale and length of the recoupment period.[13] Investment plans in the fuel-producing countries are generally taut, with competition for resources from a number of enterprises.[14] From the Soviet point of view a function of joint investment should be that of spreading the risk that inevitably accompanies exploration in the fuels industries, particularly in oil and gas: from the point of view of the Eastern European countries the major consideration is the comparative efficiency of investment in assisting the expansion of the Soviet fuels industries versus the immediate alternative of directing available funds into the development of domestic resources.

A later analysis advocated a three-dimensional approach to energy planning for the bloc as a whole. Firstly it was suggested

---

[13] Kozlov, Shmakova op.cit. p.79.

[14] A Zubkov "Osobennosti mezhdunarodnoi kontsentratsii investitsii pri reshenii toplivno-syr'evoi problemy stran SEV" Voprosy ekonomiki 1972 No. 9, p.77.

that considerable scope existed for improving energy conversion efficiency; secondly, perhaps recognising the growing difficulties in energy production in the Soviet Union and their long-term implications, the need to accelerate the development of indigenous energy reserves was stressed; thirdly it was felt that the energy-intensity of the Eastern European economies could be lowered by improvements in inter-branch planning so as to reduce the material-intensity of production and hence energy intensity.[15] By the end of the 1971-1975 plan period it was admitted that attempts at securing energy autarchy would not solve the problem of energy provision: increased trade outside the bloc would have to be negotiated.[16]

From the 9th to the 12th of December 1975 a symposium of energy economists from the member-countries of Comecon was convened in Moscow to discuss the above questions. The broad conclusions of the symposium were that total energy demand might be higher than previously estimated. Soviet exports indicated that an aggregate demand of 780 million tonnes of standard fuel in the full and associate member-countries (i.e. including Cuba, Mongolia and Yugoslavia), minus the Soviet Union, was possible by 1980, rising to over 1 billion by 1990. They advanced the view that the level of self-sufficiency in the aforementioned group of countries would decline from 70 per cent in 1975 to

---

[15] Ufer op.cit. pp.1134-1135, 1137.

[16] (i) A I Zubkov "SSSR i reshenie toplivno-energeticheskoi i syr'evoi problemy v stranakh SEV" Istoriya SSSR Jan/Feb 1976, p.58.

(ii) N I Zakhmatov, S S Yakushin "Sotrudnichestvo stran-

50 per cent by 1990 and that the import of energy resources of all types would increase threefold.[17]

The concensus of the symposium on the optimal pattern of development of the Comecon energy balance was that a rapid programme of investment in nuclear power ought to be undertaken, but accepting that this could not be expected to make a significant contribution before the 1980s. Two elements of policy were highlighted as being particularly relevant to the short-term problem, namely that a target of 20 per cent improvement in conversion efficiency over 1975 levels could be achieved economically and that this process could be supported by a more critical attitude to the location and expansion of energy-intensive industry itself in relation to existing and anticipated fuel supply.[18] Very significantly, it was felt that the prospects for increasing imports of oil from OPEC producers to alleviate the tight supply position were limited: it was concluded that a maximum of 30 million tonnes of OPEC oil at an estimated cost of 2 billion rubles could be contemplated by 1980.[19]

The impression gained from studying Soviet and Eastern European discussions of energy questions is that planners and analysts admit the existence of a number of interacting problems, which whilst causing a measure of concern have not reached such

---

chlenov SEV v reshenii toplivno-syr'evykh problem" Izvestiya AN SSSR Ser. ekon. 1976 No 4, p.158.

[17] Zakhmatov, Yakushin op. cit. p.156.

[18] ibid. pp.157-158.

[19] ibid. p.158.

proportions as to constitute a Comecon 'energy crisis'. However a different range of conclusions emerges from a number of Western analyses of energy development in Comecon, written in the late sixties and early seventies.

In a study written in 1969 the American analyst Jaroslav Polach, taking into account the changing trends in consumption of individual fuels and in general conversion efficiency, concluded that in 1980 Eastern Europe (in this instance including Albania and Yugoslavia) would face an energy deficit of 150 to 165 million tonnes of standard fuel, of which oil might account for 130 million, this being 100 million tonnes' actual production. If the Soviet Union were to supply this requirement it would account for 16 to 18 per cent of production in 1980, this put by Polach at 550 to 600 million tonnes.[20]

In Polach's view the supply of this quantity would seriously impair Soviet plans for economic growth. Therefore the obvious alternative is considered to be that of increased imports from other oil producers. This, he maintains, would give rise to two problems: firstly, it might hinder the overall process of economic integration within the bloc, which was seen as an increasingly desirable objective, and secondly the necessity of paying for such imports partly in hard currencies might necessitate the liberalisation of trade between Eastern Europe and the rest of the world, an eventuality which might work to the

---

[20] J G Polach "The Development of Energy in East Europe", in 'Economic Problems in Countries of Eastern Europe' Washington D C: US Congress, Joint Economic Committee 1970, p.411.

disadvantage of the Soviet Union in that she might then have to compete for the output of Eastern European industry. Polach advances a further alternative, - in his view the likely one, - namely that the Soviet Union would seek to strengthen her hold on the fuel surplus of the Middle East as an interim measure, until the development of Siberia was further advanced, thus maintaining control of her fuel exports to Eastern Europe without having to curtail domestic demand or exports to the West.[21] Despite the theoretical logic of such a policy, Polach does not assess its feasibility. At the time of Polach's writing the decision-making process determining price and output of Middle East oil was still was still under the control of the major oil companies, operating in various groupings as producer companies. At a time when there was still a strong belief in the West that Soviet oil policy had as an objective the maintenance of as high a level of exports as possible in order to gain increasing influence in the world market, the question of these companies' willingness to produce on behalf of Arab countries quantities of oil which, once under Soviet control, might find their way on to the Western European market, eroding the prevailing market price, as had been the case during the sixties when the Soviet Union sought re-entry into export markets, has been overlooked by Polach. For reasons already outlined the companies sought to pursue a strategy aimed at hardening prices in Western Europe.

---

[21] ibid. p.412.

In another article written in 1969 the American analyst Stanislaw Wasowski addresses himself to the question of the imminent oil deficit in Eastern Europe.[22] Wasowski bases his projection of energy demand on a projection of an energy/GNP elasticity coefficient, including an adjustment for the assumed substitution effect of oil for solid fuels. A further assumption is that natural gas would not make any impact on the Eastern European energy balance. In the case of oil demand he analyses the growth trend and planned development of those sectors of the economies in which oil has no ready substitute, citing transport and petrochemicals specifically.* Wasowski's conclusion is that the demand for oil in Eastern Europe in 1980 could be expected to rise to 190 million tonnes.[23] He expresses the view that indigenous production of oil will be insignificant, that nuclear power will make no contribution by this time and that the solution will be found in Eastern Europe's negotiating supply on the basis of barter trade with Middle East producers.[24] However similar constraints would apply in the case of supply to Eastern Europe as to the Soviet Union.

A somewhat different approach was taken by the German analyst Werner Bröll, writing at about the same time as the

---

[22] S Wasowski "The Fuel Situation in Eastern Europe" Soviet Studies July 1969, pp.35-51.

[23] ibid. p.41.

[24] ibid. pp.50-51.

*Note however that the petrochemical industry had been designated a priority sector for the supply of gas.

previous two analyses.[25] Projecting a calculation of per capita energy consumption, he arrives at a broadly similar conclusion to that reached by Wasowski, namely that Eastern Europe will face an oil deficit of 140 million tonnes by 1980, this representing demand of 170 million less indigenous production of 30 million.[26] In contrast to the aforementioned analyses Bröll does qualify his estimate by stating that the rapidly developing gas industry of the Soviet Union, and to a limited extent that of Eastern Europe itself, could in the medium term alleviate the problems of energy supply by substituting in certain end-uses for which oil was currently preferred.[27]

By 1973 it was realised that extrapolation of trends relating historical energy consumption to industrial growth rates or of per capita energy consumption were inaccurate even in the short term, since there were no signs of an increase in Eastern Europe's non-Soviet oil imports that might suggest eventual levels predicted in earlier analyses. However the prevailing view was that Eastern Europe would face an oil deficit. Writing in mid-1973,[28] Sabine Baufeldt took the view that previous analyses had overestimated energy demand, underestimated supply and ignored the emergent role of gas, but nonetheless predicted an oil deficit of 100 million tonnes by 1980, putting demant at 120

---

[25] W Bröll "Die energetische Integration des RGW-Raumes" Osteuropa Wirtschaft March 1968, pp.26-49.

[26] ibid. p.35.

[27] ibid. p.39.

[28] S Baufeldt "Die künftige Erdöllucke im RGW vor dem Hintergrund des sowjetischen Engagements in Nah-Mittel-Ost" Osteurope Wirtschaft June 1973, pp.35-54.

million and indigenous supply at 20 million.[29] She likewise stresses that the capacity of Eastern Europe to increase indigenous production of oil was limited and that the short-term solution to the problem was to diversify the source of supply to include purchases from the Middle East.[30]

If during the early seventies Western perceptions of Eastern Europe's need to negotiate for supplies of oil from Middle East producers differed only in conclusions about the amount that would be involved, the events of 1973-1974 changed this perspective considerably. Such is the theme of a Japanese analysis of the Eastern European energy problem written after the effect of OPEC's price rises had begun to be felt.[31] Kazuo Ogawa points to the benefits offered by the "energy crisis" and oil price rises to the energy- and chemical-exporting members of Comecon (the Soviet Union, Poland and Romania), and contrasts the situation of other members of the bloc.[32] He stresses that whereas the OPEC price rises afforded the Soviet Union the opportunity of raising the intra-Comecon prices of crude oil and refined products the impact on Eastern Europe was to reverse the trend of "weaning" from the Soviet Union which had commenced in the late sixties and which was expected in some quarters to continue, and to inject

---

[29] ibid. p.44.

[30] ibid. p.45.

[31] K Ogawa "Economic Conditions in Eastern Europe and Energy Problem" Chemical Economy and Engineering Review November 1975, pp.12-18.

[32] ibid. pp.14-15.

greater urgency into Eastern Europe's development of indigenous reserves.[33] Ogawa points to a further aspect of the impact of the OPEC price rises and the Soviet Union's difficulties in increasing oil deliveries, namely the re-evaluation and emergence of natural gas, which could become the Soviet Union's preferred export fuel for Eastern Europe.[34]

A somewhat more bleak analysis was carried out by the Canadian researchers B Korda and I Moravcik in 1976,[35] starting from the standpoint that the prevalent features of Eastern European energy planning are intrinsic disunity in the bloc[36] and the propensity of the economic system itself to cause wastage of raw materials and energy.[37] Korda and Moravcik prescribe five elements of strategy for dealing with the problem of energy supply: development of alternative energy forms, increased intra-Comecon trade in all forms of energy materials, increased imports from outside Comecon, expansion of indigenous production and more stringent energy conservation,[38] in short a listing of all the possibilities. The nature of the problem is viewed as having four distinct features; firstly that indigenous energy reserves are insufficient even if fully

---

[33] ibid. p.18.

[34] ibid.

[35] B Korda, I Moravcik "The Energy Problem in Eastern Europe and the Soviet Union" Canadian Slavonic Papers 1976, No. 3, pp.1-14.

[36] ibid. p.2.

[37] ibid. pp.6-7.

[38] ibid. p.9.

developed, secondly that the current energy mix is unfavourable, thirdly that energy consumption is excessive and fourthly that Eastern Europe lacks the means of acquiring the hard currencies that would be necessary for imports of fuels from non-Comecon sources.[39] The authors' view is that political expediency (undefined) rather than economic efficiency is likely to be the factor determining the nature of energy development, this being manifest in the Soviet Union's willingness to sustain economic loss in order to maintain through the continued status of principal energy supplier within Comecon her dominance in the political scene. However no indication is given by the authors as to how such a policy would be expressed in the resultant fuel balance and import structure of the bloc.

There has been and remains considerable scope for debate as to options and likely outcomes of the range of policies suggested. In order to analyse the contribution of the oil and gas industries of Eastern Europe to their countries' energy balance account must be taken of the state of development of these industries at the end of 1975 and to outline the immediate problems faced by planners at the outset of the 1976-1980 period.

The fundamental features of the development of the Eastern European energy balance are that changes in fuel consumption to favour use of the more efficient fuels, oil and gas, have taken place at a later stage than in the Soviet Union in all countries

---

[39] ibid. p.14.

except Romania, and that there has been a widening gulf between the consumption and production balance. By 1973 production of oil in Eastern Europe totalled 22.6 million tonnes, of gas 49.5 billion cubic metres, these figures representing 1 and 4 per cent of world production respectively. In both the oil and gas industries in Eastern Europe there has been considerable difficulty in proving reserves even though sizable proportions of the land-mass are considered to be potential oil- and gas-bearing areas, as detailed in table 4.4.

During the sixties the rate of discovery of oil reserves in Hungary enabled planners to conclude that oil production levels could be maintained. In Poland, Czechoslovakia and the GDR the declining ratio of oil reserves to production prevented plans for expansion and it was felt from the early seventies that Romania might also face this problem.[40] As in the case of the Soviet Union, data on reserves are sparse. Lisichkin gives no indication of the level of reserves in Poland, the GDR and Bulgaria; however he puts the level of proven oil reserves in Romania at 130 million tonnes,[41] and in the case of Czechoslovakia and Hungary confines himself to the statement that reserves are "insignificant".[42] Maksakovskii is more forthcoming with data

---

[40]Maksakovskii "Toplivnaya promyshlennost'..." (1975), pp.139-140.

[41]Note that Lisichkin's classification of reserves might not conform to the Soviet and Eastern European standard. He uses the term "validated" ('dostoverennye'), whereas the standard term is "proven/explored" ('razvedannye'). It is likely that Lisichkin's figures include reserves in the C2 category.

[42]Lisichkin op.cit. pp.63, 93, 103.

TABLE 4.4. Potential Hydrocarbon Bearing Area in Eastern Europe (thousand square kilometres)

Country	Total Area	Potential Hydrocarbon Bearing Area	% of Total Area
Poland	312.5	255	81.2
GDR	108.3	63	58.2
Czechoslovakia	127.9	36	28.1
Hungary	93.0	74	79.6
Romania	237.5	150	63.2
Bulgaria	110.9	48	43.3
Total	990.1	626	63.2

Source: V P Maksakovskii "Toplivnye resursy sotsialisticheskikh stran Evropy" Moscow Nedra 1968, p.21.

on oil reserves, all of which relate to the categories A+B+C1, but which are calculated from information compiled in 1967. He puts Polish reserves at 8 million tonnes, those of the GDR at 1.5 million, of Czechoslovakia at 1.7, Romania at 100 and Bulgaria at 2.1: his figure for Hungary is that for total ultimate reserves, and this is put at 36.8 million tonnes.[43]

Lisichkin is likewise sparing in his data on gas reserves. He puts the Hungarian total in the categories A+B+C1 at 115 billion cubic metres,[44] gives no data for Poland, Czechoslovakia, Romania and Bulgaria, and views any estimate of reserves in the GDR as premature due to late commencement of exploration there.[45]

---

[43] Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.129.

[44] Lisichkin op.cit. p.63.

[45] ibid. p.70.

For his part Maksakovskii, again relying on 1967 data, puts Polish gas reserves in the aforementioned categories at 200 billion cubic metres, those of Czechoslovakia at 13 billion cubic metres, those of Czechoslovakia at 13 billion, with the likelihood of a further 13 billion in the category C2, of Hungary at 100 billion and of Romania at 212 billion.[46] He likewise offers no data on gas reserves in Bulgaria and the GDR.

There exists a number of Western estimates of Eastern European oil and gas reserves, based mainly on United Nations and OECD data. The range of estimates made by Western analysts is detailed in table 4.5. The striking features of these analyses are the extent of disparity amongst themselves and their divergence from the aforementioned Soviet estimates. Polach rightly points to the Comecon practice of evaluating reserves on the basis of geological surveys and production technology existing at the time of the evaluation, a method which ignores the potentially modifying influence of prices of alternative fuels on production levels.[47] Thus what would be defined as recoverable in a Comecon estimate differs from the conclusion that would be reached in evaluating the potential of a Western hydrocarbon province, when likely forward trading prices on the Rotterdam market would be taken into account. Moreover whereas the former system of estimation is subject to

---

[46] Maksakovskii "Toplivnaya promyshlennost'..." (1975), pp.179, 189, 191, 195.

[47] Polach op.cit. p.379.

TABLE 4.5. Western Estimates of Eastern European Oil and Gas Reserves
(Oil - million tonnes, gas - billion cubic metres)

Country	A		B		C	
	Oil	Gas	Oil	Gas	Oil	Gas
Bulgaria	7.1	25-30	38	31	5	25
Hungary	21.8	24-50	37	119	20	100
GDR	1.0	5.0	2	14	1	100
Poland	3.6	5-46	8	90	5	130
Romania	158.6	200-246	100	250	165	250
Czechoslovakia	1.9	15.0	2	11	2	15

Sources: A. J G Polach "The Development of Energy in East Europe", in 'Economic Development in Countries of Eastern Europe', Washington D C: US Congress, Joint Economic Committee 1970, pp.376-377.

B. J Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104), Berlin: Duncker & Humblot 1975, pp.85, 88.

C. J R Lee "Petroleum Supply Problems in Eastern Europe", in 'Reorientation and Commercial Relations of the Economies of Eastern Europe' Washington D C: US Congress Joint Economic Committee 1974, p.408.

revision only in the light of improvements in survey and production techniques, the latter would in addition be influenced by periodic re-evaluation of the forward price. In short, the problem presented in Western analysis is that of obscurity of definition of the basis for evaluation with the result that it is not possible to gauge the extent of consistency with or divergence from the standard Comecon system of reserve classification.

For the purposes of the present study the relevance of the reserve position is the extent to which its perception by Comecon planners influences energy planning as a whole and the development of the indigenous oil and gas industry in particular. On balance it can be said that the available reserves of energy, unevenly distributed in Eastern Europe, allow very little flexibility in planning at a time when the problem of increasing the contribution of indigenous production to the changing energy balance has become more urgent.

The Eastern European Oil and Gas Industries to 1975.

Table 4.6. details the production of major fuels in Eastern Europe from 1971 to 1975. Examination of the trends in hydrocarbon fuels reveals that only in the case of Romanian gas has there been significant growth during this period, the remainder of the countries showing minor gains or losses on generally low levels of production. At the outset of the 1971-1975 plan period decisions were taken that provided for a growing share of

TABLE 4.6. Eastern European Production of Major Fuels 1971-1975

Country	Year	Oil ('000 tonnes)	Nat. Gas (M cubic metres)	Hard Coal ('000 tonnes)	Brown Coal ('000 tonnes)
Bulgaria	1971	305	327	389	26620
	1972	249	221	384	26893
	1973	190	222	351	26459
	1974	144	180	307	23998
	1975	122	111	330	27515
Hungary	1971	1955	3705	3941	23484
	1972	1977	4110	3671	22171
	1973	1989	4821	3410	23371
	1974	1997	5101	3209	22552
	1975	2006	5175	3021	21867
GDR	1971	<100	2853	857	262814
	1972	<100	5055	815	248416
	1973	<100	7012	753	246245
	1974	<100	7732	594	243468
	1975	100	9000	539	246706
Poland	1971	395	5164	145491	34517
	1972	347	5601	150697	38221
	1973	392	5811	156630	39215
	1974	550	5528	162202	39826
	1975	553	5776	171625	39865
Romania	1971	13793	25605	6793	13808
	1972	14128	26552	6612	16547
	1973	14287	28005	7172	17679
	1974	14486	28852	7109	19789
	1975	14590	31570	7320	19771
Czechoslovakia	1971	194	1222	28818	84162
	1972	191	1163	27925	84930
	1973	171	1042	27779	81249
	1974	149	976	27972	82165
	1975	142	929	28819	86272

Sources: Statisticheskii ezhegodnik stran-chlenov SEV 1976, pp.77-78.

United Nations Statistical Yearbook 1975, pp.191, 193. (GDR oil and gas production, not reported in Comecon or own statistical yearbook.)

J. Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin: Duncker and Humblot 1975, pp.87, 90.

oil and gas within the energy balance of each of the member-countries: however the effect of price rises for oil imported from the Middle East and, from 1st January 1975 from the Soviet Union, have prompted Eastern European planners to look more closely at the possibilities of raising indigenous production of oil and gas.

BULGARIA

Bulgaria is exceptionally poorly endowed with energy resources. According to a 1968 estimate some 82 per cent of energy reserves consist of brown coal, of which two thirds are concentrated in the Marbak-Iztok area: such reserves of hard coal as do exist are said to be insignificant.[48] The trend anticipated in 1970 for the Bulgarian energy balance to 1980 is detailed in table 4.7., and is based on the expectation of increasing imports of oil and gas. It was estimated that demand for oil would rise to 18-20 million tonnes and, calculations from data in table 4.8. suggest that gas demand in 1980 would be of the order of 8 billion cubic metres.[49]

The first significant discovery of oil in Bulgaria was that of the Tyulen field in 1954. Its reserves, estimated at 3.5 million tonnes, were exploited rapidly and the field reached peak production in 1957, since when it has showed a gradual decline.

---

[48] T Khristov "Novi tendentsii v razvitieto na energetikata v Bolgariya" Geografiya (Sofiya) 1970, No. 8, p.1.

[49] ibid. p.2.

TABLE 4.7. Bulgarian Energy Balance 1960-1980 Estimated in 1970 (%)

Fuel	1960	1970	1980
Solid Fuel, All Types	81.6	53.1	29.6
Oil	16.0	43.3	49.0
Gas	-	2.5	16.4
Other (Hydro & Nuclear)	2.4	1.1	5.0

Source: T Khristov "Novi tendentsii v razvitieto na energetikata v Bolgariya" Geografiya (Sofiya) 1970 No. 8, p.2.

In the early sixties the Gigen and Dolnyi-Dybnik fields were discovered, the former yielding a heavy, viscous crude oil, the latter a light type. By the late sixties the Gornyi-Dybnik field had been added, and a single gas condensate field, the Chiren, was discovered in 1963.[50] Oil refining became concentrated in two complexes, at Pleven and Burgas. The crude oil distillation capacity at Burgas in 1971 was 7 million tonnes per annum, and this was scheduled to rise to 12-13 million by 1975,

---

[50](i) Maksakovskii "Toplivnye resursy..." (1968), pp.135-137.
(ii) Lisichkin op.cit. pp.60-61.

The two major crude oils available in Bulgaria, Tyulen and Dolno-Dybin, balance each other conveniently. Tyulen is a heavy, viscous oil of low sulphur content, and used primarily for the production of fuel oil, bitumen and lubricants. Dolno-Dybin is light, and yields gasoline, kerosene, middle distillates and naphtha. See V Marinov "Razvitie na nashata neftodobivna i neftoprerabotvashcha promishlenost" Planovo stopanstvo 1968 No. 7, p.56.

with the prospect of further expansion to 18-20 million by 1980.[51] The relative scarcity of domestic reserves of oil prompted Bulgarian planners to consider critically the uses to which refined products were put. In particular evaluation of the role of fuel oil in relation to coal illustrates planners' appreciation of the importance of maximising the output of light products. Up to the early sixties practically all of Bulgaria's gasoline and kerosene requirement was imported, mainly from the USSR and to a lesser extent from Romania. The bulk of the output of domestic refineries consisted of middle distillates and fuel oil. By the late sixties it was intended to raise the production of gasoline within total refinery output from zero (1958) to 20.5 per cent by 1975 and middle distillates from 22.5 to 28.2 per cent in the same period, counterbalanced by a fall in the fuel oil share from 51.8 to 45.8 per cent. Balancing imports of refined products would evidence a relative decline in two former product groups and increase in the latter, but within a smaller total product import requirement.[52]

Discovery in the early fifties of five gasfields during exploration for oil gave some cause for optimism about further development in Bulgaria. However the Chiren gas condensate deposit was not brought into production until 1965. Chiren gas was found to have a particularly high methane content (92 per

---

[51] K F Schappelwein "Die Energiewirtschaft der VR Bulgarien" Osteuropa Wirtschaft 1974 No. 1, p.52.

[52] Marinov op.cit. pp.78-80.

cent), little impurity and an associated yield of 50 cubic centimetres of low octane condensate per thousand cubic metres' gas production, usable either in the manufacture of gasoline or as petrochemical feedstock.[53] On the basis of the availability of methand and condensate from the Chiren deposit it was decided to construct a petrochemical complex at Vratsa. In 1969 the Devetash gas field was discovered. Its gas was found to contain 60-80 per cent methane, with an associated yield of 150 cubic centimetres of condensate per thousand cubic metres of gas. As a result of this discovery it was estimated that reserves in the categories A+B+C1 could be expected to rise to between 10 and 15 billion cubic metres by 1975, and that a production level of 1 billion cubic metres could be sustained, resulting in an increasing share of indigenous gas in the energy balance. It was thought likely in 1970 that oil and gas, accounting for 42 per cent of the Bulgarian energy balance in 1968, would rise to 60 per cent in 1975, with the prospect of attaining 65-70 per cent in 1980.[54] However the Bulgarian gas industry has experienced rapid depletion during the 1971-1975 period, reflected in turn in declining production, and the long-term position of gas in the energy balance is acknowledged to depend on supply from the Soviet Union, facilitated by Bulgarian provision of equipment and manpower in joint projects.

---

[53] G Pavlov "Gazovaya promyshlennost' Bolgarii" Gazovaya promyshlennost' 1970 No. 5, p.7.

[54] ibid. p.8.

The effect of increased availability of gas has been that of hastening the move away from fuel oil and of complementing the use of coal in energy-intensive industries such as metallurgy and power generation.[55] During the 1971-1975 Bulgarian Plan indigenous coal was directed for the most part into the fuelling of power stations, this sector accounting for approximately 75 per cent of coal consumption, and it was felt at the end of the Plan that reserves were still adequate to increase coal utilisation in this outlet.[56] In contrast the discovery of new reserves of oil and gas in this period was well behind the increase in their consumption, and in view of the declining production of each, increased import dependency was acknowledged as inevitable.[57] The balance between indigenous production of oil and gas and quantities supplied for consumption from 1971 to 1975 is detailed in table 4.8. It can be seen that the total available for 1975 is below that for 1974, evidencing the effect of conservation measures introduced after the Soviet Union's doubling of oil prices in February 1975, and reflecting a generally pessimistic outlook for the oil and gas industries.

---

[55] ibid. p.9.

[56] I Kondov et al. "Razshiryavaneto na energiinata baza i rastezhot na neinata efektivnost" Planovo stopanstvo 1976 No. 2, p.36.

[57] ibid. p.37.

TABLE 4.8. Availability of Oil and Natural Gas in Bulgaria 1971-1975

A. Oil ('000 tonnes)

	1971	1972	1973	1974	1975
Indigenous Production	305	249	190	144	122
Imports	7547	8279	9652	10629	10459
Availability	7842	8518	9742	10763	10581
Import Dependency (%)	96.2	97.2	99.1	98.8	98.8

Source: Statisticheskii ezhegodnik stran-chlenov SEV 1976, pp.78, 354.

B. Gas (M cubic metres)

	1971	1972	1973	1974	1975
Indigenous Production	327	221	222	180	111
Imports	-	-	-	307	1185
Availability	327	221	222	487	1296
Import Dependency (%)	-	-	-	63.0	91.4

Sources: Statisticheskii ezhegodnik stran-chlenov SEV 1976, p.78.
Vneshnyaya torgovlya SSSR 1975, p.121.

HUNGARY

It is revealing to compare two estimates of the development of the Hungarian energy balance, one written in July 1970, the other in October 1976. Despite the substantial increases in the price of imported oil between the times of the estimates, and the logistic difficulties faced by the Soviet Union, Hungary's principal oil supplier, the two estimates assign only slightly differing shares to each fuel, as shown in table 4.9.

One of the factors that influences this is that Hungary, whilst having no prolific reserves of any one fuel, has limited reserves of each, enabling planners to enjoy some measure of short-term flexibility. Lisichkin estimates that Hungary would have 55 per cent self-sufficiency in energy in 1975 and that this would be not less than 50 per cent in 1980.[58]

In the sixties there were a number of discoveries of oil and gas in Hungary, including the relatively large Aldyo field, whose annual production of 1 million tonnes of oil and 2 billion cubic metres of gas was felt to be sustainable for 20 to 30 years. In 1974 there was a total of 34 producing oilfields in Hungary.[59] In 1970 there were 5 refineries in operation, the most complex being the integrated petroleum and petrochemical plant at Sazhalombatta, whose capacity was planned to reach 6 million tonnes per annum in 1975. The other major refinery is situated at Leninvaros, where capacity of 6 million tonnes per year is planned for 1980. Total

---

[58] Lisichkin op.cit. p.65.

[59] ibid. p.66.

TABLE 4.9. Analysis of Hungarian Energy Balance 1965-1980 (%)

Fuel	1965A	1970A	1970B	1975A	1975B	1980A	1980B
Coal	66.7	48.9	50.0	37.9	36.0	27.1	27.0
Oil	21.4	29.9	43.0	32.4	57.0	39.4	65.0
Gas	6.1	13.3		21.6		22.2	
Other	5.8	7.9	7.0	8.1	7.0	11.3	8.0

Sources: A. J Kalman Joó "Wärmeversorgung von Städten in der Ungarischen Volksrepublik" Energietechnik 1970 No. 7, p.322.

B. V. Zurbuchen "Die 5 Fünfjahrplan der Ungarischen Volksrepublik 1976 bis 1980" Wirtschaftswissenschaft 1976 No. 10, p.1325.

Hungarian capacity is scheduled to rise from 10 million tonnes per annum in 1975 to 16 million in 1980.[60]

On the other hand the Hungarian gas industry has shown a substantial degree of growth during the 1971-1975 Plan, when an increase of 49 per cent was recorded in 1975 over the 1970 level. The additional presence of the Soviet Union as a gas supplier will be felt after 1978, when the major pipeline from the Orenburg gas field is extended into Hungary. The availability of oil and gas in Hungary in the period from 1971 to 1975 is detailed in table 4.10.

Despite continued direction of capital and human resources into exploratory work in the oil and gas sectors the prevailing view at the outset of the 1971-1975 Plan was that Hungarian oil production would peak at around 2 million tonnes per annum and gas production at a little over 6 billion cubic metres, and that without further discoveries of the size of the Aldyo field production of each might start to decline by 1980. At the same time however forward estimates for 1975 demand indicated a requirement of 10 million tonnes of oil and 7 billion cubic metres of gas, with the expectation that the rising trend would continue.[61]

A significant feature of the Hungarian oil and gas industries is that a level of capital investment in oil and gas development

---

[60] Maksakovskii "Toplivnaya promyshlennost'..." (1975), pp.165-166.

[61] V Bese "Hungary's Mineral Oil and Gas Industry" Marketing in Hungary 1971 No. 4, p.10.

TABLE 4.10. Availability of Oil and Natural Gas in Hungary 1971-1975

A. Oil ('000 tonnes)

	1971	1972	1973	1974	1975
Indigenous Production	1955	1977	1989	1997	2006
Imports	4892	6065	6555	6817	8432
Availability	6847	8042	8544	8814	10438
Import Dependency (%)	71.4	75.4	76.7	77.3	80.8

B. Gas (M cubic metres)

	1971	1972	1973	1974	1975
Indigenous Production	3705	4110	4821	5101	5175
Imports	208	200	200	200	806
Availability	3913	4310	5021	5301	5981
Import Dependency (%)	5.3	4.6	4.0	3.8	13.5

Source: Statisticheskii ezhegodnik stran-chlenov SEV 1976, pp.78, 363.

some 23 billion forints (60 per cent) higher in 1971-1975 than in the previous five year period did not avert a decline in oil production, but brought about a rapid rise in gas production.[62] The gas industry has therefore come to be regarded as the most promising of the fuels industries for future development.

The inevitability of increasing imports of oil not only from the Soviet Union but from OPEC producers prompted Hungary to agree to collaborate with Yugoslavia and Czechoslovakia in the 'Adria' pipeline project (see Appendix A) facilitating the supply of oil from Kuwait. The agreement was reached before the price rises of 1973-1974, when it was envisaged that OPEC oil might account for 10-12 per cent of Hungary's oil demand.[63] So high a level is now thought unlikely, and Hungary came to view the Soviet Union as much preferred supplier.[64] Additionally it was decided towards the end of the 1971-1975 Plan to attempt to arrest the declining trend in domestic production of coal,[65] this helping to compensate for the likelihood of static oil production at approximately 2 million tonnes per annum during the 1976-1980 period, of which half would be provided by a single field, the Aldyo.[66]

As in the Soviet Union the relatively late development of the gas industry and prospects for its further development have

---

[62]Lisichkin op.cit. p.67.

[63]Népszabadság 10 January 1974, p.1.

[64]Népszabadság 8 February 1974, p.4.

[65]Népszabadság 19 March 1975, pp.6-7.

[66]Maksakovskii "Toplivnaya promyshlennost'..." (1975), pp.150-151.

meant that there was some scope for alleviating the worsening balance of supply and demand for oil. In 1970 it was estimated that demand for gas would rise to 8-9 billion cubic metres by 1980.[67] Bearing in mind increasing domestic production and greater delivery capacity for Soviet gas, scheduled to become operational in 1978, this figure could well be exceeded. Whereas during the sixties gas was directed to the petrochemical sector and to selected branches of industry, its use as a domestic fuel increased during the 1971-1975 period, and this trend is expected to continue.[68] According to a recent Hungarian source the emergence of gas within the energy balance from 1971 to 1975 has had the effect of substituting for the import of some 600 thousand tonnes of oil.[69]

The GDR

The energy sector of the GDR economy has been and remains predominantly based on production and utilisation of brown coal. Ultimate reserves of this fuel are put at 49 billion tonnes, of which 25 billion are amenable to open-cast mining. Some 60 per cent of brown coal reserves are concentrated in deposits whose individual potential runs to over 200 million tonnes. The basic disadvantages of brown coal are its low calorific value by

---

[67] T Garai "Razvitie gazovoi promyshlennosti Vengrii" Gazovaya promyshlennost' 1970 No. 5, p.10.

[68] Maksakovskii "Toplivnaya promyshlennost'..." (1975), pp.193-194.

[69] Marketing in Hungary 1977 No. 3, p.2.

weight (on average 2000 to 2800 kilocalories per tonne, or approximately half that of hard coal), and high moisture content, ranging from 45 to 65 per cent. Reserves of hard coal in the GDR total approximately 50 million tonnes, and are concentrated in a single deposit at Zwickau. Production of hard coal in the GDR has made a small and declining contribution to the energy balance in the seventies.[70]

Exploratory work for oil and gas took place during the sixties with limited success in the gas sector, where discoveries were made in the Magdeburg area. However this find proved to be disappointing, since the gas showed only a 30 per cent methane content,[71] this lowering the calorific value of the gas and necessitating investment in further processing facilities.

The 1971-1975 Plan for the GDR, approved and adopted in December 1971, provided for the allocation of some 30 per cent of total industrial investment to the fuels and energy industries. Output of brown coal was scheduled to rise to 255 million tonnes per year by 1975. Oil refining capacity was to rise from 10.6 million tonnes per year in 1970 to 18 million in 1975, by which time it was also anticipated that deliveries of Soviet gas would have commenced.[72] Not only did GDR planners wish to bring about

---

[70] Lisichkin op.cit. p.69.

[71] H Wambutt "Planmässige Entwicklung der Energiewirtschaft der DDR" Einheit 1974 No. 6, p.706. (The international average is 60-80 per cent.)

[72] K Siebold "Die Aufgaben der Energiewirtschaft der DDR bei der Erfüllung der Hauptaufgabe des Fünfjahrplanes" Energietechnik 1972 No. 12, p.534.

greater use of oil and gas for reasons of energy efficiency, and as the basis of the further development of the petrochemical industry, but they also anticipated growing problems in the indigenous coal industry, not the least of which were that the ratio of over-burden to recovered coal was estimated to be likely to increase from 3.5:1 at the end of 1971 to over 5:1 by 1980, and that consequent demand for water-cleansing facilities would rise to undesirable levels.

During the 1971-1975 period oil production in the GDR remained at a very low level in relation to imports and consumption. The majority of supply was provided by the Soviet Union, supplemented by small quantities from Middle East producers. The availability of oil in the GDR in this period is detailed in table 4.11. Whereas during the sixties the hydrogenation of brown coal to produce petroleum products yielded about 1 million tonnes per year, the process was abandoned as uneconomic by 1970.[73] The sole producing oilfield in the GDR is the Reinkenhagen, near the Baltic coast, and the geology of this field has prompted the commencement of offshore exploratory drilling.[74] However indigenous production of oil is not expected to make a significant contribution to energy demand in the GDR in the short or long term.

In contrast the emergent though limited contribution and potential of the indigenous gas industry, supplemented increasingly by imports from the Soviet Union, has generated the major course

---

[73] Petroleum Press Service, September 1973, p.337.

[74] Lisichkin op.cit. p.71.

TABLE 4.11. Availability of Oil and Natural Gas in the GDR 1971-1975.

A. Oil ('000 tonnes)

	1971	1972	1973	1974	1975
Indigenous Production	neg.	neg.	neg.	neg.	100
Imports	10919	14858	16045	16434	16997
Availability	10919	14858	16045	16434	17097
Import Dependency (%)	100	100	100	100	99.5

(neg. = negligible)

Source: Statisticheskii ezhegodnik stran-chlenov SEV 1976, p.371.

B. Gas (M cubic metres)	1971	1972	1973	1974	1975
Indigenous Production	2853	5055	7012	7732	9000
Imports	110	5	760	2841	3226
Availability	2963	5060	7772	10573	12226
Import Dependency (%)	3.7	0.1	9.8	26.9	26.4

Sources: Table 4.6.
Statisticheskii ezhegodnik stran-chlenov SEV 1976, p.371.
V P Maksakovskii "Toplivnaya promyshlennost' sotsialisticheskikh stran Evropy" Moscow Nedra 1975, p.187.

of change in the development of the GDR energy balance from 1971 to 1975, and is likely to make an increasing contribution in the immediate future. Table 4.11. also details the availability of gas in the GDR from 1971 to 1975. The most awkward problem faced in utilisation of indigenous gas is that of extracting the substantial quantities of nitrogen found in association with methane. However despite this there are still savings to be obtained from the use of gas, since in certain processes, for example metal processing and glass manufacture, gas is up to 25 per cent more efficient as a fuel than brown coal, and there are usually additional savings made in that gas-fuelled processes are generally the least labour-intensive.[75]

Towards the end of the 1971-1975 period one East German analyst pointed to two major considerations affecting the development of the energy balance; firstly the increasing need to reduce dependence on hitherto the major energy source, indigenous brown coal, by expanding the use of natural gas, and secondly inevitably increasing dependence on imports in order to achieve greater efficiency in energy utilisation.[76]

An analysis of the GDR energy balance from 1960 to 1975 is given in table 4.12., showing the increasing share of oil and gas. Though between 1970 and 1975 the increase in percentage share is similar for each, it should be borne in mind that the share of

---

[75]Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.187.

[76]Wambutt op.cit. pp.706-707.

TABLE 4.12. GDR Energy Balance 1960-1975 (%)

Fuel Type	1960	1965	1970	1975
Solid Fuel	96.8	93.0	85.7	70.9
(of which, brown coal)	(87.5)	(84.2)	(78.2)	(65.0)
Oil	2.5	6.4	13.1	20.1
Gas	-	-	0.7	7.5
Nuclear	-	-	0.2	1.3
Other	0.7	0.6	0.3	0.2

Source: H Wambutt "Planmässige Entwicklung der Energiewirtschaft der DDR" Einheit 1974 No. 6, p.706.

gas showed the majority of its increase between 1974 and 1975, when deliveries commenced from the Soviet Union. The poor hydrocarbon resource base has necessitated the use of oil and gas only in those processes in which there is a substantial advantage over coal. Thus, for example, some 83 per cent of electricity generated in 1973 was fired on brown coal[77] and it is intended to continue the use of brown coal in such basic processes as power generation and general industrial steam-raising. However there are limits to the applicability of this policy in the medium term, since the majority of reserves of brown coal are concentrated in the Cottbus district (58 per cent), around Leipzig (25 per cent) and Halle (12 per cent). Considerations of the impact on the environment arising from further development of open-cast mining,

---

[77] G. Schirmer, J Wartenberg "Zur Rolle der Energiewirtschaft im volkswirtschaftlichen Reproduktionsprozess - einige ausgewählte

together with the expectation of rising costs of production are gaining increasing influence amongst policymakers.[78]

It is nonetheless intended to arrest the decline in production of brown coal and to attempt to maintain its production at least at the 1975 level during the 1976-1980 Plan.[79] The contribution of nuclear power to the GDR energy balance during 1971-1975 was minimal: no substantial increase is expected by 1980 on the basis of developments carried out to 1975.

POLAND

By virtue of its extensive reserves of hard and brown coal and a highly developed mining industry Poland has a net energy surplus, and is an established trader in coal in Comecon and the world market. Total explored reserves of hard coal are put at 200 billion tonnes, of which categories A+B+C1 account for some 80 billion.[80] The dominant role of coal in the Polish energy balance in the period 1961 to 1975 is detailed in table 4.13. Consumption of oil and gas increased throughout the sixties as a result of exploitation of indigenous reserves in the Central

---

Probleme" Wirtschaftswissenschaft 1975 No. 4, p.540.

[78]Wambutt op.cit. p.710.

[79]K Siebold "Effektiver Einsatz der Investitionen - ein entscheidender Faktor bei der Intensivierung der Kohle- und Energiewirtschaft" Energietechnik 1975 No. 7, p.294.

[80]Lisichkin op.cit. p.87.

TABLE 4.13. The Polish Energy Balance 1961-1975 (%)

Fuel	1961	1965	1970	1975
Coal	90.7	88.2	81.4	77.9
Oil	4.4	6.4	9.7	14.9
Natural Gas	1.4	2.3	6.3	6.7
Peat and Wood	3.4	3.0	2.0	
Hydroelectricity	0.1	0.1	0.6	0.5
Nuclear	-	-	-	

Sources: (i) S M Lisichkin "Energeticheskie resursy i neftegazovaya promyshlennost' mira" Moscow Nedra 1974, p.88.

(ii) J Bethkenhagen "Die Zusammenarbeit der RGW-Länder auf dem Energiesektor" Osteuropa Wirtschaft 1977 No. 2, p.77.

Carpathian basin, but more significantly on account of imports from the Soviet Union. Production of oil in Poland has grown from 1971 to 1975, but still makes a relatively small contribution to total energy supply. The dispersion of hydrocarbon resources in Poland is given in table 4.14.

Exploratory work carried out during the 1971-1975 Plan was centred on the Carpathian basin. Greater success was gained in the gas sector than in oil, and this prompted planners to favour a conservationist policy in depletion of domestic oil reserves.[81] However the OPEC price rises, compounded by the Soviet price rise,

---

[81] Maksakovskii "Toplivnaya promyshlennost'..." (1975), pp.139-140.

TABLE 4.14. Distribution of Polish Hydrocarbon Reserves (Categories A+B+C1) (%)

	Oil	Natural Gas
Polish Lowlands	13.5	32.9
Precarpathian	38.7	64.9
Carpathian	47.8	2.2

Source: J Pilch "Stan i perspektywy rozwoju górnictwa naftowego" Wiadomości naftowe 1973 No. 3, p.55.

necessitated some re-thinking of this policy. As far as the internal logistic system permitted, it proved possible to raise domestic production during the latter half of the 1971-1975 Plan. The Poles faced a similar problem to the Soviet Union in seeking to raise oil production, namely that of underperformance in the discovery of new reserves,[82] and also of high cost of exploiting domestic oil, which on a standard fuel basis proves to be ten times that of natural gas.[83] The resultant availability of oil and natural gas in Poland from 1971 to 1975 is detailed in table 4.15.

The growth of natural gas within the Polish energy balance, both as a result of development of indigenous reserves and of imports from the Soviet Union, has been only slight in comparison

---

[82] ibid. p.151.

[83] ibid. p.152.

TABLE 4.15. Availability of Oil and Natural Gas in Poland 1971-1975

A. Oil ('000 tonnes)

	1971	1972	1973	1974	1975
Indigenous Production	395	347	392	550	553
Imports	7894	9703	11140	10582	13306
Availability	8289	10050	11532	11132	13859
Import Dependency (%)	95.2	96.5	96.6	95.1	96.0

B. Gas (M cubic metres)

	1971	1972	1973	1974	1975
Indigenous Production	5164	5601	5811	5528	5776
Imports	1493	1505	1715	2123	2516
Availability	6657	7106	7526	7651	8292
Import Dependency (%)	22.4	21.2	22.8	27.7	30.3

Source: Statisticheskii ezhegodnik stran-chlenov SEV 1976, pp.78, 386.

with other Eastern European countries. At the outset of the 1971-1975 Plan it was estimated that the share of natural gas in the energy balance would rise from 6 per cent in 1970 to 9 per cent in 1975[84] out of a total energy demand rising from 132.8 million tonnes of standard fuel in 1970 to 146 million in 1975.[85] The geographical distribution of planned production is given in Table 4.16. The major influence on underfulfilment of the oil production plan was that deeper drilling than originally envisaged proved necessary in order to discover new fields and to bring existing deposits into production, resulting in delays. In the gas sector certain of the additional discoveries were found to contain gas with a lower methane content than originally anticipated. Gas from the Sudeten lowlands was found to have a particularly high nitrogen content, and the correspondingly lower level of methane extraction than anticipated has accounted for a recorded shortfall against plan for gas production also.[87] Only the desirability of and facilities for extraction of helium, also present in Sudeten gas, renders exploitation of this field economic. In view of the fact that availability of gas was lower

---

[84] Ya Zhytka "Perspektivy razvitiya gazovoi promyshlennosti Pol'shi" Gazovaya promyshlennost' 1970 No. 5, p.20.

[85] Lisichkin op.cit. pp.86, 88. (Note that the figure for energy consumption in 1975 is given as 183 million tsf on p.86. This is probably a misprint: the figure of 146 Mtsf is given on p.88, where the figure of 183 Mtsf is shown as being that for 1980.)

[86] J Molenda "Rola gazu ziemnego w gospodarce Polski" Wiadomości naftowe 1973 No. 10, p.218.

[87] "Prospects for Polish Natural Gas 1975-1980" Gas World July 1974, pp.384-385.

TABLE 4.16. Geographical Distribution of Planned Gas Production in Poland, 1971-1975. (billion cubic metres)

Region	1971	1972	1973	1974	1975
Carpathians and Carpathian Foothills	4.9	5.0	5.14	5.14	5.2
Sub-Sudeten Monocline	0.1	0.6	2.10	3.38	5.2
Other Lowlands	-	-	-	0.20	0.6
Total	5.0	5.6	7.24	8.72	11.0

Source: Gas World July 1974, p.384.

than planned between 1971 and 1975, preferential allocation was made to the petrochemical industry, where it was estimated that some 3.74 billion cubic metres would be directed in 1975.[88]

The attractiveness of indigenous gas against oil is that its production costs are on average substantially below those for oil on a standard fuel basis.[89] However in the aftermath of the oil price rises there was a resurgence of interest in the development of indigenous resources, the area thought most likely to yield new oil and gas deposits being the Baltic continental shelf. On 24 November 1975 a joint prospecting agreement was signed by Poland, the GDR and the Soviet Union, under the terms of which an organisation headquartered in Gdansk would coordinate

---

[88] Molenda op. cit. p.221.

[89] Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.152.

exploration in the Baltic Sea.[90]

Refinery capacity in Poland has shown an increase from 9 million tonnes per year in 1970 to 13.5 million in 1975, which fully met Poland's need for refined products.[91] At the end of 1975 there were 9 refineries in Poland, the largest being at Plock, fed with Soviet oil, and at Gdansk, constructed specifically to process Middle East oil. The latter has been running at below design capacity since it was commissioned prior to the price rises of 1973/1974 when projections of future imports of oil were based on considerably lower buying prices. During 1971-1975 the Polish refinery balance showed a predominance of fuel oil, though its share during this period declined and given the tightening balance between supply and demand for oil, increasing motorisation within the economy and the growing need for oil-derived feedstock for the petrochemical industry, the trend towards maximising the production of gasoline, naphtha and middle distillates that commenced in the early seventies is now expected to intensify.[92]

Between 1971 and 1975 Poland did not face the problem of an energy shortage: however there have been difficulties in the domestic oil and gas industries which have been compounded by the Soviet Union's inability to increase supply of oil and gas above contractual commitments due to her own technical and logistic

---

[90] Słowo powszechne 27 November 1975, p.2.

[91] Lisichkin op.cit. p.92.

[92] L Bednarz "Nowe perspektywy rozwoju przeróbki ropy naftowej w Polsce" Nafta (Krakow) 1973 No. 5, p.193.

problems. Poland faced particular difficulties at the time of the 1973 "oil crisis" and subsequently in that she was unable to compensate for the immediate shortcomings by increasing imports substantially from OPEC producers, and hence in the latter part of the Plan was obliged to introduce measures for fuel, and especially oil, conservation.

ROMANIA

Romania is particularly well provided with energy resources. Total coal reserves are put at 6 billion tonnes, of which 3.7 billion consist of brown coal. Approximately 90 per cent of these reserves are concentrated in the South-West of Romania in Oltenia. This simplifies transportation, but poses increasingly difficult problems of environmental deterioration. In 1970 open-cast mining provided 33.8 per cent of coal production. Brown coal is predominantly used in electricity generation, and it was estimated in 1974 that some 70 per cent of production during 1971-1975 would be directed to this use.[93] Moreover in contrast with the remainder of Eastern Europe the Romanian energy balance was based largely on oil and gas from an early stage. From 1950 to 1965 indigenous oil and gas accounted together for over 70 per cent of Romanian energy consumption.[94] In the period from 1950 to 1970

---

[93] Lisichkin op.cit. p.93.

[94] ibid. p.94. Maksakovskii "Toplivnaya promyshlennost'..." (1975), pp.33-34.

The early development of the Romanian oil industry is covered in detail in M Pearton "Oil and the Romanian State 1895-1948" Oxford: Clarendon Press 1971. A brief analysis of the development of the Romanian gas industry is given by F W Carter "Natural Gas in Romania" Geography April 1970, pp.214-220.

investment in the oil and gas industries totalled 64 billion lei, this being some 19 per cent of overall industrial investment.[95] Total oil reserves are put at 100-130 million tonnes;[96] reserves of gas in the categories A+B+C1 at 212 billion cubic metres.[97]

During the sixties indigenous production of oil exceeded domestic demand, and Romania was able to develop export trade in refined petroleum products. However during the 1971-1975 period production of oil did not increase significantly whereas demand for refined products did. Moreover on the basis of expanding exports of refined products and the anticipation that the pre-crisis price for OPEC oil of 2-3 dollars per barrel would be maintained in real terms, decisions were made to expand Romanian refining capacity to 25 million tonnes per year in 1975.[98] Extraction of natural and wellhead gas in Romania continued to rise, recording a 31.6 per cent increase between 1970 and 1975. The value of Romanian natural gas as a fuel is enhanced by its exceptionally high methane content, at 98 to 99.5 per cent the highest in Comecon.[99]

---

[95] G Pacoste "Producția și utilizarea țițeiului și a gazelor naturale în România" Energetica (Bucharest) 1971 No. 6, p.256.

[96] Lisichkin op.cit. p.93., Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.129.

[97] Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.195.

[98] Petroleum Economist February 1977, p.73.

[99] (i) Carter op.cit. p.218.

(ii) M. Valais, M Durand "L'Industrie du Gaz dans le Monde" Paris: Editions Technip 1975 (2nd edit.), pp.I-63.

(iii) Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.195.

Energy consumption in Romania rose from 22.8 million tonnes of standard fuel in 1958 to 38.7 in 1965, with the expectation that it would reach 78-80 million in 1980.[100] The relative importance of individual fuels in the energy balance from 1950 to 1970 is shown in table 4.17. The declining share of oil is atypical of Comecon and is due to the fact that as a result of a deteriorating ratio of reserves to production and of inability to increase imports of oil from OPEC much beyond counterbalancing exports of petroleum products, greater significance is now assigned to gas. The pattern of supply of crude oil in Romania is detailed in table 4.18.

The major part of Romanian development effort is being directed towards the application of improved technology, which can increase economically the amount of oil recovered from a single field. By the end of 1975 the national average level of recovery had reached 30 per cent of oil in place, the resultant production level just covering domestic need. However in view of depletion and a probable decline in the number of deposits being worked it is estimated that a recovery level of 42 per cent must be attained in the near future.[101]

For the most part Romanian oil is of the light, paraffinic variety, suitable for maximum output of gasoline, naphtha and

---

[100] Lisichkin op.cit. p.94.

[101] G Pacoste, G Aldea "Preocupări pentru creşterea factorului final de recuperare la zăcămintele de ţiţei din RS România" Mine, Petrole şi Gaze 1975 No. 4, pp.168-169.

TABLE 4.17. The Romanian Energy Balance 1950-1970 (%)

Fuel	1950	1955	1960	1963	1970
Coal	14.9	11.3	12.1	12.7	16.7
Oil	47.8	54.0	48.7	41.6	20.5
Gas	26.4	26.9	34.0	41.0	55.6
Wood	9.5	6.4	4.1	3.1	1.6
Hydroelectricity	1.4	1.4	1.1	1.6	4.4

Sources: F W Carter "Natural Gas in Romania" Geography April 1970, p.220.

I V Herescu "Creşterea economică şi consumul de energie" Revista economică 34/1975, p.13.

TABLE 4.18. Availability of Oil in Romania 1971-1975 ('000 tonnes)

	1971	1972	1973	1974	1975
Indigenous Production	13793	14128	14287	14486	14590
Imports	2858	2873	4143	4538	5085
Availability	15651	17101	18330	18924	19675
Import Dependency (%)	18.3	16.8	22.6	24.0	25.8

Source: Statisticheskii ezhegodnik stran-chlenov SEV 1976, pp.78, 391.

middle distillates.[102] Planners' preference for a slowdown in the rate of growth in consumption of oil as fuel so as to facilitate its increased use as petrochemical feedstock was a directing influence in setting the original targets for production to 1975. It was intended that production in 1975 should be 13.1 to 13.5 million tonnes, or 98.5 to 101.5 per cent of the 1970 level, the rising demand for fuel being met by gas and coal. However this target was raised prior to the ratification of the 1971-1975 Plan, which set the 1975 target at 14.5 million tonnes, a figure which in the event was exceeded.[103] Discussions on energy policy prior to the formulation of the Plan for 1976-1980 indicated a similar preference for a low growth rate in oil production. In 1974 the optimal level for oil production in 1980 was put at 15.5 million tonnes.[104]

Changes in the pattern of oil refining date from the early sixties, when the Romanian petrochemical industry began to grow and when the ratio of proven reserves to production commenced its decline. From 1963 the refinery at Brazi underwent considerable expansion, adding cracking and hydrofining capacity and a powerforming unit providing greater output of high octane gasolines and naphtha. The refinery at Ploiești was likewise expanded and modified such that output was similar to that of the Brazi complex. A new refinery was built at Pitești, designed to

---

[102] Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.140.

[103] ibid. p.145.

[104] Scînteia 3 August 1974, p.2.

process imported oil, whose sulphur levels were higher than indigenous varieties.[105] The resultant change in output of refined products, in particular the substantial growth of middle distillate production, is detailed in table 4.19. The demands of the chemical and petrochemical industries have also been instrumental in prompting the further rapid development of the gas industry. The tenth Congress of the Romanian Communist Party, held in 1969, foresaw a level of output in the chemical industry in 1975 some 82-92 per cent above the 1965 level, and a level of production of natural gas commensurate with the expansion of this sector and with growth in demand for energy generally in the range of 22-24 billion cubic metres, supplemented by some 5 billion cubic metres of wellhead gas.[106] In fact domestic production of natural and wellhead gas showed a growth of 7.6 billion cubic metres between 1970 and 1975, rising from 24 billion to 31.6.[107] There were no imports.

Though Romania has been able to pursue a policy of energy autarchy up to 1975, the short-term position is one of tightening supply, especially in the oil industry. Thus when OPEC increased the price of oil in 1973 and 1974 Romania's decision to impose conservation measures was prompted not by the threat of an energy shortage, nor for reasons of an immediate currency drain in

---

[105] Pacoste "Producția și utilizarea..." (1971), p.258.

[106] B Popa, T Mihailescu "Aspecte din dezvoltarea exploatării gazului metan în România" Petrol și gaze 1972 No. 1, p.59.

[107] Statisticheskii ezhegodnik stran-chlenov SEV 1976, p.78.

TABLE 4.19. Changes in the Romanian Refinery Balance 1950-1970 ('000 tonnes)

	1950	1960	1970
Gasoline	1502	2792	2786
Middle Distillates	731	2376	4979
Fuel Oil	1681	3824	4249
Lubricants	125	311	546
Bitumen	92	249	537
LPG	12	77	207
Aromatics	-	0.5	358

Source: G Pacoste "Producția și utilizarea țițeiului și a gazelor naturale în România" Energetica (Bucharest) 1971 No. 6, p.259.

maintaining imports, since the cost of these was largely recouped by the export of refined products. The point at issue was the need to conserve domestic resources whilst the long-term impact of higher Middle East oil price on future energy and chemical trade policy was fully evaluated.[108] Planners are conscious of the fact that from 1960 to 1967 hydrocarbon discoveries were believed to constitute some 86 per cent of reserves which according to best available geological information were known to exist,[109] and the rehabilitation of coal has become a feature of

---

[108] V Boescu "Consumuri cît mai reduse de combustibili și energie pe unitatea de produs" Revista economică 12/1975, pp.9-10.

[109] Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.150.

Romanian energy planning which is likely to affect the short term increasingly. It is felt that domestic reserves of coal are sufficient to sustain a higher production level than the present, and that the possibilities of joint developments in coal production, both within and outside Comecon, will go some way towards alleviating the difficulties that have arisen in the oil industry.[110] The development of the Romanian energy balance between 1970 and 1975 is outlined in table 4.20.

CZECHOSLOVAKIA

Czechoslovakia faces considerable problems in the short term in energy policy. Reserves of each conventional fuel are very limited, the basic one being coal, whose total reserves are put at 13.7 billion tonnes at depths up to 1800 metres, including 6.5 billion below 1200 metres. The brown coal element of the former figure is 8.2 billion tonnes, and it is felt that proven reserves are sufficient to sustain anticipated production for several decades.[111] Reserves of oil and gas are said to be insignificant.[112] The development of the Czech energy balance

---

[110] The Romanian government has gone so far as to enter into a preliminary agreement with the American Occidental Petroleum Company Ltd. to invest $50 million in developing a high grade coal mine in Virginia USA. Possible output is 1 million tonnes per year by 1980, by which time Romania would be entitled to one-third of the output, with the option of buying a further one-third. Petroleum Economist August 1975, p.313.

[111] Lisichkin op.cit. p.102.

[112] ibid. p.110.

TABLE 4.20. The Romanian Energy Balance 1970-1975 (%)

Fuel	1970	1973	1975
Coal	21.1	21.0	20.8
Oil	24.3	25.5	23.3
Gas	54.3	51.4	52.9
Other	0.3	2.2	3.0

Source: J Bethkenhagen "Die Zusammenarbeit der RGW-Länder..." (1977), p.77.

between 1960 and 1970 is detailed in table 4.21., during which time total consumption of energy rose from 61.9 million tonnes of standard fuel to 90.6 million.[113]

Oil production in Czechoslovakia consists of the combined output of a number of small fields, whose operations exhibit high costs. Although oil is the highest cost fuel to be produced in Czechoslovakia, its conversion efficiency in many industrial processes justifies its production.[114] Following the opening of the 'Friendship' pipeline in 1964 Czech imports of Soviet oil grew rapidly, and throughout the 1971-1975 Plan Czechoslovakia was the Soviet Union's largest purchaser of oil. Small

---

[113] Kozlov, Shmakova op.cit. p.25.

[114] Maksakovskii "Toplivnaya promyshlennost'..." (1975), p.153.

TABLE 4.21. The Czechoslovak Energy Balance 1960-1970 (%)

Fuel	1960	1965	1970
Solid Fuel	89.1	83.6	74.9
Oil	6.2	11.5	17.8
Gas	2.6	1.4	3.3
Other	2.1	3.5	4.0

Source: K Houdek "Palivoenergetická základna ČSSR v páté pětiletce" Plánované hospodářství 1972 No. 1, p.12.

quantities were purchased from OPEC producers and during this period Czechoslovakia agreed to cooperate with Hungary and Yugoslavia in the development of the 'Adria' pipeline (see Appendix A). The availability of oil in Czechoslovakia is detailed in table 4.22. There appears to be no prospect of increasing domestic production of oil in the short term: even current production might continue to decline. Refinery capacity in 1975 is put at 17 million tonnes per year, of which refineries at Bratislava and Zaluzi account for the major part. Gasoline and naphtha have become the priority products.[115]

Production of natural gas in Czechoslovakia has fluctuated around an annual level of 1 billion cubic metres since the early

---

[115] ibid. pp.164-165.

TABLE 4.22. Availability of Oil and Natural Gas in Czechoslovakia 1971-1975

A. Oil ('000 tonnes)

	1971	1972	1973	1974	1975
Indigenous Production	194	191	171	149	142
Imports	11505	12571	14176	14665	15839
Availability	11699	12762	14347	14814	15981
Import Dependency (%)	98.3	98.5	98.8	99.0	99.1

B. Gas (M cubic metres)

	1971	1972	1973	1974	1975
Indigenous Production	1222	1163	1042	976	929
Imports	1660	1957	2385	3256	3821
Availability	2882	3120	3427	4232	4750
Import Dependency (%)	57.6	62.7	69.6	83.3	80.4

Source: Statisticheskii ezhegodnik stran-chlenov SEV 1976, pp. 78, 405.

sixties, and now exhibits a declining trend. Imports from the Soviet Union have increased during the 1971-1975 Plan and these will rise substantially after 1978, when the pipeline from the Orenburg field is scheduled for completion. The supply of gas from 1971 to 1975 is also detailed in table 4.22. As in the case of the oil industry, it is difficult to see how any increase in indigenous production can be expected in the near future. During the 1971-1975 Plan gas had the lowest production cost of any domestic fuel: unfortunately the poor ratio of reserves to production prevents further expansion.[116]

In a recent work published in Canada the Czech emigre economist B Korda points to the economic mechanism itself as the root cause of Czechoslovakia's energy problems.[117] Korda draws attention to the fact that the level of primary energy consumption is high in relation to final consumption, that is to say that the economy exhibits low conversion efficiency in the major energy-intensive processes.[118] He attributes this to excessive reliance in the past on domestic coal, a policy which in his view was motivated by Stalin's desire to decrease Czechoslovakia's trade with the capitalist world, which included imports of relatively cheap West German hard coal.[119] He argues that since

---

[116] ibid. p.189.

[117] B Korda "Economic Policies and the Energy Pinch in Czechoslovakia" The ACES Bulletin Vol.XLVII No.2/3 (Winter 1975), pp.3-26.

[118] ibid. p.3.

[119] ibid. p.8.

neither the Soviet Union nor the rest of Comecon could replace the West as a trading partner, Czechoslovakia had no option but to develop domestic coal regardless of cost, given the limitations on oil and gas supply from the Soviet Union. Even when the Soviet export surplus returned in the late fifties, he argues, contract quantities were insufficient to meet potential demand, and hence Czechoslovakia retained a coal-based energy economy.

The price rises imposed by OPEC and the Soviet Union had a particularly strong impact on Czechoslovakia, and the need to cut plans for the import of oil from the former source was acknowledged by a Czech energy planner in 1974.[120] Imposition of energy conservation measures had some immediate effect in improving conversion efficiency through elimination of the more obvious wasteful practices, but the main effect of the price rises, particularly those imposed by OPEC, was that of engendering greater interest on the Czech part in joint development of Soviet resources, and in nuclear power, which Korda sees as the best and most likely solution in the long term.[121] However in the short term the problem is particularly severe, and in order to meet rising energy demand there is no alternative to the further development of the domestic coal industry, despite increasing production costs and implications for the environment entailed

---

[120] J Kures in Hospodářské noviny 50/1974, p.15.

[121] Korda op.cit. p.21.

in open-cast mining.[122]

The development of the Czech energy balance from 1970 to 1980 is outlined in table 4.23. The difference between the share of oil anticipated in 1972 and the final share highlights the effect of the price rises: however the percentages understate the absolute decline, in that a lower total energy consumption than envisaged was recorded. The low share of gas reflects the difficulties experienced in domestic production and the inability of the Soviet Union to deliver in excess of contracted quantities due to her own difficulties in gas production.

Oil and Gas in Eastern Europe to 1975: An Overview

Eastern Europe is facing considerable difficulty in gearing supply and demand for oil and gas within the energy balance, though each country experiences this to a different extent and has varying opportunities for solving the problem. Between 1971 and 1975 they have been able to do little to counter the effect of the OPEC and Soviet oil price rises and this was aggravated by the Soviet Union's inability to raise production and exports substantially to Eastern Europe after the OPEC rises. As suggested by Korda and Moravcik,[123] a policy of modernising productive capacity, such that industrial output might be increased by improving the efficiency of existing facilities rather than by the installation

---

[122] K Houdek "Úspory energie jako předpoklad rozvoje národního hospodářství" Plánované hospodářství 1974 No 8, pp.27-28.

[123] Korda, Moravcik op. cit. pp.13-14.

TABLE 4.23. Czechoslovak Energy Balance 1970-1975

Fuel	1970	1973	1975 Anticipated	1975 Actual
Coal	74.9	68.3	63.7	65.9
Oil	17.8	23.9	26.8	24.6
Gas	3.3	4.6	5.4	5.9
Other	4.0	3.2	4.1	3.6

Sources: (1970 and 1975 Anticipated) K Houdek "Palivo-energetická základna ČSSR v páté pětiletce" Plánované hospodářství 1972 No. 1, p.12.
(1973 and 1975 Actual) J Bethkenhagen "Die Zusammenarbeit der RGW-Länder..." (1977), p.77.

of further energy-intensive processes, may be the best option to counteract tightening supply and rising prices. However if such a policy were adopted, it would have little effect on the short-term position. Whereas Eastern Europe has sustained a serious blow from the price rises of October 1973 to February 1975, on balance the economic impact has been measurably less serious than on industrialised countries elsewhere. In accepting a greater commitment of resources to the development of Soviet energy reserves Eastern Europe does at least have the opportunity of securing a high level of self-sufficiency in the medium term.

The acceptance of credits from the Soviet Union will help to offset the effect of the oil price rise. Though this puts the Eastern European countries in a more dependent position opposite

the Soviet Union the policy is less harsh than dealing with OPEC. Writing in 1974 the American analyst J R Lee indicates that the import of 50 million tonnes of OPEC oil at then current prices would impose a bill of $2.5 billion on Eastern Europe.[124] He suggests that a limit of 20 million tonnes can be expected, this level necessitating negotiation of substantial trading credits.[125] The question of the options open to Eastern European energy planners is addressed in the following two chapters.

---

[124] J R Lee "Petroleum Supply Problems in Eastern Europe", in 'Reorientation and Commercial Relations of the Economies of Eastern Europe' Washington D C: US Congress, Joint Economic Committee, 1974, p.417.

[125] ibid.

Chapter 5. The Comecon Oil and Gas Industries 1976-1980

The energy economies of the Soviet Union and Eastern Europe entered a period of substantial change in the course of their 1971-1975 Plans. The Soviet Union maintained discovery of substantial reserves of coal and gas but although ultimate reserves of oil are believed to be extensive, there are clear indications that reserves in the categories A, B and C1 are not being discovered and upgraded sufficiently rapidly. Reserves of energy resources in these categories are now located predominantly in the Arctic North and in Siberia, and almost all growth in production in the 1976 to 1980 period is scheduled to be provided by operations located in these areas, this posing increasingly severe problems in exploration, transportation and storage due to the inhospitable nature of the terrain and climate. In 1975 the Soviet Union exported 130 million tonnes of crude oil and refined products, and the trend over the period from 1971 to 1975 shows a steady increase in deliveries to Comecon and the world market. Large-scale export contracts for natural gas were negotiated during this period and the build-up of gas trade is seen in the last two years of the ninth Plan. The Soviet Union benefited from the increased world market price for oil in the aftermath of the events of 1973 and 1974 when there seemed to be some doubt as to the future of Soviet

production and export capacity. Soviet energy consumption grew at some 5 per cent per year during the ninth Plan and the majority of the increase in demand was met by oil and particularly gas.

Eastern European countries reoriented their energy economies from predominant reliance on coal to imported oil and gas at a time when their buying prices from the Soviet Union and other suppliers increased substantially. Though prices for imports from the Soviet Union are still below the world price, they will move closer to the latter under the terms of a revised pricing formula for intra-Comecon deliveries of raw materials negotiated in 1975. Total energy consumption in Eastern Europe grew by some 4 per cent from 1971 to 1975, but within this trend demand for oil and gas grew at a rate of 10 per cent.

The demands imposed on the energy industries relate to the rate of development of the Comecon economies as a whole. The striking feature of the Soviet Plan for 1976-1980 is the general slowdown in rates of growth in most sectors. The industrial growth rates are the lowest recorded, but this is counterbalanced by ambitious (and necessary) plans for recovery in the agricultural sector. The general direction of the Soviet Plan for 1976-1980 is given in table 5.1., and of the fuels industries in table 5.2. At first sight it appeared that without improvements in energy conversion efficiencies necessary to decelerate further the rate of increase in demand for fuels, especially oil, not only in the Soviet Union but also in Eastern Europe,

TABLE 5.1. The Framework of the Ninth and Tenth Soviet Five-Year Plans

Sector	1971-1975 Plan (1970 = 100)		1976-1980 Plan (1975 = 100)
	Plan	Actual	
National Income	138.6	128	126
Industrial Output	147.0	143	137
Producer Goods	146.3	145	140
Consumer Goods	148.6	138	131
Agricultural Output	121.7(1)	113(1)	116(1)
Total Investment	141.6(1)	139(1)	125(1)

Sources: A Nove The Times 5 January 1976 p.14.

J D Park, R A Clarke ABSEES (Special Section) July 1976 p. (i).

(1)Quinquennium as % of previous quinquennium.

TABLE 5.2. Direction of Soviet Fuel and Energy Production 1970 to 1980

	1970	1975P	1975A	1980P	1975Aas % of 1970	1980P as % of 1975A
Electricity (billion kWh)	740	1065	1038	1340-1380	140.2	131.0(1)
Oil and Gas Condensate (million tonnes)	353	505	491	620-640	139.1	128.3(1)
Natural Gas (billion cubic metres)	198	320	289	400-435	144.5	144.6(1)
Coal (million tonnes)	624	695	701	790-810	112.3	114.1(1)

Source: Park, Clarke op.cit. p. (ii).

(1)Percentage calculations based on mid-point of range.

growth in Soviet exports of oil and refined products to the West would be unlikely and that apparent opportunities for increasing earnings of hard currencies would have to be foregone.[1]

In Eastern Europe the 1971-1975 Plans for growth of net material product were fulfilled or exceeded. However the case of the aggregate industrial Plan of Bulgaria is an exception, where an underfulfilment is recorded. Generally in Eastern Europe domestic production of energy fell short of Plan targets and overall growth rates were below those attained in the sixties. An actual decline in production of oil and gas was experienced in some countries, resulting in the need to utilise more coal than initially envisaged in order to maintain deliveries of oil and gas feedstocks to the petrochemical industry. During 1975 the annual rate of growth in all Comecon countries showed a decline over the previous year: the growth rate of aggregate net material product in Eastern Europe declined from 8.3 per cent in 1974 to 7 per cent in 1975. The major indicators of economic development in Eastern Europe for 1971 to 1975 together with targets for 1980 are detailed in table 5.3., and evidence slower rates of growth in the period from 1976 to 1980 in all countries except Bulgaria.

The need for energy conservation is highlighted in the Plans of all countries, reflecting the poor prospects for increased indigenous production of energy throughout the bloc. In view of

---

[1] A Nove, in 'The Times' 5 January 1976, p.14.

TABLE 5.3. Direction of Eastern European Economic Growth 1971-1975 and 1980 Plan
(Average annual growth rates in %)

	Bulgaria	Czechoslovakia	GDR	Poland	Romania	Hungary	Eastern Europe
Net Material Product							
1971-1975 Plan	7.7-8.5	5.1	4.9	7.0	11.0-12.0	5.5-6.0	6.8
1971-1975 Actual	7.9	5.7	5.4	9.8	11.3	6.2	7.8
1976-1980 Plan	8.2-8.7	4.9-5.2	4.9-5.4	7.0-7.3	11.0	5.4-5.7	6.7
Industrial Production							
1971-1975 Plan	9.2-9.9	6.0	6.0	8.5	11.0-12.0	5.7-6.0	7.7
1971-1975 Actual	9.1	6.7	6.4	10.7	13.1	6.5	8.7
1976-1980 Plan	9.2-9.9	5.7-6.0	6.0-6.4	8.2-8.5	11.2	5.9-6.2	7.5
Foreign Trade Turnover							
1971-1975 Plan	9.8-10.5	6.4-6.6	8.0	9.5	10.0-11.5	7.0-8.5	9.0
1971-1975 Actual	16.4	12.1	13.2	22.1	15.6	14.9	15.8
1976-1980 Plan	9.9-10.5	6.2-6.5	9.7	8.5	12.4	7.7-8.5	9.0

Source: A Askanas, H Askanas, F Levcik "Die Wirtschaft der RGW-Länder 1971-1975 und die geplante Entwicklung bis 1980" Monatsbericht 3/1976, Osterreichisches Institut für Wirtschaftsforschung,

the enhanced opportunities for earnings from the export of fuels and the increasing need of the Soviet Union and Eastern Europe to import Western technology, energy conservation might have become a feature of economic development in Comecon even without the difficulties experienced in production between 1971 and 1975.

The American analyst M Slocum, writing at the end of 1974, goes so far as to state that "the energy situation in the Soviet Union poses a serious dilemma: in order to sustain planned economic growth, the Soviet Union will have to progressively increase the imports of oil and gas from the Middle East area, will have to import technology, and will have to obtain immense investment credits".[2] She goes on to contend that "the demand for fuel and energy has been greater than supply for a number of years",[3] and that this has resulted in "skyrocketing energy shortages in...industrialised areas".[4] Moreover the difficulties encountered by the Soviet Union in energy development are said to have prompted the Soviet executive into "trying desperately to penetrate Western trade barriers", which would "unquestionably give the West added bargaining power in the negotiation of trade agreements with the Soviets and provide a basis for requiring assurance of alternative modes for the repayment of loans by the Soviet Union".[5]

---

[2]Marianna Slocum "Soviet Energy: An Internal Assessment" Technology Review October/November 1974, p.17.

[3]ibid. p.24.

[4]ibid. p.29.

[5]ibid. pp.29, 32.

A somewhat different and less categorical analysis was written in 1976 by the British economist Philip Hanson.[6] The object of his enquiry is to discover why "in the past few years... the Soviet energy balance has begun to seem precarious".[7] He stresses that towards the end of the ninth Soviet Plan energy policy shifted to favour the rehabilitation of coal, facilitated by substantial development effort in the Ekibastuz and Kansk-Achinsk coalfields, and to include a nuclear power station construction programme for European Russia and the Ural region that provides for a nuclear component of 13-15 million kilowatts out of a total of 67-70 million kilowatts scheduled for completion during the tenth Plan.[8] This, coupled with a general slowdown in rates of economic growth in the tenth Plan compared with the ninth, he sees as being calculated to ease the pressure that has built up in the oil sector. His conclusion is that the planned increase of energy supply is adequate to sustain the economic growth rates in the tenth Plan, though there will be a shift to less efficient fuels, incurrence of very high costs in developing Siberia and perhaps the import of significant (unquantified) amounts of Middle East oil, but that the energy problems of the Soviet Union and the West "are not sufficiently awful to ensure peace and goodwill between Moscow and Washington".[9]

---

[6] P Hanson "The Soviet Energy Balance" Nature, 6 May 1976, pp.3-5.

[7] ibid. p.3.

[8] ibid. pp.3-4.

[9] ibid. p.5.

A further Western perspective is that of the American analysts E E Jack, J R Lee and H H Lent.[10] They point out that the Soviet Union is the sole industrialised nation in the world to have self-sufficiency in energy and that this position is likely to be maintained "for the foreseeable future".[11] The authors feel that the 1980 production target for coal can probably be met without great difficulty, whereas the "ambitious" targets for oil and gas production are not likely to be achieved, this resulting in a shortfall of 2 to 5 per cent of planned energy production and necessitating the imposition of energy conservation measures or adjustment in foreign trade.[12] Alternatively they suggest that in the event of lags in the Soviet economy as a whole the overall supply and demand balance in the energy sector could be maintained.[13]

A report of the American Central Intelligence Agency concerned specifically with future oil production was published in April 1977.[14] The report concludes that as a result of technological backwardness the point at which the Soviet Union can prove sufficient reserves to offset depletion and to add to existing

---

[10] Emily E Jack, J Richard Lee, Harold H Lent "Outlook for Soviet Energy" in 'The Soviet Economy in a New Perspective' Washington D C: US Congress, Joint Economic Committee 1976, pp.460-478.

[11] ibid. pp.460-461.

[12] ibid. p.472.

[13] ibid. p.473.

[14] Central Intelligence Agency of the USA "Prospects for Soviet Oil Production" Washington: CIA April 1977 (9pp.).

production has been passed and that production of oil and gas condensate will peak "possibly as early as next year (1978) and certainly not later than the early 1980s".[15] This, the report argues, will result in the Soviet Union's entry into the world petroleum market as a competitive purchaser of OPEC oil, since the effect of fuel substitution will be minimal in the short term.[16]

It will be seen from the aforementioned analyses that there exists a considerable range of opinion on the prospects for Soviet energy development in the tenth Plan not only in relation to growth targets but to future trade patterns. The question of trade is dealt with in Chapter 6 of this thesis: the purpose of the present chapter is to examine the above analyses in the light of the Soviet and Eastern European perception of the energy problem in general and the oil and gas industries in particular, considering the likely development of the Comecon energy balance to 1980 as suggested by the performance of the fuels industries up to mid-1977.

A detailed study of the methodology of energy planning in the Soviet Union was produced in 1973 by the Energy Institute of the Siberian Division of the Academy of Sciences in Novosibirsk.[17] Though the work is concerned primarily with alternative methods of energy analysis and planning, involving the use of complex

---

[15] ibid. p.9.

[16] ibid.

[17] A A Makarov, L A Melent'ev "Metody issledovaniya i optimizatsii energeticheskogo khozyaistva" Novosibirsk Nauka 1973.

linear programming techniques, the authors do offer some perspective of the short-term trend in the Soviet energy balance. They stress that there exists a substantial difference between energy demand in European Russia and the Eastern regions. The former accounts for the majority of hydrocarbon consumption: the share of coal in the European area's energy balance in 1970 was 20 per cent and this is expected to fall to 5-7 per cent by the end of the century, assuming successful development of the nuclear power programme. In contrast Siberia and the Trans-Baikal areas have 60 per cent of energy consumption in the form of coal and a further 10-15 per cent in the form of fuelwood, with the likelihood that this will be maintained. The authors argue that smaller consumers will utilise natural gas, distillate fuels and fuel oil, since they do not enjoy the same economies of scale in conversion of coal as, for example, power stations. In the long (unspecified) term, the authors state, oil and gas will be produced from deposits in the Lena-Vilyuy area and the Irkutsk oblast', that is to say, they view the development of East Siberian oil and gas as essential to support the long-term development plans envisaged during the ninth Five-Year Plan.[18]

A later Soviet analysis of the energy balance points to its intrinsic tautness, and outlines the extent to which conservation measures in electricity generation have contributed to a more rational use of fuel.[19] On a different plane it is

---

[18] ibid. pp.30-31.

[19] P Neporozhnii "Perspektivy Sovetskoi energetiki" Planovoe khozyaistvo 1975 No. 8, pp.42-49. Neporozhnii stresses that at the outset of the ninth Plan generation of 1 kWh of electricity

suggested that attempts to determine an optimal energy balance are subject to a number of factors that are not only essentially difficult to predict but which also exhibit a tendency to fluctuate, such as export prices. The criterion of comparative initial financial outlay must also be tempered by consideration of the effect of change in the various branches of the economy on demand for individual fuels.[20] This analysis concludes that in view of the tightening balance between supply and demand the prime objective should be that of securing maximum flexibility in the choice of fuel amongst the larger users, for example power stations, to the extent that a short-term interfuel switch becomes possible, suggesting that such a policy could be initiated in the Volga-Ural region, where coal, natural gas and fuel oil are freely available.[21]

However despite the Soviet planners' preference for securing as flexible an energy policy as possible the scope that exists in the technical sense is somewhat limited when the economic dimension is considered. Soviet planners bear in mind that whereas the long-term delivered cost of Siberian oil and gas is expected to be lower than alternative conventional fuels in

---

needed an input of 366 grammes of standard fuel. The target for 1974 was 345 gms., which was achieved. An input of 341 gms. was anticipated by the end of 1975.

[20] A Vigdorchik et al. "Metody optimizatsii dolgosrochnogo razvitiya toplivno-energeticheskogo kompleksa SSSR" Planovoe khozyaistvo 1975 No. 2, pp.29-37.

[21] ibid. p.37.

European Russia,[22] the potential for export earnings, primarily in Western Europe, has had a substantial influence on decisions as to the rate at which Siberian resources have been developed, since the long-term policy is to depress demand for conventional fuel in European Russia through the expansion of nuclear power.[23] Whereas a relatively minor role has been assigned to nuclear power in the short term, nonetheless assumptions concerning the level and timing of its contribution have a marked influence on short-term decisions concerning production and utilisation of conventional fuels. It is likely that the effect of nuclear development in the Soviet Union will not be felt before the mid-eighties, when nuclear power could account for 25 per cent of electricity produced.[24] Therefore a policy of relatively rapid depletion of coal, and to a lesser extent of gas reserves can be undertaken. However the high initial cost of such a policy can, it seems, only be offset by increased assistance, human, material and financial, from interested outsiders, fellow members of Comecon, Japan and the USA.

---

[22] V A Shelest indicates that oil and gas production costs will eventually be 2 to 4 times and coal 6 to 8 times lower in Siberia than in European Russia. "Regional'nye, energoekonomicheskie problemy SSSR" Moscow Nauka 1975, p.205.

[23] Makarov, Melent'ev op.cit. p.24.

[24] Development and plans for Soviet nuclear power generation are outlined by A Albonetti "La Situation Énergétique et Nucléaire en Union Soviétique", in 'Round Table on the Exploitation of Siberia's Natural Resources' Brussels: NATO 1974, pp.113-120. See also P R Pryde "Nuclear Energy Development in the Soviet Union", paper presented to a Conference on Soviet and East European energy problems, University of Alberta, May 1977. 13pp. Mimeo.

Oil Developments in the Soviet Union 1976-1980

The initial target for oil production in the Soviet Union in 1980 was given in the basic outlines for the tenth Five-Year Plan released in December 1975, and it was put at 620 to 640 million tonnes.[25] The final target was subsequently confirmed at 640 million.[26] Other data relating to the oil industry were that time spent in proving new wells was to be cut by 25 to 30 per cent, utilisation of wellhead gas was to be raised to 43-45 billion cubic metres and primary refining capacity increased by 25 to 30 per cent, with increasing emphasis on the production of high octane gasoline, aviation fuel and low-sulphur distillates.[27]

The target for oil production in West Siberia in 1980 was set at 300 to 310 million tonnes,[28] this meaning that Siberia would account for the total net increase in production. At the outset of the tenth Plan the Soviet Oil Minister, V D Shashin, called for a substantial transfer of exploratory effort to West Siberia and the Baltic and Caspian offshore areas.[29] He pointed out that during the ninth Plan the Samotlor oilfield in West Siberia accounted for an average increase in production of 16 million tonnes and that a corresponding figure of 8 million was

---

[25] Pravda 14 December 1975, p.2.

[26] Izvestiya 28 October 1976, p.3.

[27] Pravda 14 December 1975, p.2.

[28] ibid. p.6.

[29] V D Shashin in Pravda 18 December 1975, p.3, also in Ekonomicheskaya gazeta 22/1976, p.4.

anticipated during the tenth Plan,[30] hence discovery of fields of the size of Samotlor would be necessary in order to offset depletion. To complement production developments in West Siberia the Timan-Pechora area of the Komi ASSR was scheduled to contribute some 25 million tonnes in 1980 and in the Perm oblast' a 1980 production level of 30 million tonnes was foreseen, this latter figure representing a 7 million tonne increase on 1975.[31]

The role of oil in the energy balance was reappraised in the light of problems encountered during the ninth Plan. Since reserves of coal exceed those of oil and to a lesser extent gas, it was decided to give preference to the use of coal as a boiler and furnace fuel, saving oil for maximum production of gasoline and naphtha and gas for use as fuel in highly critical processes and as petrochemical feedstock. Accordingly it was intended that the share of oil in the energy balance should remain at the level reached in 1975, perhaps even showing a slight fall, through to 1980.[32] Conservation of hydrocarbon fuels had thus become a guiding principle.

Whereas the average annual growth rate of oil production in the Soviet Union between 1966 and 1970 had been 7.5 per cent, the rate decreased to 6.8 per cent between 1971 and 1975. To meet the final 1980 production target of 640 million tonnes an average annual growth rate of 5.4 per cent is required. Moreover

---

[30] Ekonomicheskaya gazeta 22/1976, p.4.

[31] ibid.

[32] I Ya Vainer "Neftyanaya promyshlennost' v desyatoi pyatiletke" Neftyanik 1976 No. 5, p.2.

the rate of growth required to meet the target for 1976 was 5.9 per cent on the 1975 figure. Therefore lower annual growth rates are anticipated by the end of the tenth Plan.

The problem of depletion in oilfields located in the Western areas has complicated the planning process, in that West Siberia is now being developed at a rate well in excess of that which had been previously judged optimal. Towards the end of the ninth Plan Soviet geologists forecast an optimal production level of 230 to 260 million tonnes per year from West Siberian operations by 1980, and oil industry planners gave their estimates of optimal levels as 270 million tonnes in 1980, rising to 330 in 1990 and to 360-380 by the year 2000.[33] The target finally adopted for 1980 has long-term implications for production which require action during the tenth Plan. It is thought that growth rates for West Siberia in the tenth Plan, if achieved or exceeded, are unlikely to be scaled down subsequently. Therefore increased exploratory effort will be required up to 1980 in order to ensure the continued capacity of West Siberian operations to provide the higher production levels that are likely to be planned in the eighties.[34] The implication of the target set for West Siberia in the tenth Plan, in the Soviet view, is that a production level of 500 million tonnes per year will be reached by 1990

---

[33] Z Ibragimova "Tyumenskii kompleks i ego budushchee" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No. 5, p.8.

[34] ibid. p.9.

with a consequent and commensurate requirement for logistic development.[35]

The dislocating effect of the rapid development of West Siberia is well illustrated in the case of the Samotlor oilfield. The production target originally envisaged for 1975 was 60.6 million tonnes: however as a result of production shortfalls elsewhere in the Soviet Union during the ninth Plan the final level in Samotlor was 86.5 million.[36] This 34 per cent over-fulfilment was reflected in a capital requirement some 12 per cent above Plan and necessitated the application of temporary measures to boost production, including a higher level of water-flooding than anticipated and resulting in a deteriorating ratio of recovered oil to water.[37] The rate of depletion of the Samotlor oilfield is one of the most decisive factors influencing plans for production beyond 1980. Newly discovered fields in West Siberia are so far proving to be considerably smaller than the Samotlor field, and it is estimated that in the course of the tenth Plan it will be necessary to bring on stream seven new fields per year, including the discovery of at least one field of the size of Samotlor, compared with a total of sixteen fields in the ten years to 1975.[38] The scale of the

---

[35] ibid. p.20.

[36] R I Kuzovatkin "Front i tyl Samotlora" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No. 6, pp.78, 80.

[37] ibid. p.81.

[38] Pravda 11 June 1975, p.3.

problem is such that some two thirds of a target increase in production capacity of 100 million tonnes per year between 1976 and 1980 will serve to offset the effects of depletion in existing operations.[39] This has prompted Soviet planners to consider more seriously than hitherto the production potential of East Siberia. Whilst small quantities of oil and gas have been produced in East Siberia since the early sixties, the true potential of the region is unknown: however geologists are apparently more confident of finding further oilfields of the size of Samotlor in East rather than in West Siberia.[40] It is thought that offshore exploratory activity in the Baltic and Caspian Seas, stated to be a priority for the tenth Plan, will not begin to provide additional quantities above current levels before 1980. Lack of appropriate drilling equipment is the principal problem. For example in Caspian offshore operations drilling equipment is adequate to probe only up to 60 metres below the sea bed, whereas the major deposits of oil are to be found between 60 and 200 metres. This has meant that approximately half of the exploratory wells sunk so far have had to be abandoned due to the inadequacy of production technology.[41] The extent of the problems faced in offshore drilling technology is highlighted by consideration of the efforts devoted to extracting oil from wells previously abandoned as uneconomic. For example a

---

[39] Ekonomicheskaya gazeta 22/1976, p.4.

[40] Sotsialisticheskaya industriya 13 September 1974, p.2.

[41] Vyshka 16 January 1976, p.2.

novel method of oil extraction has been developed in order to re-work some of the oilfields in the Baku area. This process involves the excavation of underground caverns and the installation of drilling and pumping equipment, such that crude oil can be 'mined', stored temporarily underground and then pumped to the surface through conventional pipelines.[42] Further examples of the re-working of abandoned wells are to be found in the Caucasus area, Central Asia and Kazakhstan.[43]

The question of exploration and utilisation of gas condensate is recognised as being of increasing importance during the tenth Plan. When the Urengoi field comes into full production in 1978 substantial amounts of condensate will be available. At the moment its role is not fully defined by Soviet planners. During the ninth Plan production remained at a relatively low level and was not increased towards the end of the Plan to counteract underperformance in the oil and gas industries. The immediate benefit of gas condensate is that apart from its high calorific value it needs little processing before it can be used either in the manufacture of gasoline or as petrochemical feedstock, and requires considerably lower incremental investment than that needed to derive the same final product from crude oil.[44] The

---

[42] Sotsialisticheskaya industriya 29 July 1976, p.2.

[43] N A Mal'tsev "Itogi i zadachi" Neftyanoe khozyaistvo 1977 No. 3, p.5.

[44] Pravda 12 June 1975, p.3. A recent Soviet paper on the development of gas condensate states that reserves are sufficient to permit a "sharp increase" in production in the

availability of condensate will alleviate slightly the pressure on demand for oil towards the end of the tenth Plan.

The oil production plan for 1976-1980 is outlined in table 5.4., in which the growing importance of West Siberia is evident.[45] It is recorded that West Siberia produced some 3 million tonnes above its target for 1976, the Samotlor oilfield accounting for some 110 million tonnes of total West Siberian production.[46] The net increase in production in 1976 compared with 1975 was 5.9 per cent and the Plan for 1977 called for a further increase of 5.7 per cent, this evidencing a steady production increment and a slightly declining rate of growth, as anticipated, towards 1980. Production in certain older fields continued to show an expected decline.

In addition to the overfulfilment of Plan by the Tyumen' oil and gas production association (Glavtyumenneftegaz), the collectives in Perm, the Komi ASSR, Udmurtia and Georgia recorded production in excess of Plan, operations in Tataria, Bashkiria, the Kuybyshev oblast', Groznyi, Orenburg, Stavropol and the Emba krai performed on target for 1976: however shortfalls were

---

short term. The authors stress that use of condensate in preference to crude oil derivatives for petrochemical manufacture will "simplify and cheapen" existing productive processes. Yu P Korotaev, G P Gurevich, I A Leont'ev "Dolgovremennoe obespechenie potrebitelei kondensatnym syr'em" Gazovaya promyshlennost' 1977 No. 4, p.21.

[45] Note that Neftyanoe khozyaistvo 1977 No.2, p.3, records that the 1976 oil production target was fulfilled at 100.3 per cent, showing 511.1 million tonnes against Plan of 509.4 million. The balance is the gas condensate element.

[46] Mal'tsev op.cit. p.4.

TABLE 5.4. Soviet Oil Production 1975 and Plan for 1976-1980
(million tonnes, incl. gas condensate)

	1975F	1976P	1976A	1977P	1980P	1980 Final Plan
USSR Production	491[1]	520[3]	520[5]	550[7]	620-640[9]	640[11]
West Siberian Production	148[2]	180[4]	184[6]	215[8]	300-310[10]	310[8]
West Siberia as % of Total Production	30.1	34.6	35.4	39.1	46.8-50.0	48.4

Sources:
1. Pravda, 1 February 1976 p.1.
2. ibid. p.2.
3. Izvestiya, 3 December 1975 p.2.
4. ibid. p.3.
5. Neftyanoe khozyaistvo 1977 No. 3, p.3.
6. ibid. p.4.
7. Ekonomicheskaya gazeta 8/1977 p.12.
8. Ekonomicheskaya gazeta 16/1977 p.12.
9. Izvestiya 14 December 1975 p.2.
10. ibid. p.5.
11. Izvestiya 28 October 1976 p.3.

recorded in Mangyshlak, Belorussia, Azov and Caspian offshore operations, Turkmenia, the Ukraine and the Lower Volga.[47] Table 5.5. details the 1976 production of major associations.

TABLE 5.5. 1976 Production of Oil by Major Production Association (million tonnes, inc. gas condensate)

Association	Production
Glavtyumenneftegaz	214.5
Tatneft'	98.9
Bashneft'	40.0
Kuybyshevneft'	31.7
Permneft'	24.7
Mangyshlakneft'	19.5
Turkmenneft'	13.9
Orenburgneft'	12.9
Kaspmorneft'	11.4
Komineft'	10.9

Source: Ekonomicheskaya gazeta 8/1977, p.2.

During 1976 some progress was made in developing the utilisation of wellhead gas. A further 3 billion cubic metres per year of processing capacity was installed, fulfilling the target set and enabling utilisation to be increased by 2 billion cubic metres. However it is noted that wastage of 17 billion cubic metres in 1976 was still regarded as excessive.[48]

---

[47] Ekonomicheskaya gazeta 8/1977, p.2.

[48] ibid.

The annual Plan for 1977 calls for an increase in production of oil and condensate to 550 million tonnes.[49] Again the major contributor to the increase is to be West Siberia and one detects little optimism for any substantial additional contribution from other producing areas. Particularly severe problems have been caused by delays in implementing the programme of offshore development, notably at the Mangyshlak peninsula in the Caspian Sea, where the prospects for bringing on stream substantial oil-fields were thought by Soviet geologists and economists to be attractive judging from exploratory evaluation during the ninth Plan.[50] Despite the apparent attractiveness of Soviet offshore oil deposits output declined during the ninth Plan.[51] Soviet planners seek to arrest this decline and to reach a production level of 18 million tonnes in 1980. The trend in Soviet offshore oil production is outlined in table 5.6.

The performance of the Soviet oil industry in the first eighteen months of the tenth Plan has been on target and might be thought to augur well for the attainment of the 1980 target of 640 million tonnes. However this depends as much on the extent to which depletion in the Volga-Ural area leads to declining

---

[49] ibid.

[50] A comprehensive description of the problems faced by the Soviet Union in developing offshore deposits of oil and gas is given by Joseph P Riva Jr in "Soviet Offshore Oil and Gas", in 'Soviet Oceana Development' Washington DC: US Congress, National Ocean Policy Committee 1976, pp.479-500.

[51] Soviet offshore output declined from 12.9 million tonnes in 1970 to 11.5 million in 1974. ibid. p.487.

TABLE 5.6. Soviet Offshore Oil Production 1965-1980Plan (M tonnes)

Year	Production
1965	11.4
1970	12.9
1971	12.5
1972	11.8
1973	12.0
1974	11.5
1975P	11.5
1980P	18.0

Source: Joseph P Riva Jr. "Soviet Offshore Oil and Gas" in 'Soviet Oceans Development' Washington D C: US Congress, National Ocean Policy Committee 1976, p.487.
(converted from barrels to tonnes at rate of 7.3 barrels per tonne)

production as on the capacity of West Siberia to overfulfil. Moreover the extent to which the Construction Ministry for Oil and Gas Enterprises fulfils its target is just as important a factor influencing the success of the Oil Ministry as their own efforts in exploration and production activity.

Gas Developments in the Soviet Union 1976-1980

The basic directives for the tenth Plan set the 1980 production target for natural gas at 400-435 billion cubic metres.[52] Production in West Siberia was scheduled to reach 125-155 billion by that date.[53] Subsequent discussion of these ranges of figures

---

[52] Pravda 14 December 1975, p.2.

[53] ibid. p.6.

resulted in the placing of the final target at the upper end of the scales, that is all-Union production of 435 billion cubic metres[54] and West Siberian of 155 billion,[55] Table 5.7. outlines the pattern of planned growth in gas production from 1976 to 1980.

During the ninth Plan the average annual increment in production was 18 billion cubic metres compared with 14 billion achieved during the eighth. However of the absolute growth in production of 91 billion cubic metres 53 billion (58 per cent) were obtained in the last two years.[56] The problems of overall fulfilment were caused in the first two years, and related to the difficulties of coordinating production and transportation rather than of the gas industry to produce.[57] Depletion in the gasfields of European Russia has been a feature of the ninth Plan, and it is likely that this will be increasingly severe during the tenth.[58]

The areas designated to be of prime importance in the tenth Plan were West Siberia, Turkmenia, the Orenburg oblast', the Komi ASSR and the Ukraine,[59] of which West Siberia was scheduled to provide over 30 per cent of Soviet output by 1980. West

---

[54] Ekonomicheskaya gazeta 6/1977, p.1.

[55] Editorial to Gazovaya promyshlennost' 1976 No. 11, p.2.

[56] S A Orudzhev "Osnovnye zadachi razvitiya gazovoi promyshlennosti v 1976 godu - pervom godu desyatoi pyatiletki" Gazovaya promyshlennost' 1976 No. 1, p.3.

[57] Jack, Lee, Lent op.cit. p.464.

[58] Gazovaya promyshlennost' 1976 No. 4, p.1. (editorial) "Po puti, namechennomu 25 s"ezdom KPSS".

[59] Orudzhev op.cit. pp.5-6.

TABLE 5.7. Soviet Natural Gas Production 1975 and 1976-1980 Plan (billion cubic metres)

	1975A	1976P	1976A	1977P	1978P	1979P	1980P	1980 Final Plan
USSR Production	289(1)	313(2)	321(3)	342(3)	370(3)	401(3)	400-435(4)	435(3)
West Siberian Production	38(5)	46(6)	48(7)	n.a.	n.a.	n.a.	125-155(8)	155+(9)
West Siberia as % of Total Production	13.1	14.7	15.0	n.a.	n.a.	n.a.	28.7-38.8	35.6+

(n.a. = not available)

Sources:
1. Pravda 1 February 1976, p.1.
2. Izvestiya 3 December 1975, p.2. Gazovaya promyshlennost' 1977 No. 6, p.1.
3. Ekonomicheskaya gazeta 6/1977, p.1.
4. Pravda 7 March 1976, p.3.
5. Ekonomicheskaya gazeta 14/1976, p.1; 22/1976, p.4.
6. Izvestiya 3 December 1975, p.3.
7. Ekonomicheskaya gazeta 6/1977, p.2.
8. Pravda 7 March 1976, p.7.
9. Gazovaya promyshlennost' 1976 No. 11, p.2, and 1976 No. 6, p.1.

Siberian reserves are such that the area is expected to be the major gas-producer long after the end of the tenth Plan.[60] However the consistent Soviet record of failure to meet production targets, with the corresponding necessity of revising them, has suggested to one Western analyst that the 1980 output of gas will at best be at the lower limit of the original range.[61]

According to a recent Soviet estimate West Siberia contains 70 per cent of Soviet gas reserves in all categories, prompting planners to require that West Siberia should provide 85 per cent of the total increase in production during the tenth Plan. The immediate benefit of West Siberian gas from the point of the production function is that the majority of reserves are concentrated in shallow deposits. Large-diameter wells sunk in the Tyumen' fields are capable of yielding 1 to 1.5 billion cubic metres of gas per 24 hours, this being 5 to 6 times the Soviet average.[63] The importance of accelerating production in the Tyumen' oblast' can be gauged from the fact that the 1976 production level of 43 billion cubic metres constituted a 10 billion

---

[60] B P Orlov "Perspektivy Sibirskoi promyshlennosti" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No. 5, p.42.

[61] Alan B Smith "Soviet Dependence on Siberian Resource Development" in 'The Soviet Economy in a New Perspective' Washington D C: US Congress, Joint Economic Committee 1976, p.491.

[62] Gazovaya promyshlennost' 1976 No. 4, p.1.

[63] S F Gudkov "Nauchnye issledovaniya - dvizhushchaya sila tekhnicheskogo progressa" Gazovaya promyshlennost' 1976 No. 1, p.9.

increase on the 1975 level.[64] These factors are however conditioned by the difficulties faced in providing adequate production technology, which would enable higher output to be achieved, since the rate of discovery of reserves of economically extractable gas was greater than the rate of increase in production, at least in the early part of the ninth Plan.

Though the Medvezh'e field will continue to be an important and expanding contributor to total production, the major area of interest is the Urengoi field, scheduled to reach full production in 1978.[65] There is still spare capacity in the Medvezh' field, since failure to commission pipeline meant that at the end of the ninth Plan the desired production level could not be achieved.[66] The amount of capital invested in the development of the Medvezh'e field comprises 40 per cent to the provision of gas-producing capacity and 60 per cent to infrastructure developments. Capital requirement and production costs are expected to rise in the Medvezh'e field during the tenth Plan,[67] and Soviet analysis of the price production cost of Medvezh'e gas has established that some 55 per cent is accounted for in

---

[64] Orudzhev op.cit. p.5.

[65] N V Petlichenko "Dobycha gaza v pervom godu desyatoi pyatiletki" Gazovaya promyshlennost' 1976 No. 2, p.5.

[66] P T Shmyglya "Nauka na sluzhbe osvoeniya gazovykh mestorozhdenii Sibiri" Gazovaya promyshlennost' 1976 No. 2, p.17.

[67] G P Sulimenkov, D A Podluzskii, V S Bulatov "Problemy povysheniya effektivnosti osvoeniya Tyumenskikh mestorozhdenii gaza" Gazovaya promyshlennost' 1976 No. 3, p.12.

offsetting depreciation of capital equipment. Though it is not clear what is included in the concept of 'depreciation', the significant fact is that this percentage is thought to be very high, and put at twice the all-Union average.[68] The major reason for this is thought to be that all materials and equipment have to be brought into the area: Tyumen' simply lacks an industrial base. Deficient organisation of the supply function has served to generate periodic shortages and to raise costs.[69]

The Urengoi gasfield presents a different aspect in that it has extensive reserves of gas condensate in addition to natural gas. Potential production of 100 billion cubic metres per year is envisaged from this field.[70] The debate on the development of gas condensate is still in progress and the ultimate production level is still a matter for speculation. The field's contribution to production is scheduled to commence in 1978, when the Medvezh'e field will have reached its production peak. It is intended that the major part of the production increase planned for Tyumen' in 1978 will be provided by Urengoi operations and the oblast' is to account for 20.4 of the 23

---

[68] ibid. p.13.

[69] For example the forestry industry in Tyumen' was developed before oil and gas, and hence still has substantial delivery quotas to fulfil, directing wood to distant deficient areas. One result is that the oil and gas construction industry in Tyumen' faces a paradoxical shortage of wood, which is brought from other areas at very high cost. ibid. p.15.

[70] Yu M Pavlov "Ekonomicheskie problemy razvitiya Sibiri i Dal'nego Vostoka" Izvestiya AN SSSR, Seriya ekon. 1976 No. 2, p.81.

billion cubic metre increase for the Soviet Union as a whole.[71] Between 1977 and 1979 Tyumen' operations are scheduled to contribute 70 to 75 per cent of the net Soviet increase in production and by 1980 they are to provide the whole of the increment.[72] The policy of rapid development of Tyumen' gas is intended to accelerate the process of maximum substitution of gas for fuel oil initiated during the ninth Plan, principally in the Volga-Ural industrial area, and to compensate for the anticipated decline in production in older fields.[73] Operations in Turkmenia, which showed a substantial rate of expansion in the latter part of the ninth Plan, when 47 of the 146 billion cubic metres produced during the Plan were obtained in 1975 alone,[74] were also scheduled for further expansion up to 1980. The production target for 1976 of 57 billion cubic metres depended for its fulfilment on the continued development of the Shatlyk gasfield, whose 1976 production target was 31 billion cubic metres,[75] whilst the objective was to maintain production in the Naip and Gugurtli fields, which had been exploited

---

[71] Editorial "Osnovnye napravleniya razvitiya gazovoi promyshlennosti v iubileinom godu" Gazovaya promyshlennost' 1977 No. 4, pp.5-6.

[72] S A Orudzhev "Osnovnye napravleniya povysheniya effektivnosti proizvodstva v otrasli v svete reshenii 25 s"ezda KPSS" Gazovaya promyshlennost' 1976 No. 11, p.3.

[73] ibid. pp.3-4.

[74] A A Annaliev "Turkmengazprom na novom etape razvitiya otrasli" Gazovaya promyshlennost' 1976 No. 3, p.10.

[75] Sotsialisticheskaya industriya 26 August 1976, p.1.

extensively during the ninth Plan.[76] By the end of May 1976 the Shatlyk field recorded a 400 million cubic metre over-fulfilment of Plan for the first five months of 1976.[77] This in its turn lifted Turkmen production to 82 million cubic metres per 24 hours and this augurs well for the possibility of Turkmenia's providing at least 80 billion cubic metres, or 20 per cent of Soviet production, in 1980, this being the objective.[78] Neighbouring fields in Uzbekistan, facing similar technical and logistic problems to those of Turkmenia, were scheduled to provide 36 billion cubic metres in 1976, but no increase on this level is expected between then and 1980.[79]

The development of the Orenburg hydrocarbon province is one of the major commitments not only of the Soviet Union but also of each of the other Eastern European full members of Comecon up to 1980. The gas production target for Orenburg in 1976 was set at 30 billion cubic metres, this representing an increase of 9.3 billion on 1975 production.[80] Capacity to to process and distribute 30 billion cubic metres per year was available at the end of the ninth Plan: however delays in bringing Orenburg up to planned production have meant that spare capacity was available at the outset of the tenth Plan.[81] These

---

[76] Annaliev op.cit. p.10, Orudzhev "Osnovnye zadachi..." Gazovaya promyshlennost' 1976 No. 1, p.6.

[77] Izvestiya 7 July 1976, p.1.

[78] Editorial "Pretvoryaya v zhizn' plant Partii" Stroitel'stvo truboprovodov 1976 No. 4, p.3.

[79] Pravda Vostoka 23 December 1975, p.2.

[80] Orudzhev "Osnovnye zadachi..." (1976), p.6.

[81] Stroitel'stvo truboprovodov 1976 No. 4, p.2.

delays have been particularly costly in that the province is the most conveniently located of the major Soviet gas deposits to centres of consumption in European Russia. The projected production capacity in the Orenburg oblast' is 45 billion cubic metres per year to be reached in 1977-1978 when the third stage of the complex is completed.[82] On the evidence available it appears that this latter figure will be the likely production level through to 1980. However, as outlined, the location and extent of reserves in this field are such that a higher level of production will be planned for the eighties. The planned increase in production for Orenburg in 1976 was achieved, the final figure being 31.8 billion cubic metres.[83]

The centre of interest in the Komi ASSR is the Vuktyl gas and gas condensate field, which is located reasonably closely to consumption centres and enjoys better transport links than many other major gas-producing regions. During the ninth Plan the field produced a total of 80 billion cubic metres of gas.[84] However it is felt that there will be short-term problems in maintaining production due to declining seam pressure and the fact that some 20 per cent of extractable reserves had been utilised by the end of 1975.[85] Gas production in the Timano-

---

[82]S A Orudzhev "Osnovnye zadachi razvitiya gazovoi promyshlennosti v iubileinom godu" Gazovaya promyshlennost' 1977 No. 4, p.6.

[83]Ekonomicheskaya gazeta 6/1977, p.2.

[84]Stroitel'stvo truboprovodov 1976 No. 4, p.2.

[85]G B Rassokhin et al. "Opyt proektirovaniya i uskorennogo vvoda v razrabotku Vuktylskogo gazokondensatnogo mestorozhdeniya" Gazovaya promyshlennost' 1976 No. 10, p.31.

Pechora region as a whole, in which the Vuktyl field is situated, is scheduled to rise to 22 billion cubic metres in 1980.[86] It is interesting to note that the directives for gas production in the Komi ASSR in 1976 require merely that the 1975 level be maintained, this being 17.8 billion cubic metres.[87] The medium-term significance of the Komi operation is its particularly favourable ratio of exploitable reserves to production. An estimate made in 1974 puts explored reserves at 390.9 billion cubic metres, of which 367.1 are classified as 'industrial', that is, readily exploitable.[88]

The 1976 production target for the Ukraine was set at 57.5 billion cubic metres.[89] The major contributor to Ukrainian production is the Shebelinka field, supplemented by a small number of new discoveries made towards the end of the ninth Plan. Maintenance of 1975 production levels is essential in the short term, since the area is the principal producer for export, being the gathering ground for the trans-Comecon 'Bratstvo' gas pipeline.

The regional performance of the gas industry in 1976 compared with 1975 is detailed in table 5.8. This distribution probably reflects the production balance originally desired for

---

[86] Stroitel'stvo truboprovodov 1976 No. 4, p.3.

[87] Orudzhev "Osnovnye zadachi..." (1976), p.6.

[88] Shelest op.cit. p.133.

[89] Orudzhev "Osnovnye zadachi..." (1976), p.6.

TABLE 5.8. Soviet Gas Production by Area 1975 and 1976 (billion cubic metres)

Area	1975	1976	1976 as % of 1975
USSR Total	289	321	111
of which:			
Ukraine	68.2	68.7	101
Turkmenia	52.3	62.6	120
Tyumen' oblast'	35.5	47.8	135
Uzbekistan	37.1	36.0	97
Orenburg oblast'	20.1	31.8	158
Komi ASSR	18.5	19.6	106

Sources: (i) Table 3.18.
(ii) Ekonomicheskaya gazeta 6/1976, pp.1-2.

1975, and constitutes a 11.1 per cent increase on 1975 production. In order to attain the target of 435 billion cubic metres in 1980 an average growth rate of 8.5 per cent is required, compared with an average annual rate of growth of 7.9 per cent actually achieved during the ninth Plan. The cumulative performance of the gas industry in the ninth Plan evidenced a shortfall of 71 billion cubic metres against a total planned for the five-year period of 1290 billion, this representing a 5.5 per cent shortfall. On the basis of performance in the first six months of 1977, totalling 170 billion cubic metres,[90] a total for the year of 345 billion can be reasonably expected.

---

[90] Ekonomicheskaya gazeta 31/1977, p.5.

The target for 1977 of 342 billion cubic metres constitutes an increase of 21 billion over the 1976 performance, but is 11 billion below the actual increase achieved in 1976 over 1975. This probably reflects an anticipated hiatus in growth prior to the commissioning of further capacity at Urengoi and Orenburg. The marked increase in production in 1976 over 1975 probably stems from the fact that productive capacity in Tyumen', available but under-utilised at the end of the ninth Plan, was brought on stream at an early stage in the tenth, when, amongst other things, freshly injected investment catalysed the provision of equipment and support materials that were evidently lacking towards the end of the ninth Plan. Consequently the importance of the timing of development in Urengoi and Orenburg for the capacity of the Soviet Union to provide the desired increase in gas production is very great, since it is likely that any "slack" within the interacting systems has by now been taken up. However, as in the case of the oil industry, the likelihood of the gas industry's meeting its 1980 target depends very much on the ability of other ministries to fulfil their delivery quotas of equipment and materials, and given the increased demands put on Siberian operations, the difficulties of gas supply are almost certain to increase. The gas industry, like the oil industry, faces the prospect of increasingly taut planning.

Logistic Developments 1976-1980

As in the ninth Plan major decisions are tied to coping with

the worsening geographical dislocation between production and consumption centres. Transport problems revolve around the installation of new pipelines and expansion of existing systems to correspond with the increments to production planned for West Siberian operations to 1980 and beyond. The tenth Plan calls for the construction of 15 thousand kilometres of trunk oil pipeline and at least a further 3500 kilometres for the transport of refined products. Some 35 thousand kilometres of new gas pipeline are planned for the same period.[91] Apart from the problem of the supply of materials and their technical performance construction engineers working in West Siberia have to contend with extremes of climate and natural environment. The most severe obstacle is that some 40 per cent of Tyumen's oil and gas-bearing area is extremely marshy in summer and frozen solid in winter, with the result that the construction "season" is limited to three or four months, when heavy equipment may be transported.[92]

The specific importance of the logistic development of West Siberia was reflected in the creation in June 1973 of the Siberian Pipeline Construction Association (Glavsibtruboprovodstroi).[93] The principal new oil pipeline projects are those

---

[91] Stroitel'stvo truboprovodov 1976 No. 4, p.1.

[92] V G Chirskov "Problemy kruglogodlichnogo stroitel'stva truboprovodov v bolotistoi mestnosti" Stroitel'stvo truboprovodov 1976 No. 1, p.10.

[93] V G Chirskov "Razvivaya truboprovodnyi transport Zapadnoi Sibiri" Stroitel'stvo truboprovodov 1976 No. 4, p.13.

from Nizhnevartovsk to Kuybyshev and from Kholmogorsk to Surgut; in the gas sector the major projects are to commission pipelines from the Medvezh'e field via Nadym to Punga, and from Nadym via Urengoi and Punga to join the system centered on the Vuktyl gas and condensate field.[94] The development of Siberia has important implications for the industrialisation of Soviet Central Asia. Whereas there is a high level of consumption there of locally produced gas, demand for petroleum products is also increasing. Hence towards the end of the ninth Plan construction work was started on a major crude oil pipeline from Surgut via Omsk. Pavlodar and Chimkent to refineries at Fergana and Chardzhou, supplying refineries at Pavlodar and Chimkent en route.[95] The difficulties of processing oil and gas at the wellhead under Siberian conditions have necessitated the greater application of technology for the transportation of gas-saturated oil to processing centres located at some distance from producing fields. This technique reduces the requirement for compressor stations, since the natural pressure of the gas is utilised, and the availability of gas in oil for further processing both marginally reduces the requirement for gas delivery capacity and stimulates greater usage of wellhead gas.[96]

---

[94] ibid.

[95] Editorial to Stroitel'stvo truboprovodov 1976 No. 5, p.3.

[96] G I Gorechenkov "Vysokoe kachestvo proektirovaniya - vazhnoe uslovie rosta effektivnosti stroitel'stva" Stroitel'stvo truboprovodov 1976 No. 5, p.6.

The most important single pipeline development currently in progress in the Soviet Union is that of the gas pipeline from Orenburg to the Western border, on which work commenced during the ninth Plan.[97] The line will be some 2800 kilometres long and consist for the most part of pipe of 1420 millimetres in diameter.[98] The delivery capacity of the system, when fully operational in 1980, will be 28 billion cubic metres per year, of which 4 billion will be used en route by the compressor stations.[99] Once the system is running at design capacity, some two thirds of the gas will be delivered to Eastern European countries as repayment of investment credits granted to the Soviet Union. The balance of the available gas and gas condensate will be directed to consumers in European Russia.[100] To take into account the development of the northerly hydrocarbon resources in the Komi ASSR a pipeline from Usinsk via Ukhta and Yaroslavl' to Moscow was completed at the end of the ninth Plan and work commenced in 1976 on the new line from the Punga and Vuktyl fields to join the gathering system in the Central region, running parallel to the existing 'Northern Lights'

---

[97] Description of the agreement reached at the 28th Congress of Comecon, held in Sofiya in June 1974, concerning joint participation in the construction of the pipeline is given in Appendix F of Jeremy Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976, pp.229-231.

[98] Stroitel'stvo truboprovodov 1976 No. 1, p.2.

[99] Hospodářské noviny 47/1975, p.8, also Vneshnyaya torgovlya SSSR 1976 No. 8, p.16.

[100] J Bethkenhagen "Die Zusammenarbeit der RGW-Länder auf dem Energiesektor" Osteuropa Wirtschaft 1977 No. 2, p.71.

pipeline.[101] The major achievements of 1976 were the commissioning of the trunk oil pipeline from Nizhnevartovsk to Kuybyshev, of the gas pipeline from Urengoi to Ukhta and of the second string of the gas pipeline from Ukhta to Torzhok.[102]

The fact of Siberia's substantial overfulfilment of the original production target for oil during the ninth Plan necessitated some rethinking of the forward requirement for pipeline capacity in the tenth Plan and beyond. In a study written in 1972 the prominent Soviet transport economist S S Ushakov put forward the view that in the period 1965-1985 one ought not to expect so great a movement of industrial production into eastern areas as to lessen the net demand for energy in European Russia.[103] Therefore there would be a continuing need to expand the oil and gas delivery systems and given the eastward shifting resource base the economics of pipeline transport become gradually more attractive.[104] The very rate at which Siberia has had to be developed serves only to underly Ushakov's conclusion. It should however be borne in mind that the availability of pipeline has been a regular bottleneck in both the oil and gas industries for a number of years,[105]

---

[101] Stroitel'stvo truboprovodov 1976 No. 4, p.3.

[102] Stroitel'stvo truboprovodov 1977 No. 4, p.1.

[103] S S Ushakov "Tekhniko-ekonomicheskie problemy transporta topliva" Moscow Transport 1972, p.15.

[104] ibid. p.166.

[105] Western sources have cited this as a factor contributing to the underfulfilment of Plan, especially in the gas industry. See Russell op.cit. pp.48, 66-67, and R W Campbell "Trends in

as is the fact of considerable cost escalation in pipeline construction in West Siberia. In the period 1965-1974 development of the pipeline system accounted for some two thirds of capital investment directed to the gas industry in that area.[106] In European operations the corresponding figure is one third.[107]

In order to alleviate the indigenous lag in technology and transport capacity the Soviet Union has negotiated a number of agreements with Western companies not only in relation to the solution of production problems but also in the construction of trunk pipelines, to the end that credits used for the procurement of Western technology and equipment might be repaid in deliveries of oil and gas.[108] (The impact of existing and possible deliveries from the Soviet Union is discussed in Chapter 6.) Whatever the outcome of current negotiations it is unlikely that large-scale development can be initiated and executed at a rate that will make a significant impact on internal availability of oil and gas or on the export balance during the tenth Plan.[109]

Information on refining policy in the tenth Plan is sparse. The directives for the Plan indicate that primary refining capacity is to rise by 25 to 30 per cent, and that the refinery mix should favour the output of high octane gasoline, low-sulphur distillate fuels, aviation kerosene and aromatics. This policy

---

the Soviet Oil and Gas Industry" Baltimore: Johns Hopkins Press 1976, pp.36-37.

[106] V S Bulatov "K voprosu ob udorozhanii gazoprovodnogo stroitel'stva na Tyumenskom severe" Izvestiya SO AN SSSR, Ser. obshch. nauk 1976 No.1, p.47.

[107] ibid. p.49.

[108] ibid. pp.49-50.

[109] The state of negotiations between the Soviet Union and Western companies and governments is outlined in J D Park "Oil and Gas in Comecon", in E de Keyser (ed.) 'The European Offshore Oil and Gas Yearbook 1976/1977' London: Kogan Page 1976, pp.261-262.

necessitates a substantial increase in secondary refining capacity.[110] It appears that the capital requirement for providing secondary refining capacity is 2 to 3 times more than equivalent primary capacity. To minimise the incremental capital requirement it is planned to expand existing secondary refining facilities rather than to undertake construction of new units. In response to the directive to site refining capacity close to consumption centres the objective is to double capacity in the Ukraine, to secure a 50 per cent increase in Belorussia, 80 per cent in Turkmenia and a 5-fold increase in Kazakhstan.[111] The directives on the refinery mix for the tenth Plan are broadly similar to those set for the ninth, and reflect the trend towards maximum production of light, non-substitutable products at the expense of fuel oil, given the taut supply of crude oil. The other significant factor to be discerned from the scarce information is that the trend towards increased capacity of individual processing units will continue, especially that of catalytic and steam crackers, the basis for manufacture of the much-desired light products.[112]

Oil and Gas Pricing, Its Relationship to Trends in the Energy Balance

Rising production costs, incurred as the oil and gas industries

---

[110] Izvestiya 14 December 1975, p.2.

[111] Ekonomicheskaya gazeta 13/1976, p.4. No data on actual capacities are divulged.

[112] V B Yastremskaya et al. "Organizatsiya i planirovanie proizvodstva v neftyanoi i gazovoi promyshlennosti" Moscow Nedra 1975, p.34.

become increasingly dependent on operations in West Siberia, have highlighted as a problematic issue the pricing of oil and refined products and natural gas in relation to other fuels. The question of crude oil pricing has been discussed in a recent article in 'Planovoe khozyaistvo'.[113] Current enterprise wholesale prices do not fully reflect cost and consequently a number of producers are performing below the financial targets of 'khozraschet'. On average, costs incurred at the exploration and development stages are estimated to be only 60 per cent covered by the present price structure, resulting in the industry's inability to retain a level of surplus that could be recirculated as investment funds. It appears that this problem arose during the last two years of the ninth Plan.[114] The nature of the problem is that under the terms of the 1967 price reform crude oil prices are determined on the basis of a calorific comparison with coal.[115] However oil has an alternative value as a raw material that bears no relation to its value as a fuel. Therefore, the authors argue, the sole product whose price should be determined in relation to coal is fuel oil.[116]

---

[113] S Levin, V Vasil'ev, N Kosinov "Tsenoobrazovanie v neftyanoi promyshlennosti" Planovoe khozyaistvo 1976 No. 7, pp.110-115.

[114] ibid. p.111.

[115] This is discussed in R W Campbell "Trends in the Soviet Oil and Gas Industry" Baltimore: Johns Hopkins Press 1976, pp.189-192.

[116] Levin, Vasil'ev, Kosinov op.cit. pp.111-112.

Currently the fuel oil element of the refinery balance is 30 to 35 per cent. Consequently, it is argued, some 65 to 70 per cent of refinery output is undervalued.[117] One might also point out that as the proportion of light crude oils in the refinery balance increases, there is a substantial economic loss in valuing the complement of refinery output on a calorific basis. An additional point is that under the present system of prices and returns it is economic to exploit only high productivity wells, leaving many unworked and further aggravating the tight supply position.[118]

At a time when the Soviet Union was seeking the increased use of fuel oil as boiler, furnace and power station fuel, its price was set at a more attractive level than that of coal, except in a number of major coal-producing regions where consumption of local coal was favoured.[119] Robert Campbell advances the highly probable hypothesis that in the light of increasing difficulties in the oil industry the pricing policy "may have been reversed" in favour of coal.[120] Given the general directives on fuel consumption policy already outlined, this would be a rational policy change on the Soviet part.

---

[117] V I Nazarov, A A Il'inskii, N I Pimenov "K obosnovaniyu predel'nykh ekonomicheskikh pokazatelei poiskov i razvedki neftyanykh plastov." Ekonomika neftyanoi promyshlennosti 1977 No. 4, p.3.

[118] ibid. p.7.

[119] V I Torbin "Territorial'naya differentsiya tsen v tyazheloi promyshlennosti" Moscow Ekonomika 1974, p.175.

[120] Campbell "Trends..." (1976), p.70.

It appears that similar problems are about to be encountered in the gas industry. There are several gasfields where production is falling and some smaller deposits which have not been brought into production because of high basic costs. It is argued that for the industry as a whole the pricing system does not permit the desired level of financial efficiency at the enterprise level.[121] This too has been a function of recently rising development and production costs, bearing in mind that as late as 1974 the system as a whole was recording a satisfactory financial performance.[122] However given the rate at which consumption has grown and production has shifted, the pattern of cost and return has changed very rapidly. Consequently, it is argued, more frequent re-appraisal of price relativities is needed.[123] Though not explicit, many of the problems surrounding the valuation of petroleum products as feedstock rather than as fuel affect the issue of natural gas pricing, since gas can fulfil either function. In any event higher prices for petroleum products and gas relative to coal would have the desired effect on consumers of improving fuel conversion efficiency and securing a move back towards coal in non-critical processes.

Rising world prices for energy, especially for oil, have altered the relative opportunity costs of energy raw materials in

---

[121] I S Tyshlyar, A A Kevorkov "Ispol'zovanie mekhanizma dogovornykh tsen na neft' dlya bolee polnoi otrabotki mestorozhdenii" Gazovaya promyshlennost' 1977 No. 3, p.23.

[122] As analysed by Campbell "Trends..." (1976), pp.70-71.

[123] Tyshlyar, Kevorkov op.cit. p.24.

the Soviet Union. It will be seen from the analysis of the general trend in Soviet energy policy given in Chapter 3 of the present study that the process of substitution of fuel oil by coal and natural gas was in progress prior to the OPEC price rises of 1973/1974 and was influenced by the view that a gradual increase in world energy prices could be expected, though not on the scale that did occur. The OPEC price rises served to compound this process.

However given the slow rate of internal adjustment that is characteristic of the Soviet system, it appears that the domestic pricing structure has not yet altered to correspond with the desired direction of change in response to the OPEC price rises. The production response was that of seeking to conserve energy, particularly oil, and of enhancing the relative position of coal, natural gas and nuclear power.

The Eastern European Oil and Gas Industries 1976-1980

Eastern and Western analysts agree broadly that the prospects for increasing production of oil and gas in Eastern Europe are very limited. However there exists a measure of flexibility in the energy balance considered as a whole, though each member-country enjoys respectively different levels of indigenous reserves and forward energy requirements, depending on factors such as the share of output of energy-intensive industry within total industrial output and relative efficiency in energy conversion.

Following the price rises imposed by the Soviet Union and OPEC the energy plans of the Eastern Europe share the common feature of stressing the maximum development of indigenous reserves up to 1980. The Bulgarian Plan calls for a 32 per cent rise in coal production between 1976 and 1980, by which time this fuel would account for approximately 20 per cent of the country's energy demand.[124] However demand for oil and gas as a fuel or as chemical feedstock showed a twelvefold rise between 1960 and 1975, and the expansion of the chemical and petrochemical industries is expected to continue to 1980, requiring proportionally increasing amounts of oil and gas.[125] Despite exploratory drilling in the Black Sea there appears to be no alternative to increasing imports in order to meet the rising demand for hydrocarbons, and the preferred policy is that of joint development with fellow-members of Comecon.[126]

Whereas the trend towards greater consumption of oil and gas in Hungary is expected to continue, it is now expected to do so at a lower rate than that anticipated before the oil price rises.[127] Consumption of natural gas is expected to reach 10

---

[124] I Kondov et al. "Razshiryavaneto na energiinata baza i rastezhot na neinata efektivnost" Planovo stopanstvo 1976 No. 2, p.37.

[125] ibid. p.38. See also Cecil Rajana "The Chemical and Petrochemical Industries of Russia and Eastern Europe 1960-1980" London: Sussex University Press 1975, p.179.

[126] Kondov et al. op.cit. p.38.

[127] V Zurbuchen "Die fünfte Fünfjahrplan der Ungarischen Volksrepublik 1976 bis 1980" Wirtschaftswissenschaft 1976 No. 10, p.1324.

billion cubic metres in 1980, of which 6.2 billion will be produced domestically compared with 5.2 out of a total availability of 5.98 billion in 1975. It is intended to produce 2 million tonnes of oil per year to 1980, whereas coal production is expected to decline slightly to 23.5-24.5 million tonnes in 1980 compared with 24.9 million in 1975. The net effect is that of raising import dependency in energy from 46 per cent in 1975 to 58 per cent in 1980.[128]

In meeting its growth targets for 1976-1980 the GDR is seeking to improve energy conversion efficiency by some 5 per cent annually.[129] Oil production will remain at its 1975 level, unless the joint Soviet-GDR-Polish enterprise currently exploring in the Baltic Sea discovers a field that can be brought into production rapidly.[130] Domestic production of natural gas is not expected to expand beyond 8 billion cubic metres by 1980 and the 1980 target for production of brown coal of 250-254 million tonnes represents a return to the production level attained in 1971.[131]

More detailed information has been provided by the remaining Eastern European countries who possess more extensive and relatively more varied reserves than the aforementioned countries.

---

[128] ibid.

[129] Petroleum Economist April 1976, p.137.

[130] Słowo powszechne 27 November 1975, p.2. records the setting-up of this consortium.

[131] G Schürer "Hauptrichtungen der weiteren Vervollkommnung unserer materiell-technischen Basis in den Jahren 1976 bis 1980" Einheit 1976 No. 9, p.1015.

Poland's reserves of hard coal can support considerable expansion of production. The Plan for 1976-1980 envisages substantial growth, within which industrial output is to rise by 48 to 50 per cent. However the rate of growth in energy availability is to be below that of most of the other sectors of the economy, including the energy-intensive sectors.[132] The priority of the Polish energy economy is to ensure rapid development of indigenous coal and gas. In the case of hard coal, production in 1975 was 170 million tonnes[133] and this is expected to rise to 200 million in 1980.[134] There has been a revival of interest in developing brown coal reserves. It is intended to raise output from 39.9 million tonnes in 1975, a figure which had remained roughly constant since 1972, to 80 million in 1980.[136] There has been a corresponding reorientation in hydrocarbon policy. Whereas in early 1973 the share of hard coal in the Polish energy balance was predicted to decline from 75 per cent in 1970 to 55 per cent by 1985 and 50 per cent by the year 2000, by which time oil and gas together would account for 30 per cent and nuclear power 12 per cent of energy demand,[137] as a result of price and supply developments in Soviet and Middle East

---

[132] J Kopytowski, Polish Deputy Minister of the Chemical Industry in an interview with 'Petroleum Economist' Petroleum Economist January 1976, p.19.

[133] ibid.

[134] ibid.

[135] Statisticheskii ezhegodnik stran-chlenov SEV 1976, p.77.

[136] Polish Economic Survey 1975 No. 7, p.6.

[137] J Mitrega "Die Brennstoff- und Energiebasis Polens heute und im Jahre 2000" Montan-Rundschau 1973 No. 3, p.72.

markets Polish planners revised their estimates to favour a lower (undisclosed) share to be held by oil in the period to 1980.[138] The forward position for Polish gas production is uncertain. There was little growth between 1971 and 1975 there is little to suggest any possibility of a marked increase in the 1975 production level of just under 6 billion cubic metres before 1980. Growth in gas consumption will depend on supply from the Soviet Union.

There are signs also of growing tension in the Romanian energy balance, caused in the main by stagnation in domestic oil production. At the outset of the 1976-1980 Plan it was envisaged that the share of domestic energy demand to be met by indigenous production would fall from 86 per cent in 1974 to 75 per cent in 1980.[139] At the same time the major change in the domestic consumption pattern would be the rise in demand for oil both as energy and feedstock for the chemical industry, whose share of total oil demand was to rise from 15 per cent in 1975 to 21 per cent in 1980.[140] Whereas the average annual rate of growth in energy consumption during 1971-1975 was 7 per cent, the corresponding figure for 1976-1980 was put at 6.8 per cent, and the necessity of maximum development and utilisation of domestic

---

[138] Petroleum Economist January 1976, p.19.

[139] I V Herescu "Creşterea economică şi consumul de energie" Revista economică 34/1975, p.12.

[140] I V Herescu "Dezvoltarea bazei energetice (1)" Revista economică 28/1976, p.1.

resources is stressed.[141] This latter element is reflected in individual fuel production targets for 1980. Oil production is scheduled to reach 15.5 million tonnes, showing little difference from the 1975 level. Likewise gas production in 1980 is put at 26.8 billion cubic metres, only slightly above the 1975 level.* However the target for coal production in 1980 is put at 52-54 million tonnes, 82 per cent of which consists of brown coal, this being an increase of 70 to 76 per cent on 1975 levels.[142] This policy for primary energy production is complemented by targets for fuel soncervation, particularly in the (energy-intensive) extractive and engineering industries.[143]

An additional effect of the deteriorating domestic supply position has been that of intensifying interest in nuclear power. However decisions concerning the commencement of power station construction taken during the drafting of the 1976-1980 Plan will not alleviate the problem until the mid-eighties. Early estimates look to a contribution by nuclear power to total

---

[141] ibid. pp.1-2.

[142] (i) Scînteia 3 August 1974, p.2.
(ii) Petroleum Economist January 1975, p.30.
(iii) Scînteia 3 July 1976, pp.2-4.

[143] I V Herescu "Dezvoltarea bazei energetice (2)" Revista economică 29/1976, p.1. See also V Popescu "Economisirea și valorificarea resurselor naturale" Revista economică 7/1976, p.5.

*This is the figure for natural gas only. A further 6-7 billion cubic metres of wellhead gas can be expected.

electricity generation of at least 20 per cent by 1980,[144] this giving an indication of Romania's considerable long-term commitment to this form of energy. At the time of writing there is some difficulty in assessing the effect of the major earthquake of 4 March 1977 on the short- and medium-term energy prospects of Romania. Information on the nature and extent of damage to installations or on the geological effect on individual fields has been sparse, but one authoritative Western source has expressed the opinion that damage was relatively slight and that it is unlikely to have any significant long-term effect.[145] It may be the case that the damage sustained by industry as a whole will result in demand for energy falling below previously expected levels, and that the resultant energy balance might not differ in terms of the relative share of fuels from that originally anticipated.

Substantial changes in energy policy in Czechoslovakia are expected between 1976 and 1980. Whereas from 1971 to 1975 the entire increase in energy requirements was met by imports, the Plan for 1976-1980 calls for greater domestic production of fuels. One third of the increase in energy consumption between 1976 and 1980 is to be provided by domestic resources, especially brown coal for use in electricity generation. Consumption of

---

[144] E Rodean "Energia nucleară şi promovarea progresului tehnico-ştiinţific în ţara noastra" Era socialistă 1975 No. 3, p.40.

[145] Petroleum Economist April 1977, p.156.

fuel oil in power stations will be retarded and eventually it is intended that coal will be the sole fuel used for new electricity generating capacity. Likewise in general boiler and furnace use coal will be the preferred fuel even when gas is available in increased quantities after 1978, when the pipeline from the Orenburg field is to be commissioned.[146] Production of hard coal is relatively insignificant and its output is not likely to be raised between 1976 and 1980. Brown coal production is scheduled to rise from 86 million tonnes in 1975 to 100 million in 1980, operations in the Most area accounting for the major part of this. Czechoslovakia is dependent on the USSR for supplies of crude oil and natural gas and demand for these will continue to grow. In the case of oil a significant change in the pattern of demand for refined products, complementing the relative decline in fuel oil, will be the increased demand for naphtha to support the planned growth of the chemical and petrochemical industries, whose share of oil consumption is to rise from 6 per cent in 1975 to 13 per cent in 1980.[147] In an attempt to alleviate the oil supply position Czechoslovakia has agreed to participate in the construction of the 'Adria' pipeline, which will deliver some 5 million tonnes of Kuwaiti oil per year after 1980.[148] It is estimated by the Czechs that on the results of exploratory work carried out during the 1971-1975 Plan domestic

---

[146] Hospodářské noviny 10 September 1976, p.3.

[147] ibid. Also Rudé právo 26 May 1976, p.5, and Rajana op.cit. p.179.

[148] Russell op.cit. pp.228-229.

production of oil and gas will not be increased between 1976 and 1980.[149] Beyond 1980 the development of nuclear power is seen to be the optimum solution to energy provision.[150]

Oil and Gas in Comecon 1976-1980: An Overview

Changes in the supply position in Comecon and the economic strain imposed by price rises have given rise to a shift in direction in energy planning in the bloc. Even when OPEC oil was available at some 10 dollars per tonne in the late sixties the foreign exchange cost was greater than the cost of using Soviet supply. Despite the Soviet Union's increasing oil and gas prices to Eastern Europe there remains the fundamental benefit of a continued high level of supply from that source. However given the considerable incentive for the Soviet Union to continue to supply her Western markets and the fact that the 'Druzhba' oil pipeline is operating at design capacity, the Soviet preference for providing gas rather than oil to Eastern Europe seems likely to be the major element of change between 1976 and 1980. Prior to the commissioning of joint projects on Soviet territory and the further development of nuclear power, the hydrocarbon supply position in Comecon, whilst not of crisis proportions, will remain tightly balanced.

149"Preliminary Observations on Long-Term Problems in the Field of Basic Products and Energy and of Long-Term Trends in the Czechoslovak Economy" Document transmitted by the Government of Czechoslovakia to the Economic Commission for Europe, Ref. EC.AD.(XI)/R.4/Add. 12. 30 January 1974, p.2.

150ibid. Also V Ehrenberger "Perspektivy rozvoje palivové a energetické základny" Nová Mysl 1976 No. 7/8, pp.100-101.

Chapter 6. Soviet Trade in Oil and Gas 1970-1980

In Comecon as a whole the level of foreign trade dependence is low by world standards. The Soviet Union is considerably less dependent on foreign trade in relation to net material product than fellow-members of Comecon.[1] Whereas in the sixties the rate of growth in foreign trade of the Comecon countries was below that of Western industrialised countries, and below the world average rate, since 1972 the position has been reversed. Whilst world trade expanded in 1972 by some 18 per cent, Comecon imports rose by 22 per cent and exports by 17.9 per cent. The member-countries enjoyed more favourable prices in hard currency trade due to advantageous realignments in Comecon currencies opposite sterling and the US dollar.[2]

A major source of influence determining the recent pattern of development of Soviet foreign trade is the low level, by world standards, of many branches of indigenous technology. As far as capital equipment is concerned, this "technology gap" has given rise to the need to secure imports of Western goods and expertise and in the early sixties, as this process gathered pace, there

---

[1] B Askanas, H Askanas, F Levcik "Structural Developments in CMEA Foreign Trade over the Last Fifteen Years (1960-1975)" Forschungsbericht No.23. (February 1975), Wiener Institut für Internationale Wirtschaftsvergleiche p.3.

[2] ibid. p.7.

was limited scope for balancing the drain on the economy through exports.

In the consumer goods sector of the Soviet economy the low level of indigenous technology provides finished goods of limited export potential. There is also evidence of rising demand for consumer goods, including those of Western origin. It might be thought that in order to alleviate problems in the balance of trade and payments by using indigenous resources the Soviet Union might direct a higher proportion of these resources to the development of industrial capital goods and to the financing of research to a greater extent than hitherto: however there is doubt as to the Soviet Union's ability to do this on a sufficient scale, since the demands on resources posed by the development of the military sector and the possible undesirable social consequences of excessive restraint on consumer demand appear to be equally influential considerations in the overall balance.

One possibility open to the Soviet Union is that of initiating joint-venture projects with fellow-members of Comecon in the industrial sector as a whole. An alternative might be to raise loans from elsewhere in Comecon, but this is limited by the fact that these countries themselves in respect of the balance of trade and payments, and are likewise aware of the dangers of restraining consumer demand. The possibility of increasing exports of a number of types of goods is fraught with difficulties: capital goods need to be retained for domestic use, consumer goods tend to be uncompetitive in world markets, agricultural

exports are unlikely to expand in view of the periodic and unpredictable shortfalls encountered in this sector. Raising further finance through Western capital markets is limited in scope since the Comecon currencies remain only partially convertible and the level of indebtedness is already regarded as high. Though the Soviet Union has relied for the most part on Western credits negotiated on a state-to-state basis, more recently loans have been raised on the Eurodollar market, since the USA government has been cautious about extending credits. On the other hand Western European governments and institutions have extended substantial credit facilities. At a time of Western economic slump credits are more readily obtainable by Comecon members, at a time of buoyancy more readily repayable.

Exports of raw materials, especially fuels, present a different prospect from the aforementioned goods. The rapid rise in prixes for energy raw materials has enabled the Soviet Union in the short term to recoup much of the cost of financing the import of technology and foodstuffs. In 1975 the Soviet Union exported some 130 million tonnes of crude oil and refined products out of a total crude oil production of 491 million. Of this 63 million tonnes were exported to the Eastern European full members of Comecon and 67 million to the remainder of the world. Over the period from 1971 to 1975 the share of fuels and and energy in total Soviet export value rose from 17.9 to 31.4 per cent.

The issues affecting the export balance in the period to

1980, when oil production is planned to reach 640 million tonnes, are the rates of increase in domestic consumption, in demand for energy in Comecon, the degree of flexibility enjoyed by the Soviet Union in meeting the increase in demand, and the capacity of the Eastern Europeancountries to supplement deliveries from the Soviet Union with purchases in the world markets. Such considerations will be influenced by the Soviet Union's analysis of her need for hard currencies and the extent to which this can be met by expanding her direct exports to the corresponding markets and also by enhancing her role as oil and gas broker. The latter issue is discussed in Chapter 7: the purpose of this Chapter is to analyse the pattern of direct Soviet export trade in oil and gas in the 1970-1980 period, having regard for the aforementioned factors and attempting to determine the considerations that influence Soviet decisions on the development of oil and gas trade.

As early as 1966 the Polish analyst S Albinowski advanced the view that the Soviet Union would run into an oil supply crisis by 1980.[3] Basing his calculations on a projected rise in per capita consumption of oil from 870 kilogrammes in 1965 to 2 tonnes in 1980, at which time he estimates that the Soviet population would have risen to 280 million, with corresponding figures for Eastern Europe in 1980 of 1.5 tonnes and 115 million,

---

[3] S Albinowski in Polityka, 24 September 1966. An English translation of this article appears in R E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970, pp.249-254. Subsequent references relate to this translation.

Albinowski concludes that demand for oil in the Soviet Union will reach 560 million tonnes in 1980 and 170 million in Eastern Europe. He puts Soviet production in 1980 at 630 million tonnes and that of Eastern Europe at 33 million. Assuming that the Soviet Union would allocate some 20 million tonnes for export to non-Comecon markets, leaving 50 million tonnes for Eastern Europe, an oil deficit of 90 million tonnes in the latter area in 1980 is predicted.[4]

Albinowski's extrapolation of per capita consumption of oil to 1980 overlooks not only the potential for improvement in energy conversion efficiency in general and particularly of oil which such a trend might suggest but also the likelihood of a declining rate of growth in population. More important, however, is the fact that although at the time of Albinowski's estimate the Soviet gas industry was in its infancy, the rates of growth being recorded had already given cause for confidence on the part of planners, who were forecasting an increasing share for this fuel in the energy balance, and of the Soviet foreign trade monopoly, who had entered into preliminary negotiations on gas export contracts.

A somewhat different analysis of Soviet trade potential was published in 1971 by the West German analyst Werner Gumpel.[5] He points to the existence of a very wide range of options existing

---

[4] ibid. pp.250-251.

[5] W Gumpel "Sowjetunion: Erdöl und Nahostpolitik" Aussenpolitik 1971 No. 11, pp.670-681.

at the time of his writing for alleviating supply tensions in any of the Soviet Union's fuels industries through coordinated planning and investment. Gumpel acknowledges an increasing tension in oil supply and demand, and the breadth of opinion as to the future of Soviet oil trade. He notes that an (unattested) OECD forecast puts 1980 oil production at 690-710 million tonnes and demand at 613 million, this leaving a surplus of 75 to 95 million tonnes for export.[6] He indicates that a prominent Soviet energy economist N V Mel'nikov estimated in 1969 that Soviet production in 1980 would be no more than 607 million tonnes,[7] and that a TASS bulletin of 16 May 1969 referred to projected Soviet oil production in 1980 as reaching "more than 500 million tonnes".[8] Gumpel favours acceptance of the Mel'nikov forecast, this in his view suggesting a small domestic oil deficit of 5 or 6 million tonnes in 1980. Though Gumpel subscribes to the view that the Soviet Union would be a net importer of crude oil by 1980,[9] the area of discussion being the extent of dependence, he does make reference to the possible emergence of natural gas, stressing the more favourable ratio of reserves to production and increasing export potential.[10] He does not however offer any analysis of domestic and export substitution possibilities, seeing

---

[6] ibid. p.676.

[7] N V Melnikov "Voprosy razvitiya toplivnoi promyshlennosti" Planovoe khozyaistvo 1969 No. 1, p.12.

[8] Gumpel op.cit. p.677.

[9] ibid.

[10] ibid. pp.679-680.

this as a minor issue.[11] A major point to which Gumpel alludes, but which is left undeveloped, is that the Soviet Union might be prepared to incur higher domestic costs in the energy sector in order to remain independent, as far as possible, of supply from historically so unstable an area as the Middle East.[12] Albinowski pointed out in 1966 that greater involvement on the part of Comecon countries in the Middle East, primarily in hydrocarbon production might afford the opportunity of influencing the development of the latter towards socialist-type patterns, as a counter to the spread of Western colonialism.[13] However whereas Albinowski confines his view of the Soviet Union's possible import of Middle East oil to suggesting that the issue might become part of a global competition for geopolitical influence, Gumpel goes so far as to intimate the possibility of an extension of the "Brezhnev doctrine" to include a direct Soviet military presence in the area.[14]

The analysis of Robert E Ebel, completed in 1970, presents yet one more view. Though primarily concerned with developments in Soviet oil and gas trade from 1917 until 1968, the work does offer in conclusion an estimate of Soviet oil and gas trade potential. Ebel is the sole author writing in this period to stress the impact of the development of gas on production of and demand for oil and petroleum products. He points to the low prime

---

[11] ibid. p.680.

[12] ibid. p.681.

[13] Albinowski, in Ebel op.cit. p.252.

[14] Gumpel op.cit. p.681.

cost of producing natural gas compared with other fuels[15] and the potential of gas not only to take the place of oil as first choice substitute for coal, in accordance with Soviet policy in the late sixties, but also as an export fuel in its own right in Comecon and Western markets. The rapid growth of the gas industry would, he argues,[16] depress the rate of growth in demand for oil in the bloc. Ebel estimates the figure for Soviet oil production in 1975 at 460 million tonnes, with the expectation that this would rise to 600-620 by 1980.[17] Despite acceptance of a lower figure than his contemporaries for 1975 (a figure which turned out to be 45 million tonnes less than the Plan target set for 1975), Ebel sees no basis for the proposition that the Soviet Union would be obliged to import substantial quantities of oil from the Middle East in the period up to 1975, suggesting rather that increased imports might be contemplated for economic reasons only and then only on the basis of accepting oil as the repayment element in barter trade.[18] Study of Ebel's forward estimate of gas production and trade sheds some light on to his view of prospects for the oil industry. The inaccuracy of Ebel's projections is due to some extent to the difficulties faced by Soviet planners themselves. In a short space of time

---

[15] Ebel op.cit. p.107.

[16] ibid. p.109.

[17] ibid. p.111 (based on forward estimates given by the Soviet Oil Minister, V D Shashin, in "Neftedobyvayushchaya promyshlennost' SSSR za 50 let Sovetskoi vlasti" Neftyanaya promyshlennost' 1967 No. 10, p.7).

[18] ibid. p.119.

the production level projected for 1975 was revised from a range of 380-400 billion cubic metres[19] to 300-340 billion[20] and even to 280-300 billion,[21] the latter estimate proving accurate in the event. Equally important were the Soviet estimates made at that time of production in 1980. A projection made in 1961 forecast a likely level of 680-700 billion cubic metres:[22] this was scaled down to 640-650 billion in an estimate made at the end of 1967,[23] but these proved to be well in excess of the final objective, limiting the rate of increase of the share of natural gas in the energy balance and in exports. Ebel forecast a slow-down in sales of oil to non-Comecon markets,[24] counterbalanced by rising exports of gas, especially to the expanding markets of the Netherlands, France, West Germany and Belgium, which were supplied at that time from the Dutch Groningen gasfield.[25] However the range of Ebel's estimate of the net Soviet export surplus of gas in 1975 of 7-9 billion cubic metres proved to be accurate.[26]

---

[19] Editorial "Na blago rodiny" Stroitel'stvo truboprovodov 1968 No. 5, p.7.

[20] Stroitel'naya gazeta 5 February 1969, p.1.

[21] Bakinskii rabochii 13 March 1969, p.2.

[22] Ebel op.cit. p.129.

[23] V G Vasil'ev "Gazovaya promyshlennost' - detishche Oktyabrya" Geologiya nefti i gaza 1967 No. 12, p.1.

[24] Ebel op.cit. p.134.

[25] ibid. p.135.

[26] ibid. p.166.

An analysis carried out in the early seventies stresses that although the export of raw materials has been advantageous for Comecon as a whole, and especially for the Soviet Union, growth in output appears inadequate to sustain the rate of economic growth in the industrial sector thought likely at that time. Consequently, the authors argue, trade in such materials, especially in coal, oil and gas, can be expected to decline.[27] They point to a declining volume of net exports of oil and refined products from the Soviet Union caused by increasing imports from the Middle East,[28] and also that although the Soviet Union could benefit from the rise in world prices for raw materials, the opportunities presented by the rise in oil prices in particular might not be fully exploitable.[29]

However analysis based on historical trends overlooks the changing role of oil and gas exports in relation to the demands of the economy as a whole. Their role as the export commodity most likely to secure the means of acquiring much-needed technology is the subject of a later review article by M C Kaser.[30] His view is that oil and gas form the "cornerstone" of Soviet plans for the development of trade with the West, to the extent that the quantity of each available for export to Eastern

---

[27] Askanas, Askanas, Levcik op.cit. p.26.

[28] ibid. p.29.

[29] ibid. pp.38-39.

[30] M C Kaser "Technology and Oil in Comecon's External Relations" (Review Article) Journal of Common Market Studies 1975 Vol. 13, pp.161-172.

Europe will be merely the residual after consideration of domestic needs and of the level of imports from the West necessary to support the economic Plan.[31] He argues that as long as the Soviet Union can maintain steady growth in oil production the volume of oil and refined products available for export to Eastern Europe should not decline below the 1970 level,[32] but stresses that the factors determining the ultimate level of exports of oil to Western Europe might be non-economic, and related to the extent to which the West might be prepared to become dependent on the Soviet Union for the supply of so vital a material as oil, fearing the possibility of embargo and its effects.[33]

On a different plane, the question of the greater involvement of the Soviet Union and Eastern Europe in world trade, and specifically in oil, in the context of the changed financial market following the massive inflow of wealth and purchasing power to the members of OPEC after 1973 is the subject of a further article by the same author.[34] Kaser advances the view that OPEC dollar surpluses might be deposited in Comecon institutions, offering financial stability, institutional solvency guaranteed by the state mechanism and an unblemished record

---

[31] ibid. pp.166-167.

[32] ibid. p.171.

[33] ibid. p.172.

[34] M C Kaser "Oil and the Broader Participation of IBEC" International Currency Review 1974 No. 6, pp.25-27, 32.

on the part of the Soviet Union in dealings with foreign creditors and depositors. Such a course of action on the part of OPEC would, he argues, allow OPEC to acquire goods without investment in Western institutions, a process which would serve merely to shore up the economic system of perceived political adversaries.[35] This overlooks the possibility that OPEC, or rather many of the Arab members, might be equally wary of financing the furtherance of Soviet imperialism, given the considerable antipathy towards Soviet-type socialism existing in many quarters of the Arab world. Direct investment by Middle Eastern countries in Comecon has been limited and the latter group has had to compete for a share of the petrodollar surplus via the international banking system.

A study completed in 1975 provides a particularly detailed analysis of Soviet trade in energy raw materials, including substantial data on oil and gas.[36] The work covers the period from 1960 to 1980 and the most recent data on which it is based are for mid-1973. Bethkenhagen's projection of the supply pattern rest on the assumption that the world price of oil could be expected to rise to 8 dollars per barrel (in 1973 dollars) by 1980.[37] Bethkenhagen's analysis contrasts with that of the

---

[35] ibid. p.25.

[36] J Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin: Duncker & Humblot 1975.

[37] ibid. p.266.

majority of observers of the time in that in 1980 Eastern Europe would receive 100 million tonnes of oil and refined products from the Soviet Union, with an upper limit of 35 million tonnes from other sources.[38] Even with an assumed forward price for OPEC oil below that actually imposed Bethkenhagen stresses the limited capacity of Eastern Europe to expand trade with OPEC producers. His projections do depend on a number of (self-admitted) assumptions that simplify considerably the forward position. For example he assumes that there would be no import restrictions on the part of Western Europe and no provision of technology and know-how from the West that could make an impact on Soviet export capacity before 1980.[39] He argues that Romania would remain independent of Soviet supply through to 1980[40] and that the upper limit on Soviet imports from the Middle East would be 20 million tonnes.[41] He points to the substantial export potential of gas in both Eastern and Western European markets, estimating that on the basis of contracts concluded up to the end of October 1973 exports of Soviet gas to Western Europe (West Germany, France, Italy, Finland, Austria and Sweden) would total 21 billion cubic metres in 1980.[42] His short-term estimate for oil production and exports proves to be somewhat

---

[38] ibid. pp.189, 294.

[39] ibid. p.298.

[40] ibid. p.299.

[41] ibid. pp.190, 295.

[42] ibid. p.204.

inaccurate, underestimating Soviet production in 1975 at 475 million tonnes and total exports at 101 million, with the supposition that there would be no increase in exports to the West on the estimated figure for 1975 of 43.6 million tonnes.[43] The short-term forecast for gas is more accurate, though again he underestimates 1975 production slightly, putting this at 284 billion cubic metres, and overestimates imports and domestic demand. He takes the view that imports of gas in 1980 will show little difference on his estimated level for 1975, with expansion in export trade from an estimated 22 billion cubic metres in 1975 to 50 billion in 1980.[44]

A similar perspective was presented at about the same time as the Bethkenhagen analysis by the American analyst A W Wright.[45] His point of departure is that Soviet decisions concerning the development of and export policy for oil and gas are determined by rational economic criteria. Whilst admitting an appreciation on the part of Soviet planners of potential 'political' gains resulting from trade policy (not only energy trade policy), he notes the existence of a point at which

---

[43] ibid. p.253.

[44] ibid.

[45] A W Wright "The Soviet Union in World Energy Markets", in E W Erickson, L Waverman (eds.) "The Energy Question: An International Failure of Policy" Toronto: University of Toronto Press 1974. (Vol.1.), pp.85-89. (Note also the existence of an earlier work by this author, his unpublished Ph.D. thesis entitled "The Theory and Practice of Soviet Investment Planning with Special Reference to the Mineral Fuels Industries" Massachusetts Institute of Technology 1969.)

incurrence of economic loss is judged excessive in relation to perceived political gain.[46] He argues that members of any 'customs union' may in respect of certain individual products pay a price for membership quantifiable in terms of import and export opportunities foregone, but that the overall benefit of membership may outweigh this.[47] He does however admit that in the course of the ninth Plan the terms of trade in energy materials altered in the Soviet Union's favour, correctly anticipating the Soviet Union's imposing a substantial price rise for fuels supplied to Eastern Europe.[49] Wright makes two important points particularly clearly. Firstly he expresses the view that the Soviet Union is capable of implementing fuel production and import/export policies involving independent development of indigenous resources, but that such decisions are required to be economically sound in relation to domestic cost and import and export prices of fuels. He maintains that the resurgence of interest on the part of the Soviet Union in joint ventures with Western associations was prompted by uncertainty as to whether the high import prices for energy in the post-1973 period could be expected to fall, leaving the Soviet Union with a substantial commitment to (uneconomic) energy developments, whereas joint investment would both spread the risk and create a communality of interest in keeping world energy

---

[46] ibid. p.85.

[47] ibid. p.91.

[48] ibid. p.93.

[49] ibid. p.94.

prices high. Secondly he makes the point that Soviet trade in non-Comecon energy markets has been conducted on a sound commercial basis, with no evidence of price-cutting beyond the level required to secure a contract and that this policy is likely to continue.[50]

P R Odell regards the principal feature of the Soviet energy economy as a continuing drive for self-sufficiency, to the extent of incurring expense in supplying certain areas with indigenously produced fuel in preference to lower cost imports, maintaining that the Soviet Union chooses to import oil and gas for reasons of logistic convenience rather than of actual need.[51] This latter point appears justified in the case of gas. However in the case of oil the position is more complicated. Whereas Soviet foreign trade statistics show imports of crude oil and refined products from certain Middle East and North African producers, it has been pointed out that some of this may not in fact enter the Soviet Union, but instead be delivered to Comecon or non-Comecon markets on Soviet account.[52] In the light of the existing body of Western analysis of Soviet energy trade and potential the following discussion seeks to discern the trend in trade policy between 1971 and 1975 and to identify and assess the possible impact of domestic and external influences on the

---

[50] ibid. p.95.

[51] P R Odell "Oil and World Power: Background to the Oil Crisis" Harmondsworth: Penguin 1975 (4th edit.), pp.47, 49.

[52] M I Goldman "Detente and Dollars: Doing Business with the Soviets" New York: Basic Books 1975, p.17.

development of Soviet oil and gas trade.

Soviet Trade in Oil and Gas 1971-1975

The structure of imports and exports is no less regulated a phenomenon than domestic production within the Plan. The Soviet economy requires that the volume and composition of imports and exports be determined in relation to the requirements of domestic Plan fulfilment. Unlike the domestic Plan however, the Soviet Union releases no data on the import-export Plan. It is known that import-export agreements are usually timed to coincide with the Plan period and that prices are fixed for the duration of an agreement. It is important to bear in mind, as J Wilczynski has pointed out,[53] that although the export price of a particular Soviet commodity may be lower than its domestic counterpart, the Soviet Union does not sustain economic loss, since the crucial factor is the net surplus to the national production account, although the opportunity cost concept is certainly followed by Soviet planners. The price rises imposed by OPEC in 1973 and subsequently changed substantially previous patterns of long-term energy trade and price relationships of the Soviet Union with her customers and suppliers.

The role of fuels and energy within the commodity structure of Soviet foreign trade during the ninth Plan is outlined in table 6.1. It will be seen that not only have fuels become the

---

[53] J Wilczynski "The Political Economy of East-West Trade" New York: Praeger 1969, p.170.

TABLE 6.1. Commodity Structure of Soviet Foreign Trade 1971-1975 (%)

(A) Exports	1971	1972	1973	1974	1975
Machinery & Equipment	21.8	23.6	21.8	19.2	18.7
Fuel	17.9	17.7	19.2	25.4	31.4
Ores & Concentrate	18.7	19.0	17.1	14.7	14.3
Metals					
Chemicals, Fertilisers	3.4	3.3	3.0	3.6	3.5
Wood Products, Cellulose	6.3	6.1	6.4	6.9	5.7
Textiles, raw and semi-finished	3.3	3.8	3.3	3.3	2.9
Furs	0.4	0.4	0.3	0.3	0.2
Food Products	9.2	5.9	5.6	7.1	4.8
Consumer Goods	2.9	3.1	3.0	2.9	3.1
Total	83.9	82.9	79.9	83.4	84.6
Unspecified	16.1	17.1	20.3	16.6	15.4
Total in million rubles	12429	12734	15802	20738	24030
Of which Socialist countries	8116	8286	9115	11092	14584

(B) Imports	1971	1972	1973	1974	1975
Machinery & Equipment	34.0	34.6	34.3	32.4	33.9
Fuel and Energy	2.7	3.0	3.4	3.5	4.0
Ores, Concentrates, Metals	9.8	8.9	9.9	13.6	11.5
Chemicals & Fertilisers	5.4	4.9	4.3	6.3	4.7
Wood Pulp, Cellulose, Paper	2.1	1.8	1.6	1.9	2.2
Textiles, raw and semi-finished	4.5	3.3	3.7	4.1	2.4
Food Products	15.2	18.0	20.2	17.1	23.0
Consumer Goods	20.1	18.6	15.9	14.6	13.0
Total	93.8	93.1	93.3	93.5	94.7
Unspecified	6.2	6.9	6.7	6.5	5.3
Total in million rubles	11232	13303	15544	18834	26669
Of which Socialist	7360	8519	9216	10304	13986

Source: Narodnoe khozyaistvo SSSR, corresponding years.

major product group in Soviet export trade but they have also constituted the biggest growth sector in value terms. In import trade the measure of the Soviet Union's self-sufficiency and flexibility in energy planning is illustrated by the maintenance of the percentage value of fuels imports in relation to total imports, resulting in a much-decreased volume, after the OPEC oil price rises of 1973 and 1974. The enhanced earning power of the export of energy raw materials is evident from the export trends.

A major consideration of Western analysts during the ninth Plan has been the gradual increase of Soviet and Eastern European indebtedness to hard currency trading areas. Given the prevalent view in Western circles that Comecon was facing a growing energy deficit, especially in oil, the financial capability of the bloc to sustain imports of oil became an issue of increasing interest. The possibility of further expansion in trade with the West is hampered by quota and tariff restrictions. Exports of agricultural produce and foodstuffs faces the problems of the European Common Agricultural Policy and of the inadequacy of the sector itself to meet domestic demand. A recent estimate of likely developments in trading patterns made by R Portes concludes that if Soviet imports remained at the level of 1976 then the Soviet Union would need to increase exports to hard currency markets at the rate of 10 per cent per year in order that her debt on hard currency account might level off by 1980.[54]

---

[54] R Portes "West-East Capital Flows", occasional paper, University of London, Birkbeck College March 1977, cited in Financial Times 5 May 1977, p.32. Portes estimates an increase in the Soviet debt to the West from 5.9 billion dollars at the

The essential attractiveness of raw material exports from the Western standpoint is that the products themselves are homogenous, and meet simple, readily testable quality standards in contrast to Soviet technological goods, whose quality and performance are often below world standards. There has been an incentive on the part of Western countries to become increasingly involved in negotiations to secure the supply of Soviet oil, refined products and gas on two counts; firstly that the changing role of OPEC within the world petroleum market has given rise to uncertainty over the future of oil supply and its price, and secondly that the availability of Soviet gas in Western Europe might be the most economical way of supplying the established market, given that production from the Dutch Groningen gasfield is expected to peak and decline before 1980.

It has been pointed out that the bilateralism that characterises Soviet foreign trade has no basis in ideology or theory, but rather in its relevance to a country lacking reserves of hard currency and desiring to remain relatively isolated from the vacillations of world markets in addition to facilitating the integration of trade into the planning process.[55] The latter point is expanded in a later study by Adam Zwass, in which he suggests that the policy of using foreign trade solely to fill gaps in domestic supply of essential imports was conceived when

---

end of 1974 to 11.4 at end-1975 and 14.4 at end-1976.

[55] A Nove "The Soviet Economy" London: Allen and Unwin 1969, pp.214-215.

the Soviet Union felt that capitalism was a short-term threat but that it would nonetheless eventually be destroyed through its own inherent contradictions.[56] Nove argues that the major reason for the continuation of this policy is that the central Plan is still the basis of economic activity, into which foreign trade must be fitted in order that planners may demonstrate the formulation of an economic strategy that is not subject to world market forces.[57]

The issue of pricing is particularly pertinent to Soviet decisions concerning the pattern of exports of oil and refined products, whose supply became more restricted in relation to demand during the seventies than in the sixties, and of gas, where export opportunities have arguably been lost through delays in the construction of delivery facilities. Zwass points out that production for the home and export markets is regarded as a single function. Enterprises manufacture under exactly the same terms and criteria for export as for the home market, without having to take into account economic conditions prevailing in their particular export market.[58] In fact the Soviet foreign trade system shields the enterprise from world market fluctuations by absorbing any short-term gains or losses into the Budget.[59]

---

[56] A Zwass "Monetary Cooperation between East and West" New York: IASP 1975, p.46.

[57] Nove op.cit. p.217.

[58] Zwass op.cit. p.50.

[59] ibid. pp.59-60.

The prime objective in intra-Comecon trade is that of balancing a number of production relations in physical terms, but which are expressed for the purpose of internal accounting in monetary values. Zwass gives some details of the mechanism used in determining prices in intra-Comecon trade,[60] indicating that in addition to the fact that prices bear no relation to domestic cost and relative scarcity, the underlying problem is the potential obsolescence during the time of their application of the prices used,[61] and a system of exchange rate that does not reflect the international competitiveness of the economy of the individual country.[62] The case of oil pricing has been particularly interesting. During the late sixties there were a number of monopolistic elements determining the "world price" of oil in the form of the major oil companies operating in the Middle East and working increasingly with OPEC to secure an orderly rise in the price of oil. How the Soviet Union defines a "monopolistic element" to be discounted in calculating the "world price" is uncertain: what is however pertinent is that

---

[60] ibid. pp.144-146. The principle is to arrive at a world market price by eliminating seasonal, speculative and monopolistic elements over an extended period and to fix these for the duration of a given Five-Year Plan. For example basic prices for the 1971-1975 Plan were calculated on the average of those for 1965-1969. World market prices are then expressed in an appropriate Western convertible currency and converted to the Comecon equivalent at the current dollar-to-ruble exchange rate. See also O I Tarnovskii, N M Mitrofanova "Stoimost' i tsena na mirovom sotsialisticheskom rynke" Moscow Nauka 1968, p.84.

[61] Zwass op.cit. p.146.

[62] ibid. p.65.

the rapid change in the market price of oil after 1973 prompted the Soviet Union to take advantage of OPEC's monopolistic success in that the value of Soviet energy exports was reappraised in a very short time, enabling the Soviet Union not only to take advantage of opportunities in hard currency trade but also to revalue its increasingly labour-intensive oil and gas against goods supplied in return by other members of Comecon.

However since there appeared to be some uncertainty over Soviet capacity to maintain the rate of growth of production and trade that had been recorded in the sixties at the same time at which the quadrupling of prices for oil and refined products greatly enhanced opportunities for increasing earnings of hard currencies, the question arose whether the Soviet Union would forego such opportunities in order to supply the increasing requirement of Comecon, or alternatively (and additionally) whether Soviet oil and gas would alleviate the impact of higher prices on developing countries.

The pattern of Soviet trade in oil and refined products is detailed in table 6.2., the major features being the steady growth of gross and net exports, the rising trend of deliveries to Comecon and non-EEC markets and the fluctuating but apparently non-expanding level of trade with the EEC nine. The OPEC price rises of 1973 and 1974 are seen to have had a marked effect in halting the growth of Soviet imports from the Middle East. As internal energy policy was readjusted to take into account the price rises, the upward trend was resumed in 1975

TABLE 6.2. Soviet Trade in Oil and Oil Products 1971-1975 (million tonnes)

Exports	1971	1972	1973	1974	1975
Comecon	44.76	48.89	55.28	58.71	63.28
EEC 9	24.52	23.67	26.63	20.96	25.03
Rest of World	35.82	34.44	36.69	36.53	42.02
Total	105.10	107.00	118.30	116.20	130.35
of which: crude oil	74.80	76.20	85.30	80.60	93.07
refined products	30.30	30.80	33.20	35.60	37.28
Total Imports	6.70	9.10	14.70	5.40	7.56
of which: crude oil	5.10	7.80	13.20	4.40	6.50
refined products	1.50	1.30	1.50	1.00	1.06
Net Exports	98.40	97.90	103.60	110.80	122.79

Source: Vneshnyaya torgovlya SSSR, corresponding years.

TABLE 6.2.B. Exports of Oil and Oil Products by Country of Destination, 1971-1975
(Volume in million tonnes, unit prices in rubles per tonne)

Destination	1971		1972		1973		1974		1975	
	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price
(i) Comecon										
Bulgaria	7.96	14.6	7.95	14.9	9.32	14.5	10.86	15.1	11.55	34.2
GDR	10.38	13.6	11.48	14.1	12.99	14.1	14.42	21.1	14.95	28.2
Poland	9.55	16.6	11.06	16.5	12.34	17.4	11.86	20.7	13.27	39.5
Czechoslovakia	11.81	16.2	12.87	16.4	14.34	16.3	14.84	16.3	15.97	30.9
Hungary	5.06	16.6	5.53	17.0	6.29	17.8	6.73	21.0	7.54	41.0
(ii) EEC 9										
France	4.54	15.1	3.08	14.1	5.35	17.0	1.36	61.9	3.31	58.2
West Germany	6.09	15.4	6.20	14.4	5.85	36.6	6.34	65.7	7.63	62.2
Netherlands	1.63	17.7	2.43	16.5	3.22	42.5	2.98	71.4	3.09	65.0
Belgium	2.04	15.1	2.52	14.2	1.67	41.0	1.75	66.4	1.26	63.1
Italy	9.00	13.1	8.43	12.9	8.65	17.4	6.79	58.2	6.88	57.0
Great Britain	0.03	26.5	0.05	15.4	0.83	20.7	0.92	76.0	1.50	64.7
Irish Republic	0.33	9.7	0.19	10.6	0.18	26.8	0.12	62.5	0.18	49.0
Denmark	0.86	12.0	0.77	13.2	0.63	51.5	0.70	61.6	1.18	57.6

TABLE 6.2.B. (contd.)

Destination	1971 Vol.	1971 Unit Price	1972 Vol.	1972 Unit Price	1973 Vol.	1973 Unit Price	1974 Vol.	1974 Unit Price	1975 Vol.	1975 Unit Price
(iii) Rest of World										
Austria	1.13	15.9	0.97	15.4	1.25	22.8	0.97	63.2	1.33	58.7
Afghanistan	0.15	37.6	0.16	33.4	0.17	29.0	0.19	31.0	0.15	86.6
N Vietnam	0.38	34.2	0.19	45.0	0.23	42.4	0.29	39.0	0.40	35.3
Ghana	0.60	14.5	0.63	14.1	0.61	14.7	0.31	78.5	0.14	65.6
Guinea	0.07	29.5	0.07	28.8	0.09	28.7	0.08	82.8	0.06	75.3
Greece	1.01	16.6	0.91	18.9	0.80	22.0	1.03	67.0	1.89	59.5
Egypt	1.60	19.8	1.44	18.2	0.35	27.8	0.23	77.0	0.23	82.2
India	0.47	20.8	0.38	18.7	0.48	22.5	1.01	65.9	1.21	77.5
Iceland	0.38	22.7	0.44	19.9	0.47	27.0	0.46	75.2	0.45	73.5
Spain	0.21	18.9	0.78	14.6	0.51	17.8	1.35	60.6	1.72	57.6
Cyprus	0.20	13.1	0.13	14.0	0.12	14.2	0.11	52.2	0.21	44.9
N Korea	0.70	33.4	0.40	34.6	0.59	28.6	0.94	26.4	1.11	24.0
Cuba	6.44	11.4	7.02	13.1	7.44	15.2	7.64	17.7	8.06	30.8
Morocco	0.87	13.9	0.93	14.3	0.94	14.4	0.65	69.8	0.65	58.9
Mongolia	0.27	42.1	0.30	36.6	0.32	37.8	0.35	35.9	0.36	36.1
Norway	0.63	18.3	0.45	15.1	0.60	19.2	0.28	74.8	0.28	63.5

TABLE 6.2.B. (contd.)

Destination	1971 Vol.	1971 Unit Price	1972 Vol.	1972 Unit Price	1973 Vol.	1973 Unit Price	1974 Vol.	1974 Unit Price	1975 Vol.	1975 Unit Price
Somalia	0.07	23.4	0.07	28.5	0.07	25.7	0.11	38.6	0.12	72.6
Turkey	0.07	28.7	neg.	-	-	-	-	-	-	-
Finland	8.57	19.4	8.63	18.8	10.03	22.1	9.17	66.8	8.77	61.9
Switzerland	0.80	20.8	0.82	17.0	0.66	55.3	0.78	67.6	0.96	64.2
Sweden	4.57	12.9	4.36	13.3	3.22	18.0	3.03	55.9	3.45	50.1
Yugoslavia	2.88	18.2	3.40	15.1	3.89	22.8	3.80	65.5	4.44	61.3
Japan	3.28	13.6	1.01	15.4	2.02*	27.9	1.24*	57.8	1.32	51.2
West Berlin	0.17	15.6	0.36	16.0	0.43	52.5	0.53	76.3	0.85	70.7
Bangladesh	-	-	0.03	17.0	0.05	20.5	0.17	70.1	0.17	77.5
Nigeria	0.15	15.8	neg.	-	-	-	-	-	-	-
USA	-	-	-	-	-	-	0.18	59.8	0.54	62.2
Portugal	-	-	-	-	-	-	0.07		1.06	59.0
Nepal	-	-	-	-	-	-	neg.	-	0.06	72.5
Syria	neg.	-	neg.	-	neg.	-	0.05	76.7	neg.	-
Liberia	-	-	-	-	neg.	-	neg.	-	0.03	51.5
Brazil	-	-	-	-	-	-	1.23	65.0	1.48	88.7
Canada	-	-	-	-	-	-	0.16	50.8	0.22	60.2

*plus 1.0 million tonnes in 1973 and 0.2 million in 1974 under a non-commercial agreement.
(neg. = negligible)

Source: Vneshnyaya torgovlya SSSR, corresponding years.

TABLE 6.2.C. Pattern of Soviet Trade in Crude Oil and Major Refined Products 1971-1975
(million tonnes, unit prices in rubles per tonne)

(i) Exports	1971		1972		1973		1974		1975	
	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price
Crude Oil	74.8	14.1	76.2	14.4	85.3	15.8	80.6	28.9	93.1	40.3
Gasoline	4.1	22.1	4.5	19.8	5.5	28.9	5.8	68.4	6.0	67.1
Kerosene	2.4	24.4	2.3	22.5	2.3	33.5	2.6	55.3	2.6	67.6
Gas Oil	11.4	22.4	12.5	20.2	14.2	44.9	15.8	64.3	15.9	66.8
Fuel Oil	11.9	12.6	11.1	12.6	10.4	14.1	10.8	38.9	12.0	38.1
(ii) Imports										
Crude Oil	5.1	11.1	7.8	14.3	13.2	16.7	4.4	66.1	6.5	61.1
Gasoline	0.37	28.5	0.34	27.0	0.53	24.8	0.48	26.7	0.48	53.0
Kerosene	0.33	24.7	0.17	29.0	0.17	29.0	0.17	29.0	0.18	59.0
Gas Oil	0.18	24.4	0.14	25.2	0.14	25.4	0.12	25.2	0.12	51.0
Fuel Oil	-	-	-	-	-	-	-	-	-	-

Source: Vneshnyaya torgovlya SSSR, corresponding years.

but at a lower level than that suggested by the trend of the previous few years.

Table 6.3. details the corresponding pattern of Soviet trade in natural gas, showing the gradual transition in the status of the Soviet Union from net importer to net exporter, favouring primarily the Comecon market for logistic as well as politico-economic reasons. The significance of Soviet imports of gas is twofold. Firstly deliveries of Iranian gas constitute repayment in kind for Soviet supply of equipment and expertise used to develop the Iranian gas industry. Soviet engineers supervised the construction of the pipeline from Iran that joins the Soviet system linking Central Asia with the Central and European areas. The gas is consumed in Armenia and Georgia, whose local production is declining and where no substantial new reserves have been discovered recently. Similarly gas from Afghanistan serves as repayment for a variety of Soviet machinery and technology, and is consumed in the industrial areas of Kirghizia and Tadzhikistan, where local fuel production, especially of hydrocarbons, is inadequate to meet local demand. In the case of Iranian and Afghan supply the Soviet Union has successfully negotiated to maintain a lower import price than she is able to obtain for her own exported gas. Secondly there is no alternative market for either Iranian or Afghan gas. The major gas-consuming centres, namely Western Europe and the USA, have gas available at prices well below those at which Iranian or Afghan gas could be supplied, and since the majority of Iranian gas is associated with oil, the

TABLE 6.3. Soviet Trade in Natural Gas 1971-1975
(billion cubic metres)

	1971	1972	1973	1974	1975
Exports					
Comecon	3.13	3.44	4.07	8.56	11.29
EEC 9	-	-	0.35	2.93	5.44
Rest of World	1.43	1.63	1.62	2.55	2.60
Total Exports	4.56	5.07	6.83	14.04	19.33
Imports	8.18	11.04	11.41	11.94	12.41
Net Exports	(-3.62)	(-5.97)	(-4.58)	2.10	6.92

Source: Vneshnyaya torgovlya SSSR, corresponding years.
(Note that in 1973 the totals of the individual countries' exports do not add to the reported national total. The discrepancy of 740 million cubic metres is not explained in Soviet statistics.)

alternative would be to flare it at the wellhead.

The Soviet Union committed herself to supply fellow-members of Comecon between 1971 and 1975 with 243 million tonnes of oil and 33 billion cubic metres of gas, compared with 138 million tonnes and 8 billion cubic metres over the previous Plan.[63] It will be seen from tables 6.2. and 6.3. that deliveries of oil and refined products to Comecon between 1971 and 1975 totalled 271 million tonnes and of gas 30.5 billion cubic metres. Since Soviet and the majority of Eastern European export statistics no longer record separate deliveries of oil and oil products by

---

[63] Zwass op.cit. p.152.

TABLE 6.3.B. Gas Trade by Country. (billion cubic metres, unit prices in rubles per 1000 m^3) 1971-1975

Exports	1971 Vol.	1971 Unit Price	1972 Vol.	1972 Unit Price	1973 Vol.	1973 Unit Price	1974 Vol.	1974 Unit Price	1975 Vol.	1975 Unit Price
(i) Comecon										
Bulgaria	-	-	-	-	-	-	0.31	15.16	1.19	29.39
Hungary	-	-	-	-	-	-	-	-	0.60	
GDR	-	-	-	-	-	-	2.90	15.10	3.30	15.11
Poland	1.49	13.84	1.50	13.84	1.71	13.84	2.12	13.86	2.51	28.01
Czechoslovakia	1.64	13.81	1.94	14.75	2.36	14.75	3.23	15.28	3.69	25.47
(ii) EEC 9										
Italy	-	-	-	-	-	-	0.79	7.81	2.34	16.35
West Germany	-	-	-	-	0.35	14.62	2.14	14.12	3.10	17.83
(iii) Rest of World										
Austria	1.43	12.69	1.63	11.60	1.62	10.46	2.11	13.62	1.88	30.33
Finland	-	-	-	-	-	-	0.44	47.73	0.72	46.85

(Note that in 1973 the individual quantities do not add up to the reported global total. The shortfall of 760 billion cubic metres is not explained in Soviet foreign trade statistics.)

TABLE 6.3.B. (contd.)

	1971		1972		1973		1974		1975	
	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price	Vol.	Unit Price
Imports										
Afghanistan	2.51	5.43	2.85	4.99	2.73	4.94	2.85	6.84	2.85	12.43
Iran	5.62	6.19	8.20	6.29	8.68	7.80	9.04	14.57	9.56	15.33

Source: Vneshnyaya torgovlya SSSR, corresponding years.

country, it is not possible to calculate the extent of divergence from the agreed schedule. However, given that refinery capacity in Eastern Europe is regarded as adequate to meet domestic demand, with a consequently minor need for refined products, the likelihood is that the substantial part of deliveries consists of crude oil and that the contractual obligation was broadly honoured in spite of the increasing difficulties in oil production and the shortfall against original Plan. Bearing in mind the causes of the shortfall in the Soviet gas industry's production, the delivery of 30.5 billion cubic metres to Comecon during the ninth Plan represents a considerable commitment.

An interesting feature of the Soviet Union's pattern of trade in petroleum products is the maintenance of similar ratios between the product groups. Unit values for Soviet export trade in oil and refined products reflect the price adjustments made in non-Comecon trade in 1974 following the OPEC price rises and in trade with Comecon from 1st January 1975. The impact of the OPEC price rises if reflected in unit values for imported oil in 1974 and 1975 and in the drop in imports from the 1973 level. The relatively small volume of refined products imported by the Soviet Union originates in Romania and the unit prices in 1975 reflect the Romanian response to the re-evaluation of oil and its derivatives.

The terms of the change in the method of determining oil prices, effective from 1 January 1975, were that prices would be fixed annually on the basis of average world prices for the

period of the immediately preceding five years, an exception being made in the case of 1975, when they would be determined against the average of the three-year period from 1972 to 1974.[64] Though information on the effect of the Soviet oil price rise has been somewhat fragmentary, it has proved possible to make a number of observations on its impact on petroleum consumption in Eastern Europe and on Soviet trade. Prior to the Soviet price rise events had been set in motion that were to anticipate the further effect of such a rise. The impact of the OPEC rises was that of bringing about an immediate programme of energy conservation in Eastern Europe. In view of the small percentage of oil and energy supply accounted for by OPEC oil at that time one might reasonably conclude that the reaction related as much to an anticipated increase in such deliveries as to the solution of the immediate problem. For example, in Czechoslovakia the prices of the range of refined products were doubled and previously allocated delivery levels from refineries cut by an average of 10 per cent.[65] In Romania, where the domestic supply of energy, and of oil in particular, was a good deal less taut than elsewhere in Eastern Europe strict norms for improvements in energy conversion efficiency were introduced rapidly, and were expected to remain in force for the 1976-1980 Plan.[66]

---

[64] Trybuna ludu 8-9 February 1975, p.5.

[65] Rudé právo 30 March 1974, pp.1-2, Financial Times 2 April 1974, p.4.

[66] Revista economică 12/1975, pp.9-10.

The 1975 price for deliveries of Soviet oil to Eastern Europe was set at some 130 per cent above that charged from 1971 to 1974. The benefits of this substantial step-change to the Soviet Union were the earlier availability of higher revenues and the catalysing of discussion in Eastern Europe over the forward development of the energy balance of the individual countries and the issue of fuel conversion efficiency in general. The price rise involved an increase from an average of 16 rubles per tonne at the Soviet border to 37, with slight differences between the countries to take into account varying transportation costs.[67] However to the price rise was added a further problem, namely that for supply of oil above the negotiated annual quotas for 1975 and subsequently the Soviet Union would require payment in hard currencies.[68]

The price rise for Soviet oil was imposed at a time when Eastern Europe was faced with a mounting trade and payments deficit with the West, and when their trade surplus with the Soviet Union was turning into a deficit. The former deficit was incurred as a result of the adaptation in differing degrees on the part of the Eastern European countries of a development strategy of import-led growth, such that the output of imported machinery could eventually be used to repay the credits granted for its procurement. Decisions had been taken in the late sixties to initiate this process. However the upheavals in raw

---

[67] Financial Times 16 January 1975, p.6, 24 February 1975, p.8.

[68] Financial Times 20 March 1975, p.6.

material prices between 1973 and 1975 placed unanticipated stress on the international payment capacity of the Eastern European countries.

The process of import-led growth was taken to the greatest extent by Poland. Fortunately the existence of substantial reserves of hard coal enabled planners to react to the increases in oil prices by reorienting energy policy to favour a slower rate of substitution of coal by hydrocarbon fuels. The other Eastern European countries, with the possible continued exception of Romania, will have to allocate a level of goods for export to the Soviet Union proportionally higher than hitherto and seek credits from the Soviet Union to offset the higher fuel import bill if Soviet absorption capacity proves inadequate, especially since a continued rise in oil prices can be expected between 1976 and 1980 following the introduction of the moving average as the basis for calculation of prices. This is offset, albeit to a limited extent, in that one effect of the OPEC price rises has been that of worsening the detectable decline in the economic health of the West, resulting in decreased demand for its products, including machinery and technological processes, and greater efforts on the part of the West to sell these items to Eastern Europe on credit terms that are now substantially more favourable than could have been anticipated in the late sixties and early seventies, when steady growth was normal.

The Soviet Union reacted quickly to the OPEC price rises of

1973-1974. As an immediate measure imports of oil were cut from 13.2 million tonnes in 1973 to 4.4 million in 1974. At the same time the Soviet Union imposed a cut in exports of oil and refined products from 118.3 million tonnes in 1973 to 116.2 million in 1974, whilst the complex issues surrounding the likely level of future cohesion of OPEC, its effect on pricing policy and the extent to which high world prices for energy could be expected to hold were debated within the context of the options open to the Soviet Union for alternative energy policies, including the planned change in the role of oil in relation to gas and coal.

The availability of Soviet natural gas in Eastern Europe dates from the latter part of the eighth Plan, when contracts were negotiated with Poland and Czechoslovakia. By the end of the ninth Plan Soviet gas was available to each of the member-countries of the bloc with the exception of Romania, which remained self-sufficient up to 1975 and even exported a small quantity to Hungary. Comparison of unit import and export prices shows a diverging trend in favour of the Soviet Union, though as world prices hardened in the aftermath of the oil price rises both Afghanistan and Iran succeeded in negotiating higher prices for their gas delivered to the Soviet Union.[69] Given the more favourable ratio of explored reserves to production of gas compared with oil and the lower percentage of exports in

---

[69] Financial Times 11 July 1974, p.8, 19 August 1974, p.5.

production, a policy of substitution of oil by gas, not only in domestic but also in export markets, was initiated. The underfulfilment of targets in the ninth Plan by the gas industry delayed this process. However the emergence of supply problems was probably instrumental in catalysing cooperation between the Comecon members in developing Soviet oil and gas resources, the results of which will be evident towards the end of the tenth Plan.

In contrast to the Eastern European energy markets, which evidenced falling rates of growth in consumption, the energy markets of the rest of the industrialised world experienced an actual decline in energy consumed and this decline was most marked in the case of oil. Western Europe has been the prime market for Soviet oil since her re-emergence as an exporter in the late fifties and was seen as an obvious market for natural gas. In the immediate aftermath of the OPEC price rises and embargo on Rotterdam, the principal distribution point for the Western European oil market, the view was advanced that the Soviet Union might choose to expand sales substantially even at the expense of Eastern Europe.[70]

An analysis of the impact of Soviet oil on principal Western European markets is given in table 6.4. The essential features are a rise in the Soviet share of the total market, still small in most cases, as total demand declined and (see table 6.2.) the

---

[70] Petroleum Economist March 1974, p.99.

TABLE 6.4. Impact of Soviet Oil and Oil Products on Principal West European Markets 1971-1975 (million tonnes)

Country	1971	1972	1973	1974	1975
France:					
Total Imports:*	115.74	126.84	142.28	137.64	114.00
from USSR*	4.54	3.08	5.35	1.36	3.31
West Germany:					
Total Imports:	135.63	141.75	153.77	141.46	129.06
from USSR:	6.09	6.20	5.85	6.34	7.63
Netherlands:					
Total Imports:	69.02	67.79	72.16	64.59	55.23
from USSR:	1.63	2.43	3.22	2.98	3.09
Belgium:					
Total Imports:	37.99	42.38	45.67	39.67	38.03
from USSR:	2.04	2.52	1.67	1.75	1.23
Italy:					
Total Imports:	120.24	124.39	123.63	126.25	104.84
from USSR:	9.00	8.43	8.65	6.79	6.88
Great Britain:					
Total Imports:	126.80	128.14	133.28	127.59	104.16
from USSR:	0.03	0.05	0.83	0.92	1.50
Irish Republic:					
Total Imports:	5.81	5.62	5.06	5.81	5.57
from USSR:	0.33	0.19	0.18	0.12	0.18
Denmark:					
Total Imports:	21.07	22.01	21.31	20.14	18.77
from USSR:	0.86	0.77	0.63	0.70	1.18
Austria:					
Total Imports:	7.39	8.07	9.22	8.36	8.56
from USSR:	1.13	0.97	1.25	0.97	1.33
Spain:					
Total Imports:	36.53	28.34	44.08	45.84	43.85
from USSR:	0.21	0.78	0.51	1.35	1.72
Norway:					
Total Imports:	8.94	9.92	10.65	9.70	8.69
from USSR:	0.63	0.45	0.60	0.28	0.28

(*Note that in each country imports include crude oil and refined products.)

TABLE 6.4. (contd.)

Country	1971	1972	1973	1974	1975
Finland:					
Total Imports:	11.43	12.97	13.59	13.63	12.83
from USSR:	8.57	8.63	10.03	9.17	8.77
Switzerland:					
Total Imports:	13.02	13.43	14.38	13.35	12.67
from USSR:	0.80	0.82	0.66	0.78	0.96
Sweden:					
Total Imports:	29.75	28.66	28.64	27.39	30.88
from USSR:	4.57	4.36	3.22	3.03	3.45

Sources: (i) Table 6.2.
(ii) Eurostat, Energy Statistics 1975 pp.118-119, 163.
(iii) Eurostat, Quarterly Energy Statistics 4/1976 pp.51-55, 61-65.
(iv) OECD Statistics of Energy 1959-1973 passim.
1960-1974 passim.
1973-1975 passim.

marked increase in unit prices after 1973. The absolute volume of Soviet exports rose only slightly during this period, but included some fluctuations. However the major change between 1971 and 1975 was the effect on the visible trade balance of the increased price obtainable for Soviet oil after 1973. Data illustrating the importance to the Soviet Union of trade in oil with Western European countries are presented in table 6.5.

Finland and Sweden are the only Western European countries in which Soviet oil and petroleum products can be said to have made a significant contribution to supply. In the case of Finland there has been a long history of trade with Russia and the Soviet

TABLE 6.5. Soviet Visible Trade Balance with Principal West European Countries 1971-1975 (million rubles)

Country	1971	1972	1973	1974	1975
France:					
Exports:	194.3	194.0	272.2	397.9	495.7
Oil Exports:*	68.3	43.4	91.0	84.2	192.6
Oil.% of Exports*	35.2	22.4	33.4	21.2	38.8
Imports:	281.9	350.3	449.4	543.1	800.8
West Germany:					
Exports:	254.7	255.9	453.8	834.5	857.9
Oil Exports:	94.1	88.9	214.1	423.3	475.3
Oil % of Exports:	36.9	34.8	47.2	50.7	55.4
Imports:	411.9	571.4	756.4	1374.2	1919.4
Netherlands:					
Exports:	153.6	154.6	260.6	394.3	303.8
Oil Exports:	28.9	40.2	135.6	202.0	201.0
Oil % of Exports:	18.8	26.0	58.9	51.2	66.1
Imports:	70.5	67.7	95.6	176.4	147.2
Belgium:					
Exports:	97.9	108.1	194.3	297.9	243.6
Oil Exports:	30.9	35.7	68.6	116.2	79.2
Oil % of Exports:	31.5	33.1	35.3	39.0	32.5
Imports:	59.8	66.4	160.0	305.5	286.2
Italy:					
Exports:	233.1	228.0	309.5	597.6	638.0
Oil Exports:	117.7	109.0	153.1	394.9	392.3
Oil % of Exports:	50.5	47.8	49.5	66.1	61.5
Imports:	261.5	235.5	304.1	539.6	788.0
Great Britain:					
Exports:	407.7	371.1	540.6	690.5	591.1
Oil Exports:	0.7	0.8	17.3	69.9	97.3
Oil % of Exports:	0.2	0.2	3.2	10.1	16.5
Imports:	200.0	186.7	174.6	199.6	368.2
Irish Republic:					
Exports:	4.3	2.9	5.6	12.3	10.7
Oil Exports:	3.3	2.0	4.8	7.5	8.6
Oil % of Exports:	75.3	67.6	85.0	60.7	80.6
Imports:	0.3	0.5	0.6	15.9	20.4

(*In each country the category 'oil' includes crude oil and refined products.)

TABLE 6.5. (contd.)

Country	1971	1972	1973	1974	1975
Denmark:					
Exports:	26.0	24.9	53.8	78.1	105.7
Oil Exports:	10.4	10.2	32.5	43.1	67.8
Oil % of Exports:	39.8	40.4	60.4	55.2	64.2
Imports:	21.9	24.0	26.1	41.8	40.4
Austria:					
Exports:	90.9	82.7	99.6	166.0	218.5
Oil Exports:	18.0	14.9	28.6	61.4	77.9
Oil % of Exports:	19.7	18.0	28.7	37.0	35.6
Imports:	81.4	80.8	84.7	173.6	226.6
Spain:					
Exports:	10.0	20.9	30.0	122.0	143.6
Oil Exports:	4.0	11.5	9.1	81.7	100.3
Oil % of Exports:	40.4	54.8	30.3	67.0	69.8
Imports:	9.0	22.9	10.6	27.4	45.4
Norway:					
Exports:	42.1	21.8	34.7	46.8	64.4
Oil Exports:	11.5	6.8	11.5	20.9	18.0
Oil % of Exports:	27.3	31.1	33.1	44.7	27.9
Imports:	16.0	16.1	16.5	45.1	65.9
Switzerland:					
Exports:	35.9	30.7	67.9	79.5	89.5
Oil Exports:	16.8	14.0	36.1	52.8	61.6
Oil % of Exports:	46.7	45.6	53.1	66.4	68.9
Imports:	74.7	90.5	99.8	165.1	240.8
Finland:					
Exports:	322.8	297.6	415.1	937.6	918.2
Oil Exports:	166.4	162.1	221.8	614.8	542.5
Oil % of Exports:	51.6	54.5	53.4	65.6	59.1
Imports:	246.3	304.1	362.3	602.1	837.3
Sweden:					
Exports:	110.0	108.9	130.7	285.8	289.5
Oil Exports:	59.1	58.0	58.3	168.0	172.9
Oil % of Exports:	53.7	53.3	44.6	58.8	59.7
Imports	85.5	79.9	101.6	149.7	255.9

Source: Vneshnyaya torgovlya SSSR, corresponding years.

Union, facilitated by geographical proximity and in more recent times by her closer inclusion in the Comecon trading system when granted the opportunity of accounting in transferable rubles.[71] Trade with Sweden, linked with the earliest barter agreement for large-diameter pipe, has been maintained through the ninth Plan, but showed signs of decline towards the end.

It appears from Soviet trade statistics that the Soviet Union did not use the OPEC production cutback and eventual embargo on deliveries to the Netherlands as an opportunity for substantially increasing deliveries, the 1973 volume being less than 1 million tonnes above that of 1972. However the Soviet Union did benefit from the price rise. As Nove has indicated,[72] over half of the Soviet Union's expanded trade with the Netherlands in 1973 consisted of oil and oil products bought at a price some 150 per cent above the 1972 level, this suggesting that the majority of the Dutch purchases were made after the price rises and the imposition of the embargo.

Facing the problems of rising costs in the domestic oil industry and an apparently growing need for imports from the West, the Soviet Union's policy on oil business in Western Europe has been that of reaping the rewards of rising prices and of gaining an increased share of a declining market, which could well be maintained if the market began again to expand and when Western

---

[71] Zwass op.cit. p.57.

[72] A Nove in The Times 17 July 1974, p.21.

Europe might view the Soviet Union as no less secure a source of supply than the Middle East. It seems that the Soviet Union appreciated the consequences of prompting OPEC to adjust its pricing and output policies in order to retain control of the Western European oil supply balance, should the Soviet Union attempt to increase substantially its export volume to Western Europe for short-term gain.

As a result of the policy of continued growth in deliveries to Eastern and Western European markets the Soviet Union was unable to consider the possible option of alleviating the effect of the OPEC price rises on developing countries. However the quantity of Soviet oil exports to developing countries may perhaps be less significant than that the periodic negotiations for possible supply serve as a means of inducing existing suppliers and marketers of oil and products, often the affiliates of the major oil companies, to improve their terms of trade with consuming countries.[73] Though there is some measure of advantage in this practice (notably the case of supply to India in the early sixties outlined in Chapter 2), the Soviet desire to maintain the unity of Comecon and the need to secure the supply of Western technology appear to have taken precedence over the possibility of competing for politico-economic influence in the developing world, at least using indigenous oil as an element of strategy.

---

[73] B Dasgupta "Soviet Oil and the Third World" World Development May 1975, p.358.

In view of the particularly severe impact of the events of 1973-1974 on Japah it might seem surprising that trade in oil and refined products did not rise towards the end of the ninth Plan, but in fact showed a decline. An explanation of this trend is to be found in the emergence of China as an oil exporter, looking at Japan as a prime market. Deliveries of Chinese crude oil to Japan commenced in 1973 and totalled 1 million tonnes. This figure rose to 4 million in 1974 and to 8 million in 1975.[74] Influenced perhaps by the difficulties they were facing in negotiating supply from the Soviet Union at that time, involving changing commitments on the Soviet part as to quantities, price and terms of payment, the Japanese sought and secured marginal supplies from China on a barter basis, mainly in return for steel and industrial products, without becoming involved in negotiating credits and joint ventures with the Chinese.

In the aftermath of America's "oil crisis" there was some discussion of the possibility of the Soviet Union's supplying oil to the USA in return for grain.[75] One interpretation of this option, advanced at the outset of the 1975 Soviet-American negotiations over grain supply, was that the USA had no immediate need for Soviet oil, but that its increasing presence on the world market might serve to bring down the price set by OPEC and that this would contribute to Kissinger's "grand design" to

---

[74] Financial Times 26 February 1976, p.4.

[75] The Times 10 September 1975, p.4, 20 September 1975, p.4.

restore economic equilibrium in the world and to "fashion a new balance of power".[76] However despite the apparent need and desire of the Soviet Union to acquire supply of American grain there was no great eagerness on the Soviet part to sell domestically produced oil and refined products unless there was a corresponding commitment on the American part to entering into joint projects on Soviet territory, providing for the long-term development of Soviet resources. A further obstacle was that the USA attempted initially to negotiate for supplies at below world prices. One analyst argues that the causes of the apparent fall in American interest not only in short-term purchases of spot cargoes but also in long-term cooperation were suspicion of Soviet motives following the "grain robbery" of 1972, preoccupation with the socio-political impact of Watergate and the enthusiastic launching of "Project Independence 1980".[77]

There exists however a different dimension to Soviet interest in the American oil market. Although official Soviet trade statistics record exports of small quantities of oil and refined products to the USA in 1974 and 1975 (see table 6.2.), such figures cannot be regarded as representative of total business contracted between the two countries. Any Soviet oil or refined product made available to the USA would be phased optimally into the world logistic system of the major oil

---

[76] International Herald Tribune 2 October 1975, p.8.

[77] J Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976, p.178.

companies and therefore might be represented in physical movement to any of a number of countries. Additionally any oil made available to the Soviet Union in return for technical assistance or as the balance of a barter arrangement could be delivered from a third country to the USA on Soviet account. Although the Soviet system of import classification provides for the inclusion of materials re-exported without entry into the Soviet Union, it records only quantities authorised by the Soviet Foreign Trade Ministry. Any "switched" oil might be ordered through the international broking network and thus recorded as a direct delivery. It is likely, though not statistically demonstrable, that quantities of oil were shipped from Brazil and Venezuela to the USA under such arrangements, and consequently it is not possible to deduce the extent of the short-term commitment of "Soviet" oil to the USA.

During the ninth Plan the status of the Soviet Union as a gas trader changed from that of net importer to net exporter, building on delivery systems constructed as elements of barter trade during the latter part of the eighth Plan, facilitating supply to Czechoslovakia and Austria with an extension of the pipeline to Northern Italy, and to Poland and West Germany with a branch supplying the chemical complexes of the Halle-Leipzig area in East Germany.

After the oil price rises of 1973 and 1974 gas prices in Western Europe, the Soviet Union's prime market, began to harden. The attractiveness of gas as an export fuel was further enhanced

by the fact that the prices for imports of Afghan and Iranian gas did not rise proportionally to export prices (see table 6.2.). Export pricing of natural gas shows some interesting differences. In deliveries to Eastern Europe prices remained at a level of 13 to 15 rubles per thousand cubic metres from 1971 through to 1974, followed by a substantial rise, parallel to that for oil, in 1975 in each country with the exception of East Germany. The likely explanation of the latter factor is that it had been intended to supply East Germany at an earlier stage, but that commencement was delayed because of underfulfilment of the production Plan by the Soviet Union, leaving a lower quantity available for export than anticipated. Hence when deliveries did commence, the previously negotiated price was charged. Since deliveries to Western countries are tied to previous supply of steel pipe and equipment, the Soviet Union may well have decided that longer-term interests would be better served in meeting contracted deliveries to the West.

Pricing of deliveries to Austria and Finland shows in the former case a marked rise in 1975 compared with 1974 and in the latter a substantially higher price than for any other country. In the Austrian case the higher price was negotiated under a contract signed in 1974 following the expiry of the previous one negotiated in 1966/1967, linking gas deliveries to the supply of steel pipe, the price for return deliveries of gas relating to the market conditions of the time. Decisions taken in late 1974 relating to deliveries for 1975 and beyond involved a re-evaluation

of gas against the Austrian market price of fuel oil. Hence subsequent Soviet gas prices reflect not only the effect of the OPEC oil price rises but also the fact that since Austria is landlocked, the delivered cost of hydrocarbon fuels is, with Switzerland, the highest in Western Europe.[78] In the Finnish case the high cost of Soviet gas is due to the fact that supply is not linked to the counter-delivery of pipeline or equipment and has been negotiated separately from general bilateral trade agreements. The price was therefore linked to what the nearest free market alternative would have been.[79] In view of the rising cost of OPEC oil and the absence of convenient alternative fuels Finland had to pay the price determined by the international market.

During the ninth Plan the development of the Soviet gas industry was such that despite the shortfall against original targets planners were able to forecast trends in the domestic energy balance and trade structure that provided for its increasing contribution. The impact of Soviet gas on the energy economies of the individual countries was increasingly felt, though it could not alleviate the tensions caused by shortcomings in production and supply of other fuels and the increased cost of oil imports. Nonetheless the Soviet Union has negotiated supply contracts in Eastern and Western Europe that evidence considerable expansion over 1975 levels.

---

[78] Financial Times 28 January 1975, p.14.

[79] Bethkenhagen op.cit. p.208.

The pattern of Romanian trade in petroleum products is outlined in table 6.6. Although crude oil production in Romania showed little growth between 1971 and 1975 in accordance with Plan decisions had been taken to expand refinery capacity to 25 million tonnes per year with the intention of increasing exports of fuels and petrochemical feedstock. Despite the imposition of economy measures in 1974 domestic consumption has grown at a rate that has resulted in declining net exports at a time when prices in hard currency markets were rising. Consequently quantities of refined products that had been earmarked for export were consumed domestically and, as outlined in Chapter 5, the need to arrest this trend has influenced the planning of the Romanian energy balance for 1976-1980.

Soviet Trade in Oil and Gas 1976-1980

There are considerable differences in the views of Western analysts as to the likely level of exports of Soviet oil and gas in 1980, and these are outlined in tables 6.7. and 6.8. The issues are further complicated by the analysis of the Hungarian energy economist Istvan Dobozi, published in January 1973.[80] He too estimates not only an oil and gas deficit in Comecon as a whole by 1980, but also the likelihood of a deficit in the Soviet Union itself. Dobozi's analysis is detailed in table 6.9. Analysis of the likely performance of the Soviet oil and gas

---

[80] I Dobozi "An energiahordozók a KGST gazdaságában" Valóság 1973 No. 1, pp.18-27.

TABLE 6.6. Romanian Trade in Oil and Oil Products 1971-1975 (million tonnes)

	1971	1972	1973	1974	1975
Crude Oil Availability	15651	17101	18330	18924	19675
Total Exports of Products	5143	4966	4841	6456	6057
including:					
Gasoline	588	579	610	1106	1464
Gas Oil	2620	2374	2195	2378	2024
Fuel Oil	1541	1615	1715	2656	2258

Sources: (i) Table 4.21.
(ii) Statisticheskii ezhegodnik stran-chlenov SEV 1976 p.389.
(iii) Annuarul statistic din R S România 1976, p.391.

industries during the tenth Plan has been given in the preceding chapter: in studying the possible growth trend in consumption attention has been paid to developments during the ninth Plan and an attempt made to evaluate the impact of policies intended to have an effect on energy utilisation. Since the Soviet Union records no data on consumption of individual fuels, the quantity of oil and gas available for consumption, i.e. the net of production, imports and exports, has been taken as the basis for analysis, and the trends for the period 1971 to mid-1977 are outlined in table 6.10.

Western estimates of Soviet energy consumption made in the early to mid-seventies tended to the view that the rate of growth

TABLE 6.7. Western Analyses of Soviet Oil Export Potential in 1980 (million tonnes)

	1	2	3	4	5	6
1980 Production	607	640 (610-620)	640	640+	590	638
Imports	?	?	17.5	?	15	?
Availability	?	?	657.5	640+	605	?
Demand	612/613	500	514	517	470	550
Export availability	-5/-6	110+	143.5	123+	135	88

Sources:

1. W Gumpel "Sowjetunion: Erdöl und Nahostpolitik" Aussenpolitik 1971, No.11, p.677. Though Gumpel does not state a likely import level for 1980, he notes that the actual import/export pattern will be influenced by the need to maintain exports to Comecon for "political" reasons. He does however state clearly (p.679) that by 1980 oil will have ceased to play a part in Soviet export trade.

2. Economist Intelligence Unit "Soviet Oil to 1980" London: EIU 1973, p.33. The conclusion of the EIU analysis is somewhat unclear. The author states that official Soviet sources (unspecified) estimate crude oil production in the Soviet Union in 1980 to be 610-620 million tonnes, but advances the view that the likely level will be 640 million.

3. J Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin: Duncker & Humblot 1975, pp.61, 131, 253.

4. J Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976, p.56. Russell does not give an estimate of imports: however it appears from his preceding analysis that the figure of 123 million tonnes constitutes net exports.

5. E E Jack, J R Lee, H H Lent "Outlook for Soviet Energy" in 'The Soviet Economy in a New Perspective' Washington D C: US Congress, Joint Economic Committee 1976, p.473.

TABLE 6.7. (contd.)

6. A F G Scanlan "The Energy Balance of the Comecon Countries" in 'NATO Round Table on Exploitation of Siberia's Natural Resources' Brussels: NATO 1974, pp.97, 105.

TABLE 6.8. Western Analyses of Soviet Gas Export Potential in 1980 (billion cubic metres)

	1	2	3	4	5
1980 Production	460	400	400-440	390	454.5
Imports	13	15	15	15	?
Availability	473	415	415-454	405	?
Demand	430.7 (400)	365	363.3-402.3	346	412.5
Export Availability	42.3	50	51.7	59	42.0

Sources:
1. Economist Intelligence Unit "Soviet Natural Gas to 1985" London: EIU 1975, pp.45-47. The author of the report admits (p.47) that his initial estimate of 1980 domestic demand may only be of the order of 400 billion cubic metres, permitting export availability to rise to 73 billion.
2. J Bethkenhagen op.cit. p.253.
3. J Russell op.cit. pp.33, 68, 70.
4. Jack, Lee, Lent op.cit. p.473.
5. Scanlan op.cit. p.97.

TABLE 6.9. Hungarian Estimate (1973) of Comecon Production and Demand to 1980

A. Oil Production and Consumption (million tonnes)

Year	Production			Consumption			Production minus Consumption
	E Europe	USSR	Comecon	E Europe	USSR	Comecon	Comecon
1969	16	316	332	51	262	313	19
1980	22	625-645	647-667	170	650	820	-153 to -173

B. Gas Production and Consumption (billion cubic metres)

Year	Production			Consumption			Production minus Consumption
	E Europe	USSR	Comecon	E Europe	USSR	Comecon	Comecon
1966	21.17	142.96	164.13	21.87	142.13	164.00	0.13
1968	26.75	169.10	198.65	28.30	168.87	197.17	1.32
1980	50.00	550-600	600-650	100.00	630.00	730.00	-80 to -130

Source: I Dobozi "An energiahordozók a KGST gazdaságában" Valóság 1973, No. 1, p.22.

in consumption, especially of oil and gas, would be greater than the rate of growth in production,[81] resulting in a decline in exports.[82] The actual trends ran counter to expectation, evidenced in the data contained in table 6.10. There has been a substantial degree of substitution of oil by gas, despite the latter industry's failure to fulfil the initial targets of the ninth Plan, but the major effect has been a lower level of total energy demand than anticipated, due to the declining rate of growth of the economy as a whole.

The trend in consumption of oil and gas to 1980 will depend on the improvements that can be made in energy conversion efficiency, the rate of Soviet economic growth and the influence on import-export policy of the balance of payments. The basic directives for the tenth Plan emphasise the need to use cheap solid fuel rather than oil and gas in electricity production and set a target for reducing the amount of energy consumed in producing 1 kilowatt-hour to 325-328 grammes of standard fuel,

---

[81] See A F G Scanlan "The Energy Balance of the Comecon Countries" in 'Round Table on the Exploitation of Siberia's Natural Resources' Brussels: NATO 1974, pp.83-107. He argues (p.96) that demand for energy in the Soviet Union will rise at an average of 6 per cent per year between 1972 and 1980, and for oil at a rate of 8 per cent per year, reaching 550 million tonnes of standard fuel in 1980. This rate of growth in total energy demand is the same as that of the previous decade.

[82] R W Campbell states, "without trying to project specific rates, we might still conclude that there would be some acceleration of the growth of consumption in the coming period compared to the sixties, and as the rate of growth of primary energy production is unlikely to accelerate, the prospect is for heavy pressure to reduce exports". "Siberian Energy Resources and the World Energy Market" in 'NATO Round Table...' (1974), p.79.

TABLE 6.10. Trends in Production and Domestic Availability of Oil and Gas 1971 to mid-1977

A. Oil (M tonnes, inc. gas condensate)

	1971	1972	1973	1974	1975	1976	1977 Jan-Jun
Production	377	400	429	459	491	520	268
Imports (Oil and Prods.)	7	9	15	5	8	7	n.a.
Availability	384	409	444	464	499	527	n.a.
Exports (Oil and Prods.)	105	107	118	116	130	149	n.a.
Domestic Availability	279	302	326	348	369	378	n.f.

Growth Pattern	1972/1971	1973/1972	1974/1973	1975/1974	1976/1975	1977 Jan-Jun / 1976 Jan-Jun	1980P/1975A
Production (Mt)	23	29	30	32	29	13	139
(%)	6.1	7.2	7.0	7.0	5.9	5.1	28.3
Domestic Availability (Mt)	23	24	22	21	9	n.a.	n.a.
(%)	8.3	8.3	6.8	6.0	2.4	n.a.	n.a.

TABLE 6.10. (contd.)

B. Gas (billion cubic metres)

	1971	1972	1973	1974	1975	1976	1977 Jan-Jun
Production	212	221	236	261	289	321	170
Imports	8	11	11	12	12	12	n.a.
Availability	220	232	247	273	301	333	n.a.
Exports	5	5	7	14	19	26	n.a.
Domestic Availability	215	227	240	259	282	307	n.a.

Growth Pattern	1972/1971	1973/1972	1974/1973	1975/1974	1976/1975	1977 Jan-Jun / 1976 Jan-Jun	1980P/1975A
Production (billion cub. m.)	9	25	25	28	32	12	146
(%)	4.2	11.3	10.6	10.8	11.1	7.6	50.5
Domestic Availability (billion cub. m.)	12	13	19	23	25	n.a.	n.a.
(%)	5.6	5.8	7.9	7.6	8.9	n.a.	n.a.

Sources: Vneshnyaya torgovlya SSSR, corresponding years.

compared with 340 grammes in 1975.[83] This objective was stressed again by Kosygin in his speech to the 30th Comecon congress, adding that industry ought to convert rapidly to less energy-intensive processes and that the construction of nuclear capacity should be accelerated.[84] The economy as a whole has exhibited decreasing energy-intensity and this is planned to continue. Planners seek to achieve a saving in the level of energy consumed of 10 per cent (150 million tonnes of standard fuel) of the energy consumption level derived by extrapolation to 1980 of the energy consumption to NMP coefficient of 1975.

It is evident from table 6.10. that in 1976 the rate of increase in the domestic availability of oil and products was only 2.4 per cent on the previous year, whereas availability of gas increased by 8.9 per cent. Taking into account the trends in consumption during the ninth Plan (gas rising, oil falling), the annual expansion in the oil sector in 1976 compared with 1975 seems low, and could evidence some de-stocking to boost exports and domestic supply. Despite this, the trend is towards a declining annual rate of growth in oil consumption. Assuming that consumption increases by an average of 5.5 per cent per year between 1976 and 1980 and that imports reach no more than 10 million tonnes, then if Soviet production in 1980 is at the lower limit of the initial target for the tenth Plan (620 million

---

[83] Izvestiya 14 December 1975, p.2.

[84] A N Kosygin "Ocherednye zadachi sotsialisticheskoi integratsii" Planovoe khozyaistvo 1976 No. 9, p.5.

tonnes) the export surplus would be 135 million tonnes. If oil production reaches the upper limit (640 million) the export surplus would be 155 million. Alternatively if one supposes from the 1971-1975 trend that a further decline of 0.5 per cent per year in oil consumption can be expected, then, again assuming that imports total 10 million tonnes, the export surplus would be 170 million tonnes at 620 million tonnes' production and 190 million at 640 million tonnes.

In view of the trends in production and consumption between 1971 and 1976 it appears that the extremes of the above range of figures are unlikely. The range of 155 to 170 million tonnes of oil and oil products available for export in 1980 is therefore suggested as a reasonable estimate, and the substantial growth in export volume in 1976 could indicate that the upper limit of the suggested range is attainable. Table 6.11. contains a detailed analysis of Soviet exports of oil and oil products in 1976, showing changes in volume and unit price compared with 1975. The unit price is however not strictly comparable on a country-to-country basis because of the effect of product mix and of change in this mix over time. Nonetheless it is unlikely that the mix has changed greatly in the major export markets where, given that refinery capacity is generally adequate to meet demand, the majority of purchases from the Soviet Union will be of crude oil. In all but a few cases there has been a continued rise in the unit price of Soviet deliveries, but unit prices in trade with Eastern Europe have risen less than those

TABLE 6.11. Soviet Oil Exports 1976
(Oil and Products)

Destination	Volume ('000 tonnes)	Change cf. 1975	1976 Price (R/tonne)	Change cf. 1975
Total Soviet Exports	148514	+18163	51.7	+6.4
of which: oil	110790	+17720	46.2	+5.9
Products	37724	+443	67.7	+9.8
(i) Comecon				
Bulgaria	11868	+315	37.5	+3.7
GDR	16766	+1814	32.1	+3.9
Poland	14073	+802	42.0	+2.5
Czechoslovakia	17233	+1268	34.1	+3.2
Hungary	8435	+900	44.7	+3.7
(ii) EEC 9				
France	5729	+2422	65.0	+6.8
W Germany	7132	-502	80.9	+18.7
Netherlands	2674	-416	82.5	+17.5
Belgium/Luxemburg	2082	+827	66.8	+3.7
Italy	11982	+5099	65.4	+8.4
Great Britain	4051	+2796	68.9	+4.2
Irish Republic	155	-21	54.5	+5.5
Denmark	1632	+454	66.6	+9.0
(iii) Rest of World				
Austria	1513	+186	65.5	+6.8
Greece	1948	+60	67.0	+7.5
W Berlin	1072	+224	74.4	+3.7
Iceland	417	-21	77.3	+3.8
Spain	2002	+278	63.3	+5.7
Norway	218	-65	68.7	+5.2
Portugal	1039	-17	64.5	+5.5
Finland	9620	+912	66.4	+4.5
Switzerland	942	-18	71.6	+7.4
Sweden	2729	-721	61.2	+11.1
Yugoslavia	4858	+414	65.6	+4.3
Afghanistan	149	0	96.0	+9.4
Bangladesh	95	-72	85.3	+7.8
N Vietnam	439	+36	32.9	-2.4
India	1113	-94	88.1	+10.6
Cyprus	257	+51	51.3	+6.4
N Korea	1061	-49	41.2	+17.2

TABLE 6.11. (contd.)

Destination	Volume ('000 tonnes)	Change cf. 1975	1976 Price (R/tonne)	Change cf. 1975
Mongolia	415	+51	61.8	-25.7
Nepal	77	+18	81.4	+8.9
Syria	385	+383	74.9	-308.1
Japan	1773	+453	63.8	+12.6
Ghana	250	+106	64.7	-0.9
Guinea	81	+19	90.7	+15.4
Egypt	226	-5	89.8	+7.6
Liberia	24	-2.6	54.3	+2.8
Morocco	665	+16	64.2	+5.3
Somalia	136	+18	64.9	-7.7
Brazil	1071	-404	65.6	-23.1
Canada	93	-127	64.4	+4.2
Cuba	8809	+749	32.7	+1.9
USA	1059	+520	65.5	+3.3

Source: Vneshnyaya torgovlya SSSR 1976, passim.

charged to the majority of other countries. In a few cases the unit price has dropped, but the volumes involved are small and a slight change in product mix could account for this, since the price levels suggest that refined products constitute the sum of the quantities involved.

The structure of Soviet trade in gas in 1976 is outlined in table 6.12. Total exports grew by almost 6.5 billion cubic metres, showing increases in deliveries to each of the established markets and the commencement of deliveries to France. As in the case of oil prices, the Soviet Union has taken advantage of the rising world price for gas in its trade with the West and this is reflected also in rising unit prices in trade with other Eastern European countries. In contrast to the position in the oil

TABLE 6.12. Soviet Gas Exports 1976

Destination	Volume (billion cub.m.)	Change cf. 1975	1976 Price (R/'000 cub. m.)	Change cf. 1975
Total Soviet Exports	25780	+6447	28.45	+5.11
(i) Comecon				
Bulgaria	2229	+1044	33.37	+3.98
Hungary	1.001	+0.4	33.95	+4.13
GDR	3369	+67	27.71	+12.60
Poland	2549	+40	32.00	+4.00
Czechoslovakia	4287	+593	34.52	+9.05
(ii) EEC 9				
Italy	3720	+1378	14.00	-2.35
W Germany	3976	+878	22.73	+4.90
France	993	+993	25.60	n.app.
(iii) Rest of World				
Austria	2785	+902	33.45	+3.12
Finland	870	+151	47.26	+0.41

n.app. = not applicable.

Source: Vneshnyaya torgovlya SSSR 1976, passim.

industry, domestic availability of gas has shown increasing rates of growth (table 6.10.B.). However the future export level of Soviet gas will depend on success in meeting Plan targets and the rate at which it is used as a domestic substitute for oil, since there is no possibility of increasing imports from Iran and Afghanistan, since the pipelines are currently operating near design capacity. Considering the past performance of the gas industry against Plan it is difficult to estimate the likelihood of attainihg the target of 435 billion cubic metres in 1980. It may however be indicative of Soviet confidence that the gas target for 1980 was eventually set at the upper limit of the original range. It may also be significant that in the early part of 1977 annual production targets to 1980 for the coal and gas industries were released, but none for oil.[85] One possible explanation for this is that plans for oil production may be subject to revision in the light of any success achieved in coal and gas production that facilitates substitution of fuel oil by the former and of petrochemical feedstock and domestic fuels by the latter, leaving planners the choice of scaling down the oil production target for reasons of technical difficulty, high operating cost or for reserve conservation. Judging from the performance of the gas industry to mid-1977 there is a strong possibility that the target of 435 billion cubic metres can be

---

[85]Annual targets for coal production to 1980 are given and discussed in Ekonomicheskaya gazeta 4/1977, pp.1-2, and for gas production in Ekonomicheskaya gazeta 6/1977, pp.1-2. However the discussion of oil developments given in Ekonomicheskaya gazeta 8/1977, p.2 does not detail annual production targets.

attained in 1980 and even if a shortfall similar to that experienced in the ninth Plan were repeated, the production level is hardly likely to be less than 400 billion. If therefore imports remain at 12 billion cubic metres, then, assuming that domestic consumption were to grow by 8.5 per cent per year between 1976 and 1980 (this being only slightly below the rate of increase in 1976 over 1975), then an export surplus of 31 billion cubic metres would be available in 1980 if production then were 435 billion. If however consumption were to grow at an average of 6 per cent per year after 1976, an export surplus of 59 billion cubic metres could be counted on. In the light of the gas industry's performance to mid-1977 the latter figure is considered realistic.

The need to import grain and technology from the West during the ninth Plan accounted for the substantial growth in imports. Export prospects deteriorated as the developed Western world became increasingly affected by inflation and economic recession. Despite this the enhanced value of fuels exports accounted for much of the increase in the Soviet Union's non-Comecon trade and the greater revenues came when they were most needed, after the grain purchases of 1972 and 1973. As Philip Hanson has indicated,[86] the Soviet Union's trade with non-Comecon countries during the ninth Plan was some 50 per cent above the level

---

[86] P Hanson "USSR: Foreign Trade Implications of the 1976-1980 Plan" (Economist Intelligence Unit Special Report No 36, 1976). London: EIU 1976, p.3.

implied in the original directives. Although it is likely that there will be some deceleration in imports other than of grain during the tenth Plan, there is still a large debt to service, which Hanson believes will grow up to 1980. Accordingly the increased export of fuels and energy, especially of oil and gas, may be unavoidable, to the extent that availability for domestic and Comecon deliveries may be determined only after taking into account the demands of the deficit on trade with the West. As shown in the 1976 trade figures, the Soviet Union is expanding her oil trade with the West and is developing her gas trade with Western Europe particularly rapidly. The income from oil and gas trade will not clear the Soviet debt: it may however serve to keep the Soviet Union from the point at which international institutions might call a halt to the extension of credits.

Chapter 7. Soviet Relations with Oil and Gas Producers

It might be thought reasonable to suppose that given the Soviet Union's self-sufficiency in energy, including oil, and its capacity to supply the substantial majority of Eastern Europe's energy need whilst maintaining a level of exports to the West adequate to support essential imports and to help avoid the risk of a balance of payments deficit such as would prompt the industrialised West into limiting the extension of low-interest loans facilitating such imports, there should be no basis for any interest on the part of the Soviet Union in negotiating for supplies of oil and gas from other producers. However imports can serve other than domestic needs and oil trade in particular reflects to a great extent the coalescence of economic, political and strategic elements of Soviet relations with the rest of the world, and particularly with the USA. Discussion of the Soviet Union's apparently increasing need for Middle East oil from the early seventies pointed to an impending change in superpower relations that perceivedly declining Soviet self-sufficiency in energy would entail. However the events of 1973-1974 necessitated considerable re-thinking of the role of energy, especially of oil, not only in respect of the import needs of much of the industrialised world, but also of the inter-relationship of the major powers.

Any nation that is dependent on unstable foreign sources for its energy supply is in danger of having that supply interrupted at any time. A country that has been dependent on OPEC oil in the pre- and post-Yom Kippur period has been obliged to restructure its foreign trade, generally such a nation has been obliged to spend considerably more on the import of oil and its terms of trade have deteriorated substantially with OPEC. Moreover given the fear of possible further interruption of supply a highly dependent net importer has seen its foreign policy options, especially in the Middle East, become narrower. In contrast the self-sufficient nation enjoying autarchy, if necessary at a tolerable cost, can remain aloof from the vacillations of an unstable international market and enjoy a wider range of options in external relations, which would be enhanced by the possession of a vital resource such as oil, which, as long as a surplus over domestic demand were maintained, would afford a measure of logistic freedom, from which would stem greater flexibility in trade strategy and foreign policy.

The multidimensional nature of the Soviet role in the Middle East, the world's major oil-producing area, is highlighted in two recent publications. Ian Smart stresses four principal interacting influences that shape the policy of the USA and the Soviet Union with regard to the Middle East: firstly that the area itself is an arena of violent international conflict on frequent, though generally unpredictable occasions, secondly that the two countries conventionally

termed "superpowers", namely the USA and the Soviet Union, have varied interests and influences in the area, thirdly that each superpower is concerned with the international energy market, though each to a different extent and in a different way, and fourthly that the conduct of policy in the Middle East on the part of each superpower affects their own economic and political interactions.[1] Concentrating exclusively on the question of the Soviet role in the Middle East, Hannes Adomeit points to three major elements shaping Soviet policy: firstly that the Soviet Union regards as illegitimate the setting-up and continued existence of the state of Israel in Palestine, the major cause of conflict in the area, secondly that the Soviet Union attaches great importance to her ability to intervene militarily on behalf of states perceived to be friendly, and thirdly that the Soviet Union believes she has an ideological commitment to assist the Arab nations in freeing themselves from a colonial past.[2]

To understand the nature of the Soviet Union's interest and involvement in Middle East oil it is necessary to look not only at the course of Soviet policy in the area prior to 1973, but also at the process of development of Arab moves to independence in oil affairs, which were catalysed through OPEC, rightly judging the moment at which oil could be employed as

---

[1] I Smart "Oil, The Superpowers and The Middle East" International Affairs January 1977, pp. 17-18.

[2] H Adomeit "Soviet Policy in the Middle East: Problems of Analysis" Soviet Studies April 1975, p. 304.

an element of general strategy and which confirmed a fundamental change in international economic and political relations. This latter point is particularly important in analysis of Soviet, American and Arab interrelations in the post-Yom Kippur War period.

Adomeit indicates a major analytical problem, namely that whereas it can be said that governments act in accordance with what they believe to be the 'national interest' this concept is neither predetermined nor immutable.[3] 'National interest' may be applied as a retrospective validation of a resultant reaction to events that is little more than the outcome of the uncoordinated interaction of conflicting influences.[4] Moreover in the Soviet case one can point to stringent efforts to increase military, political and economic influence in the Middle East. It is however extremely difficult to measure quantitatively or qualitatively the effects of such influence as might be reflected in, for example, changes in economic or governmental systems of those countries in which a Soviet presence is detected.

Furthermore it is misleading to assume the existence of an overall coordinated strategy on the part of the Soviet Union, drawn up and directed by the Party's Politburo. The detectable gulf between Soviet pronouncements and actions also serves to complicate the analytical process.[5] In a study completed very soon after the Yom Kippur War the American

---

[3] ibid. p.302.

[4] ibid. p.295.

[5] A Nove ("On Soviet Policy and Intentions" Survey Vol.22, No.314 (Summer/Autumn) 1976. p.112.) highlights the fact that Soviet reporting of its own foreign policy has not only a communicative function but also one of reinforcing official doctrine.

analysts Kohler, Goure and Harvey draw the picture of an aggressive Soviet Union showing "little evidence of willingness to cooperate in the preservation of international stability in general or for the attainment of a settlement in the Middle East in particular except on Soviet terms".[6] They do admit however that the degree to which the Soviet Union can influence Arab states to pursue policies optimal to Soviet interest is limited, but that opportunities exist for disruption by the Soviet Union, rendering more difficult any negotiations aimed at securing a settlement. Why the Soviet Union would wish to do this is not made clear.

In the case of the USA it has been pointed out that popular opinion disfavoured American involvement in any Arab-Israeli conflict and that in the aftermath of the 1967 six-day war the proportion of the American nation sympathetic to the Israeli cause was declining, but that nonetheless Congress was committed by a substantial majority to support Israel, believing that the 'national interest' lay in countering (perceived) Soviet designs in the Middle East, despite the opposition of a large majority of the population to the continued supply of arms to Israel.[7] Up to the commencement of the Yom Kippur War few members of Congress appreciated

---

[6] F D Kohler, L Goure, M L Harvey "The Soviet Union and the October 1973 Middle East War: The Implications for Detente" Washington D C: University of Miami Centre for Advanced International Studies 1974, p.121.

[7] J W McKie in 'Daedalus' Vol.104, No.4 (Fall 1975), p.84.

the potential danger of such a policy. One American analyst, J C Campbell, has pointed out that a fundamental error of judgement was made in underestimating the degree of cohesion that would be exhibited by the Arabs, acting through OPEC, with consequent inability to gauge accurately the forces that would determine the course of events and the scope for negotiations in the aftermath of the war.[8] Such a policy, whilst "containing Communism", led to a measure of economic loss through destruction of the balance in negotiations between the oil companies and OPEC over the future supply and price of oil. These factors, plus the cost of failed policy in South-East Asia have led, in the view of the British analyst Douglas Evans, to acceptance by the USA of a diminished role in world politics.[9]

This role is however open to influence by the home-based oil industry, whose sphere of activity transcends national boundaries. As a result of the growth of the multi-national oil industry there arises the potential for a conflict of interest between companies and governments of the home and host country. Dependent on mutual perception of the alternatives open to each a range of policy options can be determined and acting within the framework of national and

---

[8] J C Campbell "The Energy Crisis and US Policy in the Middle East" in J S Szyliowicz, B E O'Neill (eds.) "The Energy Crisis and US Foreign Policy" New York: Praeger 1974, p.111.

[9] Douglas Evans "The Politics of Energy: The Emergence of the Superstates" London: Macmillan 1976, p.24.

international law an oil company can formulate and put into effect policies which are financially attractive to themselves, but which may run counter to the home government's preference. J S Nye has put forward the view that any influence possessed by the oil companies is characterised by their playing either a direct role in executing a privately-determined foreign policy, or an indirect role in influencing the course of inter-governmental relationships.[10] There is evidence of the results of the playing of either role by multinational companies, and not only oil companies. However as far as the course of political developments in the Middle East is concerned, Walter Laqueur has advanced the view that "in spite of their great economic significance the oil companies have not during the last decade acted from a position of political strength", and that they have been able "neither to provoke wars nor prevent wars", since "there has been a striking discrepancy between their economic significance and their political power".[11]

Although the frontiers of a State define the extent of its right to command, it is unrealistic to expect full implementation within the frontiers. The more a state tends towards pluralism, the more it has to strive to ensure acceptance of its corporate will, and vice-versa. What is distinctive about the relationship of the oil companies and the American government is that persistent attempts at resource allocation have

---

[10] J S Nye "Multinational Corporations in World Politics" in E W Erickson, L Waverman (eds.) "The Energy Question: An International Failure of Policy" Toronto: University of Toronto Press 1974, (Vol.1.), p.213.

[11] W Laqueur "The Struggle For the Middle East: The Soviet Union and the Middle East 1958-68" Harmondsworth: Penguin 1972, p.119.

to be repeatedly revised because the effect of implementation of policy runs counter to the interest of the implementers. Hence America became substantially dependent on imported energy in the form of OPEC oil and this dependence shows no sign of diminishing despite the price rises and 'Project Independence 1980'.

The foregoing is complicated by the changing role of the oil-producing states themselves not only in international politics but also in the world energy market, and account must be taken of this factor in discussing oil in relation to Soviet policy in the Middle East and to Soviet dealings with other powers, notably the USA. This is not to suggest that through OPEC the producer states may be regarded as a homogenous group, agreed amongst members on a unified policy of economic and social development. Indeed the very diversity of objectives within the producer states has been internally problematic. There are wide social, economic and political differences which determine the preferred policy of the individual states and which serve to illustrate why their actions have often not been unified.[12] It is also worth noting that as far as the hostilities of 1973 were concerned the countries immediately involved, namely Syria and Egypt, were not members of OPEC, but were ethnically identifiable with the major oil producers.

---

[12]For example, governmental systems vary from the parliamentary in Kuwait to conservative autocratic monarchies such as Iran and Saudi Arabia and to revolutionary military governments such as Algeria and Libya. There have been inter-Arab disputes over a number of territorial questions. Z Mikdashi "The OPEC Process" 'Daedalus' Vol.104, No.4. (Fall 1975), p.209.

However, as the Minister for Petroleum of the United Arab Emirates has pointed out, the hostilities gave the oil-producing Arab states the opportunity of enhancing the influence of Arab interests in general.[13] The war itself helped to legitimise putting into effect a policy that had been debated within OAPEC, of which Egypt and Syria were members, but not in OPEC thus far.[14]

One can detect two major causes of tension influencing OPEC's developing view of the world petroleum market. The latter half of the 1960s and the early 1970s were characterised by inflation in most of the industrialised world on which the Arab countries depended for capital goods and technology to raise them from a comparatively low standard of living. In the USA, for example, the Consumer Price Index had risen by 23 per cent between 1965 and 1970 and a further 20 per cent between 1970 and mid-1972. Similar or greater increases were recorded in many European countries and in Japan. Whereas this affected goods and services essential to the Arab countries, the price of oil, as indicated in Chapter 1, fell in real terms up to 1970 and only after the Libyan success

---

[13] During the 1973 war with Israel "the Arab oil-exporting countries, although geographically distant from the front line, could not wait in the sidelines and see their Arab compatriots being deprived of their lands....The Arab oil-exporting countries will not hesitate to use all the weapons they have and will continue to give every material and moral support...in their fight for the restoration of Right and Justice" M S Al-Otaiba "OPEC and the Petroleum Industry" (Preface to the English language edition) London: Croom Helm 1975, p.vi.

[14] Mikdashi op. cit. p.204. Though of course the major producers, Saudi Arabia and Kuwait, were members of OAPEC, the full cooperation of OPEC was necessary in order to prevent a recurrence of the failed boycott of 1967.

in unilaterally raising oil prices did the prospect for action independent of the oil companies begin to appear possible. The second influence was the intensifying desire of the Arabs for national ownership of oil production and distribution facilities. This was not envisaged as an element of the dialogue between the companies and host countries pursued under the auspices of the London Oil Policy Group, and was initially a separate issue, as far as Arab producers were concerned, from discussions on prices. However the two issues coalesced in the events of 1973-1974, in the aftermath of which previous agreements relating to the gradual relinquishing of concessions by the companies to the host governments were abandoned, and when there commenced rapid moves towards complete takeover by the host governments of the management of the producing companies.[15]

Though on the question of pricing there have appeared signs of disagreement within OPEC, the most telling being the negotiations leading to the price increase of December 1976, which resulted in different percentage increases imposed by members,[16] the increased financial strength of OPEC has not been in doubt and it is appreciated in the Organisation that there are continued benefits to be derived from solidarity and dangers in bringing about too rapid a substitution of oil by

---

[15]For example, the Kuwait Oil Company, jointly owned by BP and Gulf each having an equal share of the equity, was due to cede its concession rights to the Kuwaiti government in 2025. By March 1975 it was fully nationalised. Petroleum Economist April 1975, pp.124-125.

[16]Saudi Arabia insisted on a 5% price rise for Arab light ('marker') oil, supported by the UAE. Other producers opted for a 10% rise effective from 1 January 1977 and a further rise of 5% effective from 1 July 1977. This was the first split in OPEC on the issue of pricing. Petroleum Economist January 1977, pp.2-3.

other energy forms. The principal feature of the oil market after 1973 is that OPEC does not need to look for additional outlets, whether in Japan, Western Europe, the USA or Comecon. Its common objective is that of retaining the means of controlling the development of the world petroleum market in a way that is regarded as optimal, the concept of optimality being conditioned by the impact of such external factors as possible American escalation of military and economic aid to Israel. In the case of the Soviet Union as a potential market for Arab oil the immediate issue is that of using the one product the Arabs have in free supply to offset the debt arising out of the Soviet Union's supply of arms. However the need to deplete reserves in order todo this is falling as a result of the ability of the Arabs to pay in hard currencies.

There exists a considerable volume of published work on the interrelationships of the Soviet Union, the USA and the Middle East. A critical examination of this is beyond the scope of the present study: however the issues raised in a number of these works are worth citation in order to outline the mainstream of Western analysis of what has come to be regarded as a major problem of interstate relations in the seventies. An attempt will be made to highlight the factors that have influenced Soviet policy towards other oil producers, primarily those of the Middle East, and to establish what role, if any, is played by consideration of future oil supply.

Writing in 1969 Walter Laqueur expressed the view that the Soviet Union's interest in Middle East oil was confined to propagandist attacks on the activities of (primarily) American companies operating in the area and that there was little basis for the hypothesis that the Soviet Unionwas seeking 'control' over oil as a potential means of denying supply to Western Europe.[17] He stresses the significance of the year 1966 as a turning point in Soviet policy, following the agreement with Iran for the supply of natural gas, the first sign of Soviet need for a non-indigenous fuel. Whilst indicating that political considerations may in general be an element in the formulation of Soviet policy, Laqueur does point out that as the cost of production in the Soviet Union is often greater than the import cost of a product, then the purchase of Middle East oil or gas in no way differs from the import of any other commodity in that the decision is justifiable on economic grounds alone. He regards as more significant however the need of the Soviet Union to accept oil as the balancing element of barter trade.[18] The circumstances surrounding the possible role of oil as an element of trade between Eastern Europe and the Middle East are somewhat different in that the latter's debt incurred in respect of arms trade is not as high as with the Soviet Union, and the absorbtion capacity of Middle Eastern countries, with for the most part small populations and non-industrial economies, in respect of goods produced in

---

[17] Laqueur op. cit. p.133.

[18] ibid. p.135.

Eastern Europe relatively low. Writing in 1969 the American analyst S Wasowski indicates that if Eastern Europe were to attempt to satisfy its additional requirement for oil by supply from the Middle East, goods worth between $1 and $2 billion at 1966 prices would have to be exported,[19] a figure which Laqueur believes to be well beyond the Middle East's absorbtion capacity.[20] Though Laqueur does not offer an analysis of supply and demand for oil and gas in the Soviet Union, he does note that Middle East hydrocarbon resources were gaining importance for the Soviet Union without their becoming a factor in shaping policy in the area, since the country had thus far been able to afford a policy of energy autarchy.[21]

In a Soviet work published at approximately the same time as Laqueur's L Z Zevin stresses that the import of Middle East oil had become in certain instances economically advantageous for the Soviet Union.[22] In a further work of that period N P Shmelev indicates that the agreements reached between the Comecon countries and Middle East oil producers represented only the first steps towards further

---

[19] S Wasowski "The Fuel Situation in Eastern Europe" Soviet Studies July 1969, p.50.

[20] Laqueur op. cit. p.132.

[21] ibid. pp.135-136.

[22] L Z Zevin in E Kamenov, G Prokhorov (eds.) "Mirovoi sotsializm i razvivayushchiesya strany" Moscow Mysl' 1969, p22. Also Zevin "Novye tendentsii v ekonomicheskom sotrudnichestve sotsialisticheskikh i razvivayushchikhsya stran" Moscow Nauka 1970, p.123.

trade,[23] and likewise Zevin states that cooperation in the development of natural resources with a view to their possible export to Comecon was in its initial stages only.[24] Zevin is however aware of the constraints on the ability of the member-countries of Comecon to enter into such agreements with Middle Eastern producers, namely provision of exportqble goods adequate to compensate for increased imports in view of taut domestic supply.[25]

Bearing in mind Laqueur's analysis and the developing Soviet view, two analyses of oil as an element of Soviet policy in the Middle East, written in the early seventies, attempt to determine policy options based on a range of supply and demand balances.[26] W Gumpel's broad hypothesis is that the Soviet Union's desire to maintain self-sufficiency supersedes all other considerations to the extent that policymakers would on balance be prepared to sustain economic loss in its pursuit, but he adds that if the economic cost (unspecified) were to become excessive, then the best solution to an energy deficit would be the import of oil from the Middle East.[27]

---

[23] N P Shmelev "Problemy ekonomicheskogo rosta razvivayushchikhsya stran" Moscow Nauka 1970, p.222.

[24] Zevin "Novye tendentsii..." (1970), p.127.

[25] Zevin in Kamenov, Prokhorov op. cit. p.24.

[26] (i) W Gumpel "Sowjetunion: Erdöl und Nahostpolitik" Aussenpolitik 1971 No.11, pp.670-681.

(ii) Sabine Baufeldt "Die künftige Erdöllücke im RGW vor dem Hintergrund des sowjetischen Engagements in Nah-Mittel-Ost" Osteuropa Wirtschaft June 1973, pp.35-54.

[27] Gumpel op. cit. p.681.

In contrast Sabine Baufeldt argues that the Soviet Union's net surplus of oil will decline for economic reasons alone with three possible outcomes; firstly that exports to the West will decline, the rate depending on growth in domestic consumption, necessitating greater dependence on the Middle East, secondly that the Soviet Union could maintain exports to the West and to fellow-members of Comecon only by substantially increasing imports from OPEC, thirdly that under the same conditions as the second possibility Eastern Europe rather than the Soviet Union could increase its imports.[28] On the grounds that the Soviet Union needs technology from the West and that oil and petroleum products are a particularly useful way of securing such goods, Baufeldt rules out the first option. The second option, she argues, is unlikely to be adopted on the grounds that barter arrangements could not be stretched to cope. She regards the third option as the most likely, stating that if the total Comecon deficit can be kept to 40 million tonnes per year then agreements concluded up to 1973 would be adequate.[29]

Concerning Soviet desire to ensure security of supply in the (in her view likely) event of import dependency, she outlines three possible Soviet strategies in relations with Middle East producers. Firstly she suggests the possibility of direct collaboration in producing companies in the Middle

---

[28]Baufeldt op. cit. p.47.

[29]ibid. pp.48-49.

East, that is to say that the Soviet Union might fulfil a broadly similar function to that of the major oil companies, enabling the Sowiet Union to deliver her allocation of oil produced to established Western and Eastern European markets, or in the case of an embargo on supplies to the West to retain it. It is however argued that this option is likely to be constrained by Arab unwillingness to countenance collaboration with the Soviet Union any more readily than with American (or any other) enterprises, and on another plane by Soviet wariness of undertaking financial commitments in Arab countries following their costly experience in Egypt, which came to a head in 1972 with the expulsion of Soviet advisers. There would arise, moreover, the problem of reconciling direct Soviet involvement in production with the stand taken by the Soviet Union supporting the right of the Arab nations to have unfettered control of their own resources.[30] The second option is stated to be that of the Soviet use of political (unspecified) influence to prompt producers to cut back supplies to the West, though even at the time of writing the author stresses the ability of the Arab states to take decisions independently of either of the superpowers and that the Soviet Union might therefore be restricted to post-factum support of Arab policy.[31] The third option, in Baufeldt's view the most likely, is described as "indirect influence" ('indirekte Beeinflussung'),

---

[30] ibid. pp.51-52.

[31] ibid. pp.51,53.

the possible manifestation of which would be overt support for Arab moves towards nationalisation. This might be effective as an element of strategy in the short term, since it helps to secure a rising income for oil producers and diminishes the influence of the USA in the form of the oil companies, both these factors being in the interest of the producers and the Soviet Union.[32] This latter view contrasts somewhat with that expressed in an earlier study by Robert Hunter.[33] Accepting the view that the Soviet Union was about to become an oil importer, Hunter argues that the change in status to net importer may come as early as 1975.[34] He rules out the possibility of Soviet "colonialist" intervention in the Middle East, stating that the Soviet Union would rather seek supply through normal commercial arrangements,[35] and arguing that the Soviet Union's objectives would be better served by adopting a "temperate attitude towards relations between the oil-producing states and Western oil companies", so as to avoid cuts in Middle East oil revenues which would be detrimental to the Soviet Union.[36] Hunter's view of oil in relation to Soviet policy in the Middle East is somewhat inconclusive,

---

[32] ibid. pp.53-54.

[33] Robert E Hunter "The Soviet Dilemma in the Middle East: Part 2, Oil and The Persian Gulf" Adelphi Paper No.69. London: International Institute for Strategic Studies October 1969.

[34] ibid. p.3.

[35] ibid. p.7.

[36] ibid. p.9.

seeing the problem as an unresolved dilemma influenced by the difficulty of making a decision when faced with the abandonment of what he believes to have been a fundamental Soviet objective since the time of the Revolution, namely self-sufficiency in oil.[37]

A further perspective is offered by Abraham S Becker in a paper written in 1973.[38] His is the earliest analysis to stress that the issue of whether the Soviet Union would wish to influence events in the Middle East by aiming for stability in the area or in promoting radical nationalist militancy overlooks the emergence of the Middle East, and especially the Arab states, through OPEC, into an independent force in world politics.[39] He shares the widely-held view of the Soviet Union's impending oil deficit (though he does allude to the possibility of substitution by gas[40]) largely on the grounds that "the development of Siberia will take decades, not years",[41] and concludes that whereas "the net export position of the (Comecon) group will be under no threat in the next few years,...by 1980 an overall CMEA deficit is likely".[42] It is difficult to comprehend Becker's view of

---

[37] ibid. p.17.

[38] Abraham S Becker "Oil and the Persian Gulf in Soviet Policy in the Seventies" in M Confino, S Shamir (eds.) "The USSR and the Middle East" Jerusalem: Israel Universities' Press 1973, pp.173-214.

[39] ibid. pp.186-187.

[40] ibid. p.175.

[41] ibid. p.184.

[42] ibid. p.185.

the likely development of Siberian energy reserves when one bears in mind that his analysis was written when the basic directives for the ninth Plan were available, outlining clearly the emergent importance of the region for total production.[43] Also neglect of the changing role of natural gas detracts from his analysis of supply and demand for oil. Nevertheless he does bring out one important point of discussion in stressing that the economic motivations for the Soviet Union's possible increase in imports from the Middle East should not be overdrawn, since "the classical motivations have been political".[44] Arguing that the Soviet Union "is not averse to economic warfare in principle", he notes that "a future oil crisis might see Moscow enthusiastically backing radical measures undertaken by the producer states depending on the breadth of the producer coalition and the objectives at stake".[45]

The crystallisation of Becker's thoughts on the Soviet role in the Middle East is found in a later work of his, in which a further dimension, that of the interaction between Soviet policy in the Middle East and relations with the USA, is introduced into the discussion.[46] With hindsight to the Yom Kippur war Becker stresses that the Soviet Union has been

---

[43] Ekonomicheskaya gazeta 22/1969, pp.12-13.; Izvestiya, 9 December 1970, p.3, 19 December 1972, p.2.

[44] Becker in Confino, Shamir (eds.) op. cit. p.190.

[45] ibid. p.195.

[46] Abraham S Becker "Soviet-American Relations after the Energy Crisis" in Szyliowicz, O'Neill (eds.) op. cit. pp.159-182.

cautious about undertaking direct commitments to support any one or any group of Middle East states and that pronouncements on policy have been confined to "the safety of anti-Zionism and anti-oil imperialism".[47] Aware of the fierce internal rivalries for supremacy within the Arab world, the Soviet Union, he argues,[48] has developed the skill necessary to support, for example, Iran and Iraq simultaneously: the rivalry between Baghdad and Tehran for supremacy in Arab affairs has so far not occasioned the Soviet Union to take the side of either party.

A somewhat different view of the relevance of oil to Soviet policy in the Middle East is provided by the American analyst Lincoln Landis.[49] He argues that Soviet energy planning is characterised by the possibility of developing all forms of energy resources domestically, increasing demand in domestic and export markets and a deficient planning system, unable to cope with short and long-term requirements.[50] He sees the Middle East oil as having a "compensating and corrective" function and that therefore the Soviet Union will become increasingly involved in Middle East oil affairs in developing the role of "strategic middleman",[51] importing quantities of

---

[47] ibid. p.177.

[48] ibid. pp.177-178.

[49] Lincoln Landis "Politics and Oil: Moscow in the Middle East" New York: Dunellen 1973.

[50] ibid. pp.95-96.

[51] ibid. p.101.

oil to compensate for domestic shortcomings whilst seeking to maintain developing export business in existing markets. However Landis extends his theory of the Soviet Union as "strategic middleman" to postulate the ultimate objective of a Soviet-controlled "world energy delivery system within a world socialist planned economy", which would enable the Soviet Union "according to her own choosing to continue in the use of politics and to exert pressures upon capitalist states by threatening their strategic interests, which include the unhampered flow of petroleum from the Middle East".[52] Though the extension of Landis' theory might seem exaggerated in view of the considerable constraints that would be imposed on such a policy not only by the Middle East producers themselves but by the Western states and institutions who would see their interests threatened, the concept of "strategic middleman" is useful in looking at the Soviet role, and sheds some light on to the flexibility within the Soviet energy planning process.

It is however only in a very recent study the key issue is highlighted and discussed namely the limitations on policy in the Middle East imposed by considerations of detente between the Soviet Union and the USA, vulnerable in the event of a possible military confrontation in the Middle East.[53] Galia

---

[52] ibid. p.121.

[53] Galia Golan "Yom Kippur and After: The Soviet Union and the Middle East Crisis" London: CUP 1977, p.13.

Golan argues not only that the level of cooperation between the Soviet Union and the Middle East oil producers is low but also that the major producers vary in their attitude to the Soviet Union in general from neutrality to outright hostility.[54] Hence, she concludes, the Soviet Union is still far from able to influence the use of the "oil weapon" in her own interest and, equally important, she points out that the rate of expansion of the Soviet share of Western oil markets scarcely constituted competition for the Arab producers.[55]

The foregoing analysis of Western views of the Soviet Union's role in the Middle East is intended to highlight the diverse factors that influence the formulation of policy. No assumption is made that in the end behaviour is determined in accordance with a fully coordinated and optimised decision-making process. Indeed, as Hannes Adomeit has pointed out,[56] the scope of international relations of the Soviet Union has become so vast as to render impracticable any attempt at a unified "decision theory" model, aspiring to weigh each variable by accepted objective criteria. However given the existence of a Soviet presence in the Middle East and of the conflicting perspectives of the nature of Soviet interest in its hydrocarbon resources that are found in Western discussion of the future development of Soviet energy, an attempt must

---

[54] ibid. p.15.

[55] ibid. p.243.

[56] Adomeit op cit. pp.294-295.

be made in the context of this study to examine the involvement of the Soviet Union as it relates to her economic dealings with Middle East oil producers, extending this to consider relations with other producers, bearing in mind the changing dynamics of the world petroleum market.

In a trading relationship the imbalance between one country's need to export and another's need to import affords one party a measure of advantage which may be converted into influence over matters related or unrelated to the trade agreement. Even if the advantaged supplier or recipient chooses not to exercise that influence, the possibility of its so doing is likely to affect the perceptions held by each of the "rules" or scope for negotiation that govern the relationship between themselves. Specifically, whilst Soviet trade with Middle East countries over the period 1971-1975 constituted approximately 7 per cent of her total world trade, the case of trade with the Soviet Union from the point of view of certain Middle East countries is completely different. For example, in 1974 some 23 per cent of Syria's exports were destined for the Soviet Union.[57] In the case of Egypt approximately 28 per cent of its exports were directed to the Soviet Union between 1960 and 1974, this figure rising to almost 40 per cent if other Eastern European countries are included.[58] One must bear in mind in each case that there is a considerable burden in that exports have to be maintained in order to repay the

---

[57] Middle East Economic Digest 11 July 1975, p.26.

[58] The Middle East 10 July 1975, p.24.

cost of development goods and expertise previously provided by the Soviet Union, this in itself constituting a constraint on flexibility in trade policy. In particular the burden of Egypt's debt to the Soviet Union for arms supplies has been such that around 50 per cent of her principal exportable commodity, raw cotton, has effectively been mortgaged to the Soviet Union.[59]

Table 7.1. details the visible trade balance between the Soviet Union and the principal oil producers, predominantly Arab Middle East states, from 1971 to 1976; the importance of oil and gas in the total import trade of the Soviet Union is given in table 7.2, and absolute volumes and prices in table 7.3. It will be seen that there was a substantial drop in imports of oil in 1974 compared with 1973 following OPEC's quadrupling of prices. This factor in itself casts some doubt on the accuracy of previous views of the unavoidable need of the Soviet Union to increase imports. The slight change in the relative importance of oil in the Soviet visible trade balance was sufficient to alter the position from surplus to deficit. Sustaining only a slight drop in total exports in 1974 compared with 1973 (see table 6.2.A.), the Soviet Union was able to maintain growth in net exports in 1974 and to record further gains in 1975 and 1976. It is possible of course that in 1974 some run-down of stocks took place as plans were reformulated

---

[59] G Ofer "The Economic Burden of Soviet Involvement in the Middle East" Soviet Studies January 1973, p.333.

TABLE 7.1. Soviet Visible Trade Balance with Principal Oil and Gas Producers 1971-1976 (million rubles)

Country	1971			1972		
	Exports	Imports	Balance	Exports	Imports	Balance
Algeria	52.6	69.3	-16.7	55.9	58.6	-2.7
Ecuador	0	3.3	-3.3	0.1	2.3	-2.2
Indonesia	10.1	10.1	-	2.6	6.8	-4.2
Iran	139.3	100.1	39.2	95.5	134.0	-38.5
Iraq	99.1	5.5	93.1	90.1	61.6	28.5
Kuwait	17.4	0.7	16.7	14.5	0	14.5
Libya	8.9	0	8.9	8.6	30.0	-21.4
Nigeria	15.7	41.0	-25.3	9.0	19.8	-10.8
Saudi Arabia	5.4	0	5.4	4.5	0	4.5
Venezuela	0	0	-	0.1	4.1	-4.0
Afghanistan	45.3	34.6	10.7	38.1	30.8	7.3

Table 7.1. (cont.)

Country	1973 Exports	1973 Imports	1973 Balance	1974 Exports	1974 Imports	1974 Balance
Algeria	64.7	52.1	12.6	110.3	61.4	48.9
Ecuador	0.2	0.7	-0.5	0.5	4.4	-3.9
Indonesia	2.7	4.2	-1.5	8.0	19.9	-11.9
Iran	137.3	139.6	-2.2	265.8	229.9	35.9
Iraq	141.5	190.6	-49.1	182.3	270.8	-88.5
Kuwait	7.9	0	7.9	4.7	0	4.7
Libya	14.1	30.4	-16.3	28.5	0	28.5
Nigeria	11.0	28.9	-17.9	21.5	70.4	-48.9
Saudi Arabia	2.9	0	2.9	2.8	0	2.8
Venezuela	0.6	0.6	-	0.2	0	0.2
Afghanistan	33.7	35.8	-2.1	61.8	60.6	1.2

Table 7.1. (cont.)

Country	1975 Exports	1975 Imports	1975 Balance	1976 Exports	1976 Imports	1976 Balance
Algeria	112.3	134.7	-22.4	131.4	58.9	72.5
Ecuador	0.6	12.9	-12.3	0.4	7.4	-7.0
Indonesia	7.7	20.9	-13.2	4.4	27.9	-23.5
Iran	281.5	228.2	53.3	217.9	226.7	-8.8
Iraq	270.8	325.4	-54.6	341.6	372.9	-31.3
Kuwait	3.5	0	3.5	10.1	0	10.1
Libya	18.8	0	18.8	16.2	0	16.2
Nigeria	24.3	84.0	-59.7	23.9	26.6	-2.7
Saudi Arabia	5.6	0	5.6	13.2	0	13.2
Venezuela	0.2	0	0.2	0.3	0	0.3
Afghanistan	67.9	64.3	3.6	87.5	66.8	20.7

Source: Vneshnyaya torgovlya SSSR, corresponding years.

TABLE 7.2. Oil and Gas in Relation to Soviet Import Trade 1971-1976 (million rubles)

	1971	1972	1973	1974	1975	1976
Total Soviet Import Trade	11231.9	13303.0	15544.0	18834.4	26669.2	28730.7
Oil and Oil Product Imports	110.5	157.3	273.1	342.5	499.8	497.0
Oil and Oil Products %	1.0	1.2	1.8	1.8	1.9	1.7
Gas Imports	48.5	65.8	84.5	152.1	182.1	176.2
Gas %	0.4	0.5	0.5	0.8	0.7	0.6

Source: Vneshnyaya torgovlya SSSR, corresponding years.

TABLE 7.3. Soviet Imports of Oil and Gas 1971-1976

A. Oil and Refined Products (Volume - '000 tonnes, Unit Price - Rubles per tonne)

Principal Supplier	1971 Vol.	1971 Unit Price	1972 Vol.	1972 Unit Price	1973 Vol.	1973 Unit Price
Iraq	-	-	4084	14.19	11010	16.88
Syria	-	-	-	-	247	10.55
Algeria	749	20.65	570	18.29	-	-
Egypt	2040	6.49	971	9.73	209	6.68
Libya	-	-	1867	12.30	1713	17.73
Romania	462	39.18	351.7	40.65	522	32.88

	1974 Vol.	1974 Unit Price	1975 Vol.	1975 Unit Price	1976 Vol.	1976 Unit Price
Iraq	3888	68.44	5304	60.4	5821	63.50
Syria	330	48.72	-	-	450	56.48
Algeria	-	-	984	67.20	-	-
Egypt	172	51.27	211	49.54	154	52.90
Libya	-	-	-	-	-	-
Romania	455	33.01	492	56.77	155	66.55

TABLE 7.3. (cont.)

B. Natural Gas. (Volume - Million cubic metres, Unit price - Rubles per 1000 cubic metres)

Supplier	1971 Vol.	1971 Unit Price	1972 Vol.	1972 Unit Price	1973 Vol.	1973 Unit Price
Iran	5622.6	6.19	8197.0	6.29	8679.5	7.80
Afghanistan	2513.0	5.43	2849.4	4.99	2734.9	4.94

	1974 Vol.	1974 Unit Price	1975 Vol.	1975 Unit Price	1976 Vol.	1976 Unit Price
Iran	9094	14.57	9559	15.33	9280	15.57
Afghanistan	2847	6.84	2853	12.43	2500	12.61

Source: Vneshnyaya torgovlya SSSR, corresponding years.

to take into account the increased import price and the enhanced opportunities for earning hard currency in non-Comecon export markets afforded by OPEC's action. Another possibility, though less likely, is that the high figure of 13.2 million tonnes for imports of crude oil from the Middle East in 1973 reflects overbuying and stockpiling in anticipation of the price increase, resulting in lower demand for imports in 1974 and the resumption of the upward trend in 1975 and 1976 at levels only slightly below what might have been anticipated. Such a hypothesis assumes that the Soviet Union was able to anticipate correctly the extent and timing of the price rises. Though the Soviet Union undoubtedly did support the Arab use of the "oil weapon" in the form of a supply embargo and likewise Arab attempts to raise prices, culminating in 1973 and 1974,[60] the problem in determining the "Soviet view" is that of distinguishing between what the Soviet Union felt capable of influencing and what she regarded as inevitable.

The data in table 7.1. indicate the Soviet Union's reaction of cutting direct imports of OPEC oil following the price rises of 1973 and 1974, at the same time largely maintaining a trade balance with the two major partners, Iraq and Iran. The position of gas imports is different. Whereas the unit import price for Iranian and Afghan gas remained stable

---

[60] Kohler, Gouré, Harvey op. cit. pp.74-75.

between 1969 and 1973, prices rose sharply in 1974 and 1975.[61] The price rise for Afghan gas was negotiated in June 1974 and made effective from the first of October of that year;[62] that for Iranian gas was negotiated in August 1974 and became effective retroactively from 1st January of that year.[63] The Soviet demand response to these step-changes was the opposite to that following the oil price rises, and in view of the absence of an alternative market for Afghan and Iranian gas the success of each might seem hard to account for.

A probable explanation of this is that counterpricing of goods imported from the Soviet Union by the gas suppliers was adjusted in order to maintain the trade balance. Additionally, and perhaps more significantly, is the fact that rising prices for both oil and gas afford the Soviet Union the opportunity of raising gas prices in intra-Comecon trade. Oil prices have risen faster and further than gas prices since October 1973 and the effect has been to stimulate demand for gas, which given the particular problems of the Soviet oil industry and the relative underdevelopment of the gas industry assists the Soviet Union in achieving the objective of expanding gas consumption and trade. Moreover a rising world price for

---

[61] In comparing the unit prices of Iranian and Afghan gas to the Soviet Union it must be borne in mind that Iran constructed and paid in hard currency for the pipeline from her gasfields to the Soviet border, whereas in the Afghan case the Soviet Union undertook to finance and build the pipeline.

[62] Financial Times 11 July 1974, p.8.

[63] Financial Times 19 August 1974, p.5.

gas enables the Soviet Union to negotiate better terms with consumers on the expiry of contracts (see table 6.3.). The greater foreign exchange burden that would be imposed on Eastern Europe in attempting to increase imports of oil or gas has served to oblige them to provide materials and finance for joint energy projects on Soviet territory that might not otherwise have been undertaken.

Further benefits befall the Soviet Union as a result of higher prices and decreasing security of supply. There arose in the aftermath of Yom Kippur a greater level of interest than previously in possible joint development of Soviet hydrocarbon resources, particularly from American concerns. From the point of view of the major oil companies, whose operations in the Middle East are gradually coming under the control of the host countries, the Soviet Union's status as oil supplier may be no less reliable: from the point of view of the American government however there may seem to be political disadvantages in assisting a perceivedly hostile superpower in maintaining self-sufficiency in energy, a position which, as Ian Smart has indicated,[64] affords substantial flexibility in the conduct of foreign policy in the broad sense.

There is consistency in the Soviet Union's supporting the anti-Israeli and hence anti-American stand of the Arab

---

[64] Smart op. cit. pp.30-31.

countries whilst at the same time attempting to negotiate joint developments with American companies and the government. For example on the question of the Arab use of the oil embargo an as element of strategy in October 1973 the Soviet Union stated that "this has been no more than a necessary measure of self-defence. The Arab countries are being condemned because they have turned oil into a political weapon.... Western sources are trying to ignore the important fact that the Arab countries have the full sovereign right to do as they wish with their national resources and to use them in their national interests".[65] On the same day as the foregoing statement the view was also expressed that "the energy crisis can be overcome... It depends on broad economic cooperation between countries advantageous to all and with discrimination against none... There is at times an obsolete approach to international trade in America's policy...".[66] The Soviet Union did not let its commitment to the Arab cause interfere with other negotiations. Again as Ian Smart has pointed out,[67] discussions took place in October 1973 between the USA and the Soviet Union on possible joint development of Siberian gas on the very day after the Yom Kippur War broke out, in which both were heavily involved as arms suppliers.

---

[65] Moscow Radio (in Arabic) 16 November 1973.

[66] Moscow Radio (in English) 16 November 1973.

[67] I Smart "The Superpowers and the Middle East" The World Today January 1974, p.14.

However in dealings with the Arab countries the Soviet Union did have to deal warily with the possible allegation that they were taking or intended to take advantage of the production cutbacks and embargo to expand sales of Soviet oil and refined products in Arab markets, primarily the Netherlands.[68] Examination of the data shows that whereas in 1973 and 1974 deliveries grew at a rate which would scarcely suggest that the Soviet Union was breaking the Arab embargo or eroding their market share by selling at below the world price, the hard currency earnings from such trade contributed to a substantial improvement in the Soviet trade accounts in those years.[69] Since 1973 the Soviet Union has had a larger share of Western Europe's petroleum market due to depressed consumption in the West rather than to aggressive marketing. On occasions Western companies have decided to suspend purchase of Soviet oil on the grounds that the price asked was higher than could be obtained elsewhere.[70] It seems

---

[68] The strategy adopted by the Soviet Union for avoiding such charges is outlined in detail in Golan op.cit. pp.196-202.

[69] It should be noted that Soviet statements on export policy made in 1974 were somewhat contradictory. The Soviet Oil Minister, V D Shashin, is reported to have said that the Soviet Union was unlikely to increase oil exports significantly (Financial Times 29 May 1974, p.6.). However it is subsequently reported that TASS refuted this statement. (Financial Times 7 June 1974, p.4.).

[70] For example, the West German oil and petrochemical company VEBA suspended deliveries from the Soviet Union in March 1974 when the delivered price was stated to be the equivalent of 17 dollars per barrel. Financial Times 14 March 1974, p.24.

reasonable to suppose from the increase in deliveries to the Netherlands in 1973 compared with 1972 and from the unit price charged, that the Soviet Union, bearing in mind the constraints on increasing export volume to Western Europe imposed by domestic production difficulties, sought to re-distribute her available export quota to take advantage of the spot prices available on the Rotterdam market. However the volume involved did not cause any divergence from the Arab's intended policy. Soviet export policy in Western Europe at this time was that of riding with the tide, a policy that was shaped by three considerations, the degree of immediate flexibility in the domestic energy balance, the relevance of the Soviet Union's historical commitment to the Arab cause and the changed role of OPEC within the world market.

Taking the energy sector as a whole the view that the Soviet Union has an "energy crisis" seems, as Robert Campbell has indicated, somewhat inaccurate.[71] This hinges on one's definition of "crisis". It is true to say that the Soviet Union has been largely immune to the economic problems that have been caused in the West partly by deteriorating relationships between oil producers and consumers and to the limiting influence of energy dependence. In the sense that major decisions can be taken by Soviet energy planners largely, though not entirely, without reference to the possibility of

---

[71] R W Campbell "Trends in the Soviet Oil and Gas Industry" Baltimore: Johns Hopkins Press 1976, pp.86-87.

non-indigenous supply, the Soviet Union does not face the same "energy crisis" as does Japan or the USA. Campbell points to the fact that the substantial expansion of the role of oil and gas from the early sixties to around 1970 was facilitated by the relative simplicity of production and transportation, whereas in the seventies further expansion demanded the most advanced technology available.[72] An indication of the change in emphasis in Soviet energy policy towards the rehabilitation of coal was given in a speech to the Soviet Academy of Sciences in late November 1974 by V I Kirillin.[73] Stressing the abundance of coal reserves compared with those of oil and gas, Kirillin outlined the need to reverse the trend towards use of oil and gas in favour of coal, adding that this policy should be undertaken immediately.[74] Despite Soviet statements that there exist domestic reserves of all types of conventional fuel, it is now acknowledged that the energy balance is taut ("napryazhennyi").[75] However the essence of the issue is that the Soviet Union does have alternatives to dependence on outside supply which can be put into effect at apparently tolerable cost, in contrast to the USA, whose "Project Independence"

---

[72] ibid.

[73] V I Kirillin "Energetika: problemy i perspektivy" Kommunist 1975 No.1, pp.43-51.

[74] ibid. p.46.

[75] P Neporozhnyi "Perspektivy Sovetskoi energetiki" Planovoe khozyaistvo 1975 No.8, p.44.

has already floundered.[76]

The Soviet Union has a long-standing commitment to the Arab cause dating from the early fifties, well before the formation of OPEC. Moreover the nature of superpower involvement in the Middle East changed substantially between the times of its manifestation as participation in some form in open hostility. Ian Smart has pointed out that the emergence of the Soviet Union as a champion of the Arab cause came about in the early fifties in the aftermath of the failed Soviet attempt at sponsorship of Israel and the deterioration of relations between Egypt and the West caused by the overthrow of the monarchy. He argues that as a result of the "Eisenhower doctrine", launched in 1957, which promised American help to any Middle East nation "threatened" by international Communism, the Soviet Union took her Middle East role very seriously, to the extent that by the time of the 1967 six-day war the area was polarised along the lines of an open superpower conflict.[77]

Between 1967 and the next full-scale hostilities in 1973 there were a number of significant events that changed the course of international relations as reflected in policy towards the Middle East. The power of OPEC had increased as had American, Western European and Japanese dependence on

---

[76] R El Mallakh points to the contradictions in 'Project Independence' in "American-Arab Relations: Conflict or Cooperation?" Energy Policy September 1975, p.170.

[77] Smart "The Superpowers and the Middle East" (1974), pp7-8.

Middle East oil. However the support of each superpower for its respective ally had not waned, despite the major setback on the Soviet part of Sadat's expulsion from Egypt in July 1972 of the team of Soviet military and technical advisers.[78] The very complexity of these relations helped to prevent an open superpower confrontation and catalysed negotiations for ending the war itself. Smart describes the changed dimension of policy as "the perennial competition for influence... through the provision of military, political and economic support to client states, even if the objective now seems to be more the preservation than the extension of positions already gained".[79] Indeed the relatively unchanging territorial domain of the major protagonists in the 1967 and 1973 Middle East wars lends support to Smart's analysis of policy. However the important issue is that the nature of the forces that determine the equilibrium has altered.

The principal force is that of the changed power of OPEC and its consequent enhancement of Arab influence. The benefits gained by the Soviet Union from OPEC's production and pricing policy have come about not as a result of Soviet influence within or upon the executive of OPEC and, for reasons already outlined, OPEC's policy could have been put into effect in

---

[78] Galia Golan points out that in the build-up to the Yom Kippur War the sole issue on which the Soviet Union and Egypt were in agreement was that of the possible use of the "oil weapon". op. cit. pp.55-56.

[79] Smart "The Superpowers and the Middle East" (1974), pp.14-15.

spite of Soviet disapproval. Moreover it seems hardly likely in the broader context of international political relations that the Soviet Union would have risked the consequences of withdrawing military support from the Arab states because of disapproval of OPEC's oil policy. Though Arab and Soviet views might coalesce on the subject of the legality of Israel, the Arab states, many of them members of OPEC, OAPEC or of both, are likely to be very wary of becoming dependent on the Soviet Union because of communality of interest on this point. However they are free to exploit it. As P R Odell has indicated,[80] the Arab states, acting through OPEC, might well see the undermining of world economic systems, Capitalist or Communist, as the prerequisite of a more appropriate economic and social order. Accordingly, now that the degree of influence conferred by independence is appreciated, it is not likely to be abandoned to disguised colonialism.

Robert Campbell has indicated that "Soviet production cost is far above Middle Eastern cost and it would be advantageous if the USSR could meet its needs from the Middle East rather than from domestic production", and that "the resources the USSR is spending in expanding its own oil and gas industry, if invested in the Middle East, would give a much bigger payoff".[81] This depends on the acceptability of such investment to the host country. Relating investment cost to comparative production

---

[80] P R Odell "The Western European Energy Economy" Leiden: Stenfert Kroese 1976, p.27.

[81] Campbell op. cit. p.81.

cost the major oil companies would likewise derive a bigger payoff from increasing investment in the Middle East rather than in Alaska or the North Sea, or, for that matter, in West Siberia. The overriding issue is whether OPEC would countenance greater development than at present and the indications are that this is not so. The common objective of arresting the rate of depletion of reserves was a major factor in consolidating the strategy of OPEC and there is no evidence in the aftermath of their success that suggests a change in policy.

What emerges from studying this aspect of Soviet energy policy is that it is difficult to support the view that Middle East oil and gas have been the focus of Soviet interest in the area or that participation in the world market, whether as exporter or importer, has had any influence on broader policy questions. However detectable progress has been made by the Soviet Union in developing what Landis termed the "strategic middleman" role. This is particularly well illustrated in a recent tripartite agreement between a Western European consortium, consisting of West German, French and Austrian companies, the Soviet Union and Iran for the supply of Iranian gas to Europe via the Soviet Union. Under the terms of the agreement, signed in Tehran on 30 November 1975, deliveries of 13.4 billion cubic metres into the Soviet Union's Central Asian gathering system will commence in 1981. The Soviet Union will retain 2.4 billion cubic metres for domestic use and

will substitute 11 billion from Tyumen' or Orenburg via the 'Bratstvo' pipeline, of which West Germany will receive 5.5 billion, France 3.66 and Austria 1.84.[82] It should however be noted that the Soviet Union merely gains a transit fee, expressed in the value of gas retained for domestic consumption, for her part in the operation. The payment for the bulk of the gas is in the form of Western equipment supplied directly to Iran from the receiving countries and negotiated independently of the Soviet Union. The further benefit to the Soviet Union is that this arrangement contributes to the development of the Western European gas market and, for reasons outlined, gas is becoming the preferred Soviet export fuel.

This type of arrangement helps to dispel the view held in a number of quarters that the objective of Soviet interest in Middle East hydrocarbon developments is to weaken the West.[83] On balance the Soviet Union needs a relatively strong USA and Western Europe as willing trading partners, particularly as suppliers of technological goods and as absorbers of raw materials including oil and gas, which the Soviet Union can most readily export. However that is not to overlook the fact that industrial depression in Western Europe, exacerbated by the increased cost of importing oil, has caused many producers to look to Comecon as an alternative to declining

---

[82] Financial Times 1 December 1975, p.5.; Petroleum Economist January 1976, p.5.

[83] A view expressed by J A Berry in "Oil and Soviet Policy in the Middle East" The Middle East Journal Vol.26, No.9. (Spring 1972), p.149.

domestic markets, given overcapacity in many manufacturing industries.

The policy of the Soviet Union towards Middle East hydrocarbon developments has been characterised by opportunism based on sound economic rationale. That is not to say however that there have been no gains that could be described as "political". The point is that the Soviet Union does not appear to have sustained economic loss in matters relating to hydrocarbon trade for "political" gain, and as Galia Golan is at pains to point out, OPEC's policy, though suiting the Soviet Union, cannot be viewed as a consequence of Soviet policy nor in itself as the means by which any Soviet design for strategic dominance in the area could be assisted.[84]

The course of Soviet negotiations with Norway, a major oil producer and the sole country operating in the North Sea to enjoy a current surplus of energy, has attracted little attention. Analysis has been confined for the most part to discussion of the periodic wranglings between the Soviet Union and Norway over the demarcation of areas of sovereignty in the Barents Sea and the existence or non-existence of an individual continental shelf of the

---

[84]Golan op. cit. p.250.

Spitzbergen islands.[85] These issues are however of less significance than the fact that as a growing exporter of crude oil Norway is emerging as a competitor for the Western European market. Moreover Norway has so far declined membership of the International Energy Agency and is following an independent line in respect of the rate of development of her oil and gas resources.

In February 1975 it was estimated that Norway had no need of a production level in excess of 50 million tonnes of oil per year and 40 million tonnes of oil equivalent in the form of gas, given the availability of hydroelectricity, the capacity of the economy to absorb estimated incomes from exports of oil and gas and the Norwegian government's objective of maintaining a diversified pattern of economic growth, to which income from oil and gas could be expected to contribute for a long time.[86]

---

[85] Background to the debate is given in Jeremy Russell "Energy as a Factor in Soviet Foreign Policy" London: D C Heath 1976, pp.185-186, and by P Hill in The Times 16 November 1976, p.16. Briefly, dividing the Barents Sea under the terms of the 1958 Continental Shelf Act by a median line between Norway and the Soviet Union would give Norway the greater share. The Soviet Union favours the system adopted in the Antarctic, namely sectoral extension radiating from the Pole, which would give the Soviet Union the greater share. In the case of Spitzbergen, the 1920 Agreement gives the 41 signatory countries the right to prospect for minerals provided they adhere to Norwegian law. If Spitzbergen is deemed to have its own continental shelf these countries have the right to drill offshore. Norway has argued that Spitzbergen is an extension of her own continental shelf, in which case the Norwegian government would have the right to control exploration.

[86] The background to Norwegian oil policy in the seventies is given by B S Aamo in "Norwegian Oil Policy: Basic Objectives" in M Saeter, I Smart (eds.) "The Political Implications of North Sea Oil and Gas" Guildford: IPC 1975, p.88.

In an analysis written in July 1975 P R Odell suggests that in view of the tensions existing between Norway and the remaining hydrocarbon-deficient countries of Western Europe, there is "the basis for a Soviet offer to Norway whereby favourable consideration of her claim in the Barents Sea would be extended in return for acceptance of Soviet protection for Norwegian resources against all outside powers".[87] Such a policy would, he argues, enable the Soviet Union to use Norwegian oil, produced by Norway in the Barents Sea and made available on Soviet account, to be delivered into established Soviet markets in Western Europe, alleviating the economic and logistic difficulties of direct supply.[88]

Odell extends this analysis to suggest that Soviet interest in Norwegian oil and gas forms part of an "expansionist effort to secure the adhesion of Germany and Scandinavia to her system".[89] However this analysis overlooks the fact that despite her non-membership of the IEA Norway is committed to NATO. Moreover it seems highly unlikely that Norway would be prepared to assist the Soviet Union's further penetration of the Western European market other than on terms which were economically attractive and which left Norway in control of resource depletion and the total rate of increase of exports.

---

[87] P R Odell "The World of Oil Power in 1975" The World Today July 1975, p.278.

[88] ibid.

[89] ibid. p.281.

In the aftermath of the Yom Kippur War the position of Libya in relation to the Soviet Union and Eastern Europe began to draw greater attention. The independent line taken by Gadafi in imposing the oil price rise of 1970 outside the framework negotiated between OPEC and the major oil companies and in nationalising the operations of the British Petroleum Company in November 1971 had met with Soviet approval.[90] The willingness of the Soviet Union to tolerate Gadafi's changeable and unpredictable line in dealings with Moscow stems from two possible considerations. In the first instance the possibility of building up an alternative military-economic base in the Southern Mediterranean seemed attractive to Moscow given their deteriorating relations with Egypt after 1972 and the effect of Soviet moves towards some sort of alignment with Libya was enhanced by the detectable strains that had arisen between Gadafi and Sadat. In the second instance the nature and location of Libyan oil made it a particularly

---

[90] In 1970 the Soviet Union delivered 200 tanks, field guns and amphibious vehicles to Libya: in April 1972 Gadafi withdrew the Libyan ambassador from Baghdad as a protest against the signing of a 15-year treaty of cooperation between Iraq and the Soviet Union. However after nationalising BP's Libyan assets in November 1971 and finding that existing customers were unwilling to purchase oil produced from the nationalised fields - especially since BP threatened legal action against anyone so doing - Gadafi turned again to Moscow in May 1972 and, after reconciliation, negotiated an agreement whereby Soviet technicians operated the oilfields in question and the Soviet Union accepted a share of the oil produced. Petroleum Press Service February 1972, pp.64-65; R M Burrell "The Soviet-Libyan Arms Deal" Soviet Analyst, 5 June 1975, pp.2-3.

attractive import prospect for the Soviet Union.[91] In January and February 1974 Eastern European countries made spot purchases of Libyan oil and Romania negotiated a supply contract at this time for 3 million tonnes of Libyan oil per year to 1977.[92] There is however a more important aspect to the Soviet Union's having access to Libyan oil, namely that it can be used to supply the established market for Soviet oil in Italy. Given the increasing difficulty and cost of supplying the Italian market with indigenously produced oil, Libyan oil could be delivered on Soviet account in return for Soviet arms and technical expertise required to run the production facilities after the withdrawal by British Petroleum of their staff following Gadafi's nationalisation of their affiliate.[93] Such supply would decrease by a corresponding amount the loading of expensive West Siberian oil It is not possible to prove this hypothesis conclusively from statistics. However the evidence is that direct deliveries of crude oil and refined products from the Soviet Union to Italy have shown a decline in the seventies. Direct Soviet liftings of oil from Libya are recorded in 1972 and 1973 only. It seems reasonable to suppose that further oil as repayment for arms

---

[91] Libyan oil is of the "light" variety, i.e. suited to the maximal output of non-substitutable products and commanding a premium in Western European markets at that time.

[92] Golan op. cit. p.199.

[93] Burrell op. cit. p.3.

supplies was made available and delivered by chartered tanker to Italy. In 1976, upon the possible expiry of the Libyan-Soviet contract, deliveries of indigenous oil were increased, this being reflected in the increase in recorded direct deliveries from the Soviet Union to Italy in 1976 compared with 1975.[94]

There exists a similar opportunity in relations between the Soviet Union and American oil producers, principally Venezuela, Mexico and Ecuador. In return for Soviet aid such countries could offer negotiated quantities of crude oil which could be delivered on Soviet account to the existing Cuban market, the cost of supplying which is rising, or to the USA as part of the balancing element of a possible "grain for oil" agreement. It may well be that a strong reason for the USA's unwillingness to finance extensive Soviet oil developments is the fear that in the end the supply quantities negotiated will be "switched" by the Soviet Union to deliveries from alternative sources at their disposal, in which event the USA would have financed the maintenance of Soviet self-sufficiency.

The development of relations between Eastern Europe and non-Soviet oil producers dates from the mid-sixties. In December 1966 it was stressed that there should be greater interest on the part of Eastern Europe in negotiating supplies

---

[94]Analysis of this is further complicated by the decline in total demand caused by the OPEC price rises, reflected in falling total imports.

of oil from the Middle East.[95] In the course of the late sixties each of the Eastern European countries did enter into supply contracts with OPEC producers. Romania signed a ten-year agreement with the Iranian National Oil Company which provided for Romanian purchase of 1000 million dollars' worth of crude oil in return for industrial equipment, primarily for the development of the petrochemical industry. Czechoslovakia concluded similar agreements with Iran, involving the supply of general industrial machinery against the purchase of oil over a 9 year period, and with Iraq involving the transfer of refinery and pipeline know-how and equipment. Hungary likewise negotiated an agreement with Iraq for the supply of oil against deliveries of gas- and oilfield equipment, East Germany agreed on direct purchases of Iraqi oil, and Bulgaria to buy direct from Algeria.[96]

---

[95]"Close attention is now being given in almost all the Comecon countries to the necessity of...improving the fuel and energy balance....In spite of the import of large quantities of oil and gas from the Soviet Union the intensified development of the Czechoslovak economy calls also for the import of oil from the developing countries." Rudé právo 22 December 1966, p.4.

[96]The first agreements between Comecon member-countries and OPEC producers are recorded in Mizan August 1971, p.31.

Chapter 8

Summary Analysis and Conclusions

Though insulated from the major upheaval experienced by the world's major oil consumers during the seventies, the Comecon bloc has begun to encounter a number of problems which have slowed the rate of growth of oil within the Soviet energy balance, altering the economic relationship of refined products to alternative forms of energy and feedstock and necessitating re-adjustment of energy policy by the bloc. During the ninth Five-Year Plan the Soviet Union's energy consumption reached 4 billion tonnes of standard fuel, of which 2.6 billion were used in electricity generation and industrial steam raising. Energy exports totalled 1 billion tonnes of standard fuel.[1] Soviet energy planners have begun to acknowledge openly that the role of oil and gas must be re-appraised. Current policy seeks to phase out the use of residual fuel oil in favour of Ekibastuz and Kansk-Achinsk coal for power stations in regions to the east of the Urals and to accelerate the programme of nuclear power station construction in the European zone.[2] It is now admitted in the Soviet Union that failure to prove new oil reserves at an adequate rate during the ninth Plan has caused tensions in energy planning and has brought about the rehabilitation of coal and the need to further the development of nuclear power.[3]

---

[1] M M Brenner "Effektivnost' ispol'zovaniya toplivno-energeticheskikh resursov" Voprosy ekonomiki 1977 No.6, p.38.

[2] ibid. p.40.

[3] V M Gzovskii "Perspektivnoe napravlenie razvitiya neftyanoi promyshlennosti SSSR" Izvestiya AN SSSR Ser. ekon. 1977 No.3, p.73.

However this policy cannot entirely solve the problems faced in the Soviet and Eastern European energy sector to 1980 and beyond, since the only readily substitutable fuel product derived from oil is residual fuel oil. Moreover the process of fuel substitution is conveniently applicable only in respect of new installations, since in the absence of substantial administered price advantages for coal, gas or other fuels, reflected in the final energy cost to the consumer, the incremental cost of converting existing plant appears in the majority of cases to outweigh the energy cost saving. Though recent Soviet analysis openly discusses fuel substitution, it seems unlikely that the energy supply position will be eased markedly in the period to 1980.

The grave decline in Soviet production of oil and gas condensate considered likely by the Central Intelligence Agency of the USA is thought to be inaccurate. There is comparatively little technical difficulty in producing the desired 1980 level from existing operations, though it must be admitted that this could only be achieved at a cost considerably higher than anticipated for the tenth Plan and with severe long-term loss. It should be stressed that on the basis of information published up to mid-1977, the most recent on which this study is based, the oil industry's performance is on target and this augurs well for 1980. Rates of increase in production are declining: this is desired by Planners. However if sufficient new reserves are not discovered during the tenth Plan, the point at which Soviet

energy planners are faced with the problem of optimising the energy balance to an oil production level that has reached its peak may come in the mid-eighties. Nonetheless available Soviet material gives no indication that planners and energy analysts foresee this eventuality in spite of their acknowledgement of the problems that the industry faces.

Given the problems of forecasting and planning for the gas industry and its consistent failure to meet targets in the past, it might be thought reasonable to regard the Plan for 1980 as wishful thinking. However certain features should be stressed. Firstly in the latter years of the ninth Plan the increases in production were as originally intended and this has continued in the first eighteen months of the tenth Plan. Secondly the major new discoveries are geographically close to one another, this easing the logistic problems provided that the delivery systems are completed near schedule. Substantial assistance from Eastern Europe has been obtained and labour transferred from other sectors of the economy to bolster the oil and gas industries' labour force. The administrative mechanism of the gas industry has been modified somewhat, with the objective of improving communications by reducing the number of administrative levels.[4]

---

[4]The reform involved a reduction in the number of decision-making levels from five or six to two or three. This is discussed in some detail in Appendix C of J Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976, pp.223-226.

A leading Soviet specialist on the gas industry admits that prior to 1972 annual plans were over-amibitious in relation to resources available, this being conditioned by the fact that initial discoveries were particularly large. He argues that the period since 1972 has been characterised by more realistic annual plans, though admittedly evidencing a considerably reduced rate of growth for the ninth Plan as a whole.[5] The gas industry has recorded an auspicious first eighteen months of the tenth Plan and in terms of volume the industry needs to record an annual increase in production of 28.5 billion cubic metres in order to reach the 1980 target of 435 billion cubic metres. Such increments are only slightly above those recorded during the period which Smirnov regards as having been more realistically planned.

The Soviet Union has undertaken to supply fellow-members of Comecon in the course of the tenth Plan with 364 million tonnes of oil and 90 billion cubic metres of natural gas.[6] It should be noted that the former figure relates to crude oil only and that both include deliveries to Cuba and Mongolia but exclude those to Yugoslavia, an associate member of Comecon. Comparison of these figures with the corresponding commitment and deliveries during the ninth Plan illustrates the importance now attached to natural gas as the incremental hydrocarbon fuel in Eastern Europe.

---

[5] V A Smirnov "Gazovaya promyshlennost'" Ekonomika i organizatsiya promyshlennogo proizvodstva 1975 No.5, p.49.

[6] I Ivanov, A Loshchakov "Sotrudnichestvo stran SEV i vyravnivanie urovnei ikh razvitiya" Voprosy ekonomiki 1977 No.6, p.12.

A range of estimates of the 1980 Soviet energy balance is presented in table 8.1. The major factors determing the final balance are the planned decrease in energy intensity in the economy as a whole and in particular in electricity generation, where it is felt that there is still scope for further improvement. The rate of increase in the automobile park has begun to decline and the conversion of the railroads to oil power is well advanced. Hence the Soviet estimate that the share of oil in the domestic energy balance is not now expected to rise (see p.241) and plans for refinery expansion appear to indicate that a greater share of oil production will be directed to the petrochemical industry and for export. If therefore one puts the 1980 share the energy balance held by oil at the 1975 level, namely 42 per cent, and assumes that for reasons of energy efficiency fuels such as shale and peat will not show an increased share and that nuclear power is unlikely to make an impact by 1980, then approximately 50 per cent of the Soviet energy balance will be met by coal and gas. Given the greater exportability of gas in comparison with coal it is likely that Soviet planners would favour relying on coal for domestic consumption. Accordingly it is concluded that coal is likely to account for 27 per cent and natural gas 23 per cent of the 1980 Soviet energy balance.

Corresponding estimates for the energy balance of the Eastern European member countries are given in table 8.2. Remarkable consistency can be discerned in the estimates, the noteworthy

TABLE 8.1. Estimates of Soviet Energy Balance in 1980 (%)

Estimate	Coal	Oil	Natural Gas	Other	Total
Bethkenhagen	31.4	43.1	25.5	-	100
Russell	28.5	38.7	24.7	8.1	100
Hanson	26.0	42.0	23.0	10.0	100
Scanlan	32.1	37.9	28.4	1.6	100
Author	27.0	42.0	23.0	8.0	100

Sources:

A. J Bethkenhagen "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin: Duncker & Humblot 1975, p.148. Bethkenhagen simply divides his classification of 'primary energy' between coal, oil and gas, ignoring the contribution of the minor fuels and hydroelectricity.

B. J Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976, p.33.

C. P Hanson "The Soviet Energy Balance" Nature, 5 May 1976, p.3.

D. A F G Scanlan "The Energy Balance of the Comecon Countries" in 'Exploitation of Siberia's Natural Resources' Brussels: NATO 1974, p.97. Note that the category 'other' includes only hydroelectric and nuclear power and that the figure given here for coal includes other solid fuel. For the purpose of this study the important fact is that the categories 'oil' and 'natural gas' should be comparable.

exception being Russell's estimate for Romania, which assigns a particularly high share to coal. In the absence of Russell's attesting the sources for his table or the basis for his calculations it is not possible to account for this discrepancy: however one should note its inconsistency with Western and Eastern estimates. The author's estimate takes into account the most recent primary source material available and, as outlined in the analysis contained in chapters 3 and 4, evidences the rehabilitation of coal and the emergence of natural gas, given restrictions in the availability of oil. It is likely that energy consumption in 1980 will be at the lower end of the ranges indicated in table 4.1. and certain that attempts will be made to consume less energy, particularly oil, which could even lead to a lower share for this fuel than indicated in table 8.2.

Apart from restrictions in the form of the delivery quota stipulated by the Soviet Union and the difficulties of purchasing significant quantities of oil from OPEC, the effect of the new pricing formula for Soviet oil is likely to bring about a measure of oil conservation. The cost of a given quantity of oil imported by an Eastern European country from the Soviet Union in 1977 will be some 40 per cent above that for 1975. Prices for 1978 and beyond depend on the policy of OPEC, and should rise markedly once the pre-Yom Kippur prices are not incorporated into the five-year moving average. Even

Table 8.2. Estimates of the Eastern European Energy Balance in 1980 (%)

Country	Fuel	Bethkenhagen	Russell	Bednarz	Maksakovskii	Author
Bulgaria	Coal	31.4	31.6	25.0	30.0	29.6
	Oil	56.0	50.0	43,0	48.4	49.0
	Nat. Gas	12.6	18.4	23.0	17.4	16.4
	Other	-	-	9.0	4.2	5.0
Hungary	Coal	27.1	25.7	27.9	28.0	21.0
	Oil	50.1	48.6	42.6	39.6	52.4
	Nat. Gas	22.8	25.7	28.3	21.3	18.2
	Other	-	-	1.2	11.1	8.4
GDR	Coal	61.2	62.5	68.5	61.4	61.4
	Oil	29.2	22.9	23.0	22.4	22.4
	Nat. Gas	9.6	14.6	6.9	11.5	11.5
	Other	-	-	1.6	4.7	4.7
Poland	Coal	67.7	64.0	70.5	66.6-70.3	70.5
	Oil	21.2	20.0	19.0	18.0-19.0	19.0
	Nat. Gas	11.1	16.0	8.5	8.4-8.5	8.5
	Other	-	-	2.0	2.2	2.0

Table 8.2. (cont.)

Country	Fuel	A	B	C	D	E
Romania	Coal	22.5	39.3	25.0	24-25	23.5
	Oil	37.1	38.7	30.0	64-	34.3
	Nat. Gas	40.4	22.0	35.0	65	36.3
	Other	-	-	10.0	10-12	5.9
Czechoslo-vakia	Coal	61.1	62.6	60.0	57.0	65.7
	Oil	30.2	30.0	30.0	29.7	25.1
	Nat. Gas	8.6	7.4	6.0	7.5	6.0
	Other	-	-	4.0	5.8	3.2

Sources: A. J Bethkenhagen op. cit. pp.150-155. (As in table 8.1. Bethkenhagen divides his 100% 'primary energy' balance between coal, oil and natural gas).

B. J Russell op. cit p.119. (Calculated from data expressed in Mtsf. Like Bethkenhagen, Russell divides primary energy between coal, oil and natural gas, but notes that total 1980 estimated demand of 615 Mtsf should have an additional 17 Mtsf (2.6%) from 'minor sources'.)

C. L Bednarz "Problemy naftowe socjalistycznej integracji gospodarczej" Nafta (Krakow) 1974 No.4, p.532.

D. V P Maksakovskii "Toplivnaya promyshlennost' sotsialisticheskikh stran Evropy" Moscow Nedra 1975, pp.41-42.

E. Author's estimates are based on the following sources: T Khristov "Novi tendentsii v razvitieto na energetikata baza v Bolgariya" Geografiya (Sofiya) 1970 Vol.20, No.8, p.2.; V Bese "Hungary's Mineral Oil and Gas Industry" Marketing in Hungary 1971 No.4, p.8.; Bednarz op. cit. p.532.; I V Herescu "Dezvoltarea bazei energetice (1)" Revista economică 28/1976, p.1.; Hospodářské noviny 37/1976, p.3.

without oil quota restrictions this would tend to increase demand for gas, the price of which has not risen as dramatically as that of oil.

It was estimated in chapter 6 that the Soviet Union is likely to have between 150 and 170 million tonnes of oil and refined products available for export in 1980. The estimate of 1980 energy demand for the Comecon countries given in table 4.1, of the energy balance of the individual countries outlined in table 8.2., of the likely upper limit of 30 million tonnes of oil imported from OPEC producers and of Eastern European (primarily Romanian) production of 18 million tonnes imply a requirement of approximately 75 million tonnes from the Soviet Union, this leaving a maximum of 97 million tonnes for export to the rest of the world, and a minimum of 75 million.

More detailed information is available on Soviet natural gas export commitments than for oil and these are detailed in table 8.3. It was suggested in chapter 6 that Soviet export availability of natural gas was likely to be of the order of 59 billion cubic metres. The possible excess of a few billion cubic metres over commitment would enable the Soviet Union either to enter further export contracts provided that production were on target towards the end of the tenth Plan or to accelerate the process of substitution of fuel by gas in the domestic energy balance.

The foregoing analysis suggests that the Soviet Union will continue to play the role of concerned observer in her dealings with members of OPEC. The involvement of the Soviet Union is likely to be aimed at enhancing the opportunities of building on her position in the international oil broking system and in this sense could become increasingly 'dependent' on the supply of oil from OPEC, should she supply established markets with 'switched' oil.

Despite the need of Western countries to diversify not only the structure of their energy balance but their source of supply of oil the Soviet Union will remain only a marginal supplier. It is misleading to talk in terms of the Soviet Union's 'loss of opportunity' of increasing her hard currency earnings by supplying Comecon rather than the West. On the one hand the greater flexibility in pricing and output strategy enjoyed by OPEC in its major export market would be adequate to counter such an attempt on the Soviet part, which might reduce the economic and political influence that the Organisation now exercises. On the other hand the oil companies, having committed themselves to high-cost exploration in the North Sea and elsewhere have an interest in the maintenance of a high price and, as far as possible, balanced supply and demand for oil in Western Europe.

Recognising the desirability of acquiring Western technology to develop her hydrocarbon resources the Soviet

Table 8.3. Soviet Natural Gas Export Commitments, 1980
(Billion cubic metres)

	Volume
A. Comecon	
Bulgaria	6.3
Hungary	4.0
GDR	5.0
Poland	4.5
Romania	2.8
Czechoslovakia	6.0
B. Comecon Associated	
Yugoslavia	3.0
Sub-Total	31.4
C. Western Europe	
Finland	1.4
Italy	7.0
Austria	2.4
France	4.0
West Germany	8.5
Sub-Total	23.3
Total Export Commitment	54.7

Sources: Russell op. cit. p.70.
Petroleum Economist, May 1977, p.200.

Union was able to support OPEC's politico-economic strategy towards Western companies and governments, since increasing oil prices and uncertainty of future supply from OPEC served to make joint projects somewhat more attractive to the major companies. Though it can hardly be said that the Soviet Union catalysed the price rises and production cutbacks she benefited from them. The Soviet Union was able to increase substantially her hard currency earnings through hydrocarbon exports to Western Europe and to negotiate substantial price increases for exports to fellow members of Comecon. This latter outcome brought Eastern Europe closer to the Soviet Union in that provision of capital, material and human resources for the development of Soviet hydrocarbon reserves has become the optimal solution of Eastern Europe's energy problem in the medium term. This not only ties the members of Comecon more closely together, but also contributes to the maintenance of self-sufficiency in energy, most importantly in hydrocarbons, of the bloc's principal economic and political power.

APPENDIX A

Joint Ventures in the Development of Soviet Oil and Gas Resources

Information on joint projects in the development of the Soviet oil and gas industries has been incorporated in a number of recent studies. For the sake of completeness of information the current status (1977) of these projects is included here. For a fuller history of the negotiations of joint projects the reader is referred to the following works:

Robert E Ebel "Communist Trade in Oil and Gas" New York: Praeger 1970. Chapters 8 (oil) and 9 (gas) outline the course of negotiations commenced in the mid-sixties.

Jeremy Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976. Post-1970 developments are outlined in a series of chapters comprising part 2 of the book, giving a country-by-country analysis.

This appendix is based on the author's article in E de Keyser (ed.) "The European Offshore Oil and Gas Yearbook 1976/1977" London: Kogan Page 1976, updated where necessary to include the most recent information available.

1. Soviet-American-Japanese Development of East Siberia.

This scheme is concerned with the development of the gas reserves of Yakutia. Negotiations involve cooperation between the American Occidental Oil Company, El Paso Natural Gas Company and the engineering company Bechtel, in conjuction with the Japanese companies Tokyo Electric Power and Tokyo

Gas. Preliminary inconclusive discussions had been in progress since the mid sixties, but in the aftermath of 1973-1974 they commenced movement towards a possible conclusion. Early in 1974 the tripartite talks brought agreement on the basis of the provision of a $3400 million loan to be provided equally by the USA and Japan. It was intended that this loan would be used by the Soviet Union for the purchase of equipment to construct a 3220 kilometre pipeline to the port of Nakhodka, where a liquefaction plant would be sited, and that deliveries of 30 billion cubic metres of gas per year would commence in 1980, to be divided equally between the Soviet Union, the USA and Japan over a 25-year period. The American negotiators anticipate that El Paso would receive 75 per cent and Occidental 25 per cent of the American allocation, with the provision that Occidental would accept increased quantities if reserves and production proved greater than anticipated.

2. Soviet-Japanese Development of West Siberia (Tyumen')

Discussions between the Soviet Union and Japan concerning the possibility of joint development of oil and gas in West Siberia commenced in 1966. Originally the Soviet Union was prepared to supply 40 million tonnes of oil per year, but in the light of problems encountered nationally in maintaining oil production this figure was reduced to a maximum of 25 million in 1973. At the same time the Soviet Union indicated that as a result

of Western inflation and changes in exchange rates that worked to the disadvantage of the Soviet Union, considerably higher credits than originally envisaged would be required. Japan indicated at first that these new terms were still of interest: however in the early part of 1974 insistence on the Soviet part that the oil would be supplied to Japan at the current world price, indicating that the future price would be linked to the Middle East price, plus the Soviet Union's expressed wish to use part of the loan to finance the construction of a second trans-Siberian railway in preference to a pipeline, evoked a negative response from Japan, who seemed unwilling to become involved in developing the means by which the Soviet Union could improve its military logistic system close to the Chinese border. At the time of writing negotiations are still at stalemate.

3. Soviet-American Development of North-West Siberian Gas Reserves

This scheme involves a consortium of three American companies, Tenneco Petroleum, Texas Eastern Gas and the engineers Brown and Root. Negotiations have centered on the construction of a pipeline from Urengoi to Murmansk, where liquefaction facilities would be sited. The envisaged cost is of the order of $7.6 billion, of which the Soviet Union agreed to raise $1.5 billion, the rest to be raised by the American consortium. Deliveries of gas would commence in 1980.

Schemes involving American participation experienced a strong setback in December 1974, when Congress decreed that the lending authority of the Export-Import Bank would be limited to a maximum of $25 billion over a 4-year period, with a subceiling of $40 million on loans in the energy sector. In addition it was stipulated that 25 legislative days' notice should be given for energy project proposals involving loans of $25 million or above. Subsequent attempts have been made to raise finance from sources other than the Export-Import Bank: however there are currently only two projects under discussion, the Yakutia gas project and a proposal to develop offshore oil reserves in Sakhalin. A revised agreement for the former project was signed in April 1976 providing initial credits of some $50 million, of which $25 million would be provided by the Bank of America, $20 million by the Japanese Export-Import Bank and $5 million from private Japanese sources. In the case of Sakhalin an agreement was signed by Japan, the USA and the Soviet Union in January 1975 covering oil and gas developments. Initial credits of $600 million were to be provided by the Japanese Export-Import Bank and private industry.

4. Anglo-Soviet Development of Offshore Oil Reserves (Caspian).

In April 1976 an agreement was reached between Britain and the Soviet Union concerning the provision of British technology, proved in the North Sea, for use in the development of offshore reserves in the Caspian Sea. The companies most closely

involved in this project are BP and Highland Fabricators Ltd., the engineering company operated jointly by Wimpey and Brown and Root. The agreement provides for the supply of drilling equipment and expertise.

5. Smaller Scale Joint Projects.

A number of smaller-scale joint projects involving Western countries in the development of oil and gas reserves in Comecon have been initiated. In March 1974 the governments of Sweden and Finland signed a ten-year agreement with the Polish government covering joint exploration of the continental shelf of the Baltic Sea, following a Polish oil strike. The government of West Germany has had preliminary discussions with the Soviet Government on the possibility of joint exploration in the Barents Sea, though it seems more likely that negotiations with the Norwegian government will prove fruitful. Bulgaria and Romania, recognising the possibility of using proven offshore technology, have invited interested Western companies for preliminary discussions.

6. The 'Adria' Pipeline

The history of the joint participation of Hungary, Czechoslovakia and Yugoslavia with Kuwait in the construction of a pipeline from the island of Krk near Rijeka to Zagreb, with branches to Hungary and Czechoslovakia, is given as Appendix E to Russell's

(1976) study (pp.228-229). The Hungarian branch is intended to link with the trans-Comecon 'Druzhba' pipeline at Szazhalombatta for forward transmission to Bratislava; the Yugoslav branch is to extend to the north and north-east of the country to feed refineries at Bosanski Brod, Novi Sad and Pancevo. Russell estimates the total cost of the project at $500 million. The section from Krk to Zagreb was due to be operational by early 1977: however in mid-1977 construction work to expand port facilities had just commenced. (See Petroleum Economist July 1977, p.285.)

APPENDIX B

Utilisation of Natural Gas in the Soviet Union 1971-1975.

The information contained in this appendix is derived from a single source, R D Margulov, E K Selikhova and I Ya Furman "Razvitie gazovoi promyshlennosti i analiz tekhniko-ekonomicheskikh pokazatelei (nauchno-ekonomicheskii obzor)" Moscow: Ministerstvo gazovoi promyshlennosti 1976.

During the time in which natural gas has made an increasing contribution to the Soviet energy balance, essentially the post-1960 period, there have been substantial changes not only in the geography of production but also of consumption. During 1961-1965 the growth in consumption in European Russia was accompanied by a corresponding rate of growth in production. However during 1966-1970 the substantial part of European production was provided by operations in the North of the area, whereas the prime growth areas for consumption were the Ukraine, Volga, Transcaucasia, the Centre, the North-West and the South-West, as shown in the following table: (billion cubic metres).

Production Region	1960	1965	1970	1975 Prelim.
Total USSR	45.1	129.0	197.9	274.3
incl. RSFSR	23.9	75.6	117.3	160.5
North-West	1.8	6.6	9.5	13.4
Central	6.5	22.5	32.0	38.5
Central Chernozem	0.9	2.7	4.6	5.6
Volga	8.8	18.0	22.9	36.5
North Caucasus	4.4	11.2	15.3	18.2
Ural	0.5	10.2	26.2	38.7
Ukraine	14.6	34.6	49.6	58.3
Belorussia	-	2.3	2.9	4.0
Transcaucasia (Georgia, Azerbaidzhan, Armenia)	5.9	7.8	9.3	16.7

Source: op. cit. p.8.

Gas consumption increased by 40 per cent during the ninth Plan. The greatest increases in individual sectors were recorded by the chemical industry (80%), ferrous metallurgy (30%), engineering and metalworking (30%) and the non-ferrous metallurgical industry showed an increase of 150 per cent. In 1975 gas accounted for 79 per cent of fuel used in the production of ammonia (the base for fertiliser), 64 per cent of fuel in cement production and 35 per cent of fuel in copper production. A total of 126 billion cubic metres of gas was consumed in energy conversion (electricity and steam raising). The following table details the consumption of gas by sector of the economy, 1975 compared with 1970:

Gas Consumption Pattern 1970-1975
(billion cubic metres)

Consumption Sector	1970	1975	1975 as % of 1970
Total Soviet Consumption	190.8	264.5	139
Communal Use	25,3	34.0	134
Industrial Use	108.1	154.4	143
inc. Ferrous Metallurgy	28.0	35.4	126
Non-Ferrous Metallurgy	2.3	5.7	248
Engineering and Metalworking	19.1	24.2	127
Construction Materials	18.3	24.8	135
Oil and Gas	10.6	20.5	193
Fisheries	6.1	8.2	134
Light Industry	2.5	3.8	152
Other Industrial	8.3	9.0	108
Electricity Generation	52.7	67.8	129
Construction	1.0	1.7	170
Transport	0.7	1.3	186
Agriculture	0.7	1.9	271
Other	2.3	3.4	148

Source: ibid. p.14.

From 1971 to 1975 gas consumption in the North-West, the Baltic states and Belorussia increased by 6.4 billion cubic metres, in the Central region by 8.9 billion in the Volga area by 13.6 billion, in the Urals by 12.0 billion and in the Ukraine by 8.7 billion. However concurrently with growth in consumption in European Russia there has been a decline in production in the Ukraine and the North Caucasus which during the eighth Plan not only provided for demand in European Russia and the Central regions but also in the North-West, the Baltic states and Belorussia. In the course of the ninth Plan this decline totalled 57 billion cubic metres, despite the installation of new productive capacity to offset depletion. The following table details the changes in gas consumption by region, 1975 compared with 1970:

Gas Consumption by Region 1970-1975
(billion cubic metres)

Economic Region	Consumption		Growth	
	1970	1975	Absolute Increase	1975 as % increase on 1970
North-West	9.5	13.4	3.9	41.1
Centre	32.0	38.5	6.5	20.3
Central Chernozem	4.6	5.6	1.0	21.7
Volga-Vyatskii	4.7	6.1	1.4	29.8
Volga	22.9	36.5	13.6	59.4
North Caucasus	15.3	18.2	2.9	19.0
Urals	26.2	38.7	12.5	47.7
Baltic states	2.8	4.2	1.4	50.0
Belorussia	2.9	4.0	1.1	37.9
Ukraine	49.6	58.3	8.7	17.5
Transcaucasia	9.3	16.7	7.4	79.6
Kazakhstan	3.3	7.6	4.3	130.3
Central Asia	13.4	23.9	10.5	78.4
Other Regions	1.4	8.7	7.3	521.0
TOTAL	197.9	280.4	82.6	41.7

Source: ibid. p.42. (NB figures include transportation loss.)

APPENDIX C

The Soviet System of Reserve Classification

Soviet reserve classifications for oil and gas do not readily correspond with those used in the West. Recent Western works have included details of the Soviet system:[1] for ease of reference the terms of the classification are included here. The information contained in this appendix is derived from a single source, this being the presentation by M Sh Modelevsky of the Laboratory of the Geology of Foreign Countries, Moscow, and V F Pominov of the Institute of World Economics and International Relations, Moscow, to the Conference on Energy Resources held in Laxenburg, Austria, in May 1975 under the auspices of the International Institute for Applied Systems Analysis (IIASA). The system of classification given by Modelevsky and Pominov is stated to be used in most of the other socialist countries.

The classification divides known reserves into two main groups, those recoverable under present technical and economic conditions and those unrecoverable under the same conditions. The group termed "explored" ('razvedannye') reserves comprises classifications A, B and C1.

1(a) I F Elliot "The Soviet Energy Balance" London: Praeger 1974, p.19.

(b) J Bethkenhagen "Bedeutung and Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschaftsforschung, Sonderheft 104) Berlin : Duncker & Humblot 1975, pp. 29-30.

(c) J Russell "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House.1976, pp.221-222.

Category A reserves are calculated only during the time in which a given field is being exploited and when the factors influencing commercial production are known, such as total oil in place, its chemical composition, seam pressure and the degree of gas saturation.

Category B comprises reserves in wells that have been extensively drilled and indicate estimated levels of production by tested flows from at least two wells. Knowledge of the chemical composition of the oil or gas and an estimate of the total exploitability of the field, adequate to justify the decision to develop, are required.

Category C1 comprises reserves in known fields, which have already a number of wells proven to be commercial. Such reserves are normally found adjacent to deposits already classified in the A and B category, and where primary logging data indicates the likelihood of such reserves becoming commercially exploitable.

It is noted that the range of accuracy experienced in estimating reserve levels is 10, 25 and 50 per cent for categories A, B and C1 respectively.

Category C2 relates to "prospective" ('perspektivnye') reserves, found mainly in new exploration areas and are calculated on the basis of logging data and geological proximity to fields containing reserves in the higher categories.

It is pointed out that reserves in new fields are usually reckoned in categories C1 and C2, and only occasionally in

category B, immediately after drilling and testing of the first well to flow. Depending on the rate of success of development drilling, reclassification of reserves in category C1 is possible in a relatively short time.

Category D comprises "predicted" ('prognoznye') reserves. In category D1 are found reserves in deposits at depths already reached in development drilling and whose extent can be gauged from primary seismic data. No measure of the techno-commercial potential is assumed. Category D2 accounts for reserves that are believed to exist in regions with proven potential but where drilling has not been carried out or where the depth of the likely deposit has not been reached in exploratory drilling carried out in existing hydrocarbon-bearing areas.[2]

It is stressed that the Soviet approach to reserve classification is primarily geological and that "rather high" recovery factors, based on the ready availability of the most advanced technology, have been used. The economic factors, have rarely been considered adequately. However Modelevsky and Pominov do stress that there has recently been a shift in emphasis on the Soviet part to a "more commercially oriented" system of classification, including setting limits to the degree of exploration regarded as sufficient to justify the decision to develop a given field, so as to avoid what is implied to be

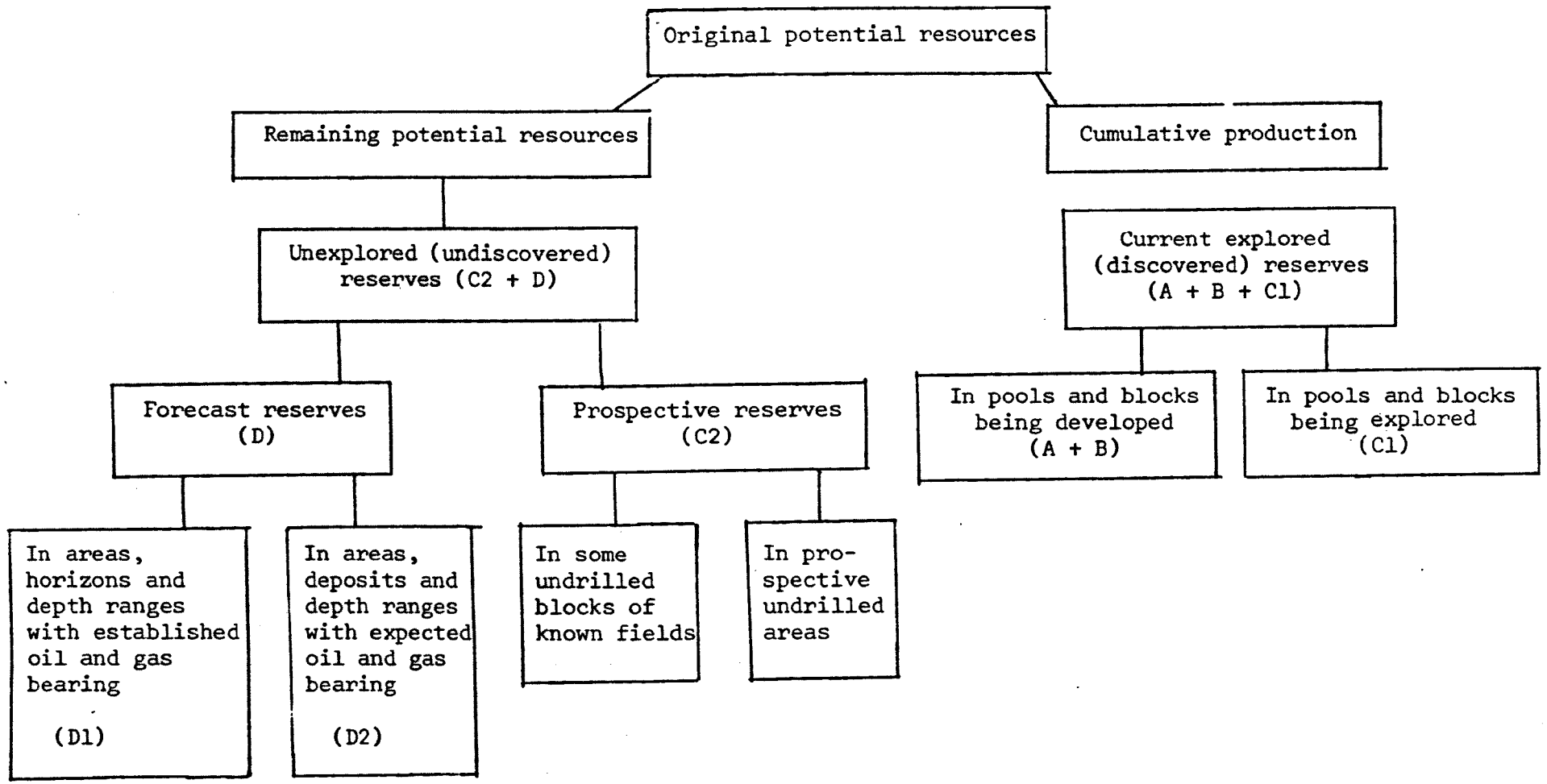
---

[2]Note also that there is data on the content of reserve categories A, B and C in L M Umanskii, M M Umanskii "Ekonomika neftyanoi i gazovoi promyshlennosti" Moscow: Nedra 1974, p.255.

excessive drilling cost incurred during the exploratory phase.

On the question of comparability with Western classification systems, the authors stress the equal importance given in the West to economic considerations and note that such an approach gives rise to underestimation by Soviet standards of ultimate explored reserves. The following tables, taken from the Modelevsky and Pominov paper, summarise the Soviet classification system (table A), and compare this system with others currently in use elsewhere in the hydrocarbon-producing world (table B).

General Soviet System of Reserve Classification



Comparison of Classification Systems Adopted in the USSR and in Other Countries

Groups of reserves in the US classification	Categories and groups from classification adopted in the USSR							
	USA and Canada	India	Iran	Malaysia	France	Netherlands	West Germany	North African countries
Proved	A, B partly C1	A, B	A, B	A, B	A, B partly C1	A, B partly C1	A, B partly C1	A, B, C1
Probable		C1,C2	C1	C1	C1 and partly C2 in known fields	mainly C1	C1 and sometimes C2 in known fields	-
Possible	D1, partly D2	-	C2 in known fields	C2 in known fields	C2 in prospective undrilled areas	C2 in known fields	C2 in prospective undrilled areas	-
Speculative	D2	D1	-	-	-	-	-	-

APPENDIX D

Issues for Further Research

(i) Labour Supply in the Development of Siberian Reserves

The provision of adequate labour for the development of West Siberian oil and gas resources and for exploratory work in East Siberia has become a major constraint on the development of the Soviet energy balance and merits further study. Recent Western analyses of Soviet energy development allude to factors such as high labour turnover despite substantial wage and other benefits: however the nature and extent of the influence of this on energy planning remains unresearched.

Of the available Soviet material on this question the work of K I Misevich and V I Chudnova ("Naselenie rainov sovremennogo promyshlennogo osvoeniya severa Zapadnoi Sibiri" Novosibirsk Nauka 1973)is the most directly related to hydrocarbon development. It is essentially a study of the emergence of the Tyumen' oblast' and the Northern Ob' area following the decree on their rapid development adopted by the 24th Party Congress on 11 December 1969. Part of Chapter 5 (pp.123-136) deals with oil and gas questions, outlining the geographical factors influencing demand for labour, but providing no factual data on population flows. The book contains an extensive bibliography of works on this issue, most of which were published in the Soviet Union after 1960. The Soviet demographer V I Perevedentsev wrote a number of works on labour economics in the late sixties

and early seventies, one of which appears in translation ("Population Movement and Labour Supply in Siberia" Soviet Sociology, Fall 1972, pp.107-125. A survey of the work of this analyst is likely to provide useful basic material. (See also S G Prociuk "The Manpower Problem in Siberia" Soviet Studies, October 1967, pp.190-210.

(ii) Location of Energy-Intensive Industry.

The Eastward-shifting energy resource base has necessitated some rethinking on the part of Soviet planners as to the optimal location of power stations and energy-intensive industrial processes. Elliot devotes some space to this question ("The Soviet Energy Balance" New York: Praeger 1974, pp.246-251), presenting some data on the comparative delivered cost of fuels in the major industrial zones. At the theoretical level S A Nikolaev ("Mezhraionnyi i vnutrirayonnyi analiz razmeshcheniya proizvoditel'nykh sil" Moscow Nauka 1971) outlines the factors taken into consideration by Soviet planners in reaching decisions on industrial location. V I Shelest ("Regional'nye energo-ekonomicheskie problemy SSSR" Moscow Nauka 1975) devotes a section (part 4 - pp.162-215) to the issue, giving some details of aggregate energy consumption in industrial processes. The Nikolaev work contains a short bibliography. The proceedings of a conference on industrial location and general development (published as "Problemy razvitiya vostochnykh raionov SSSR" Moscow Nedra 1971) include a number of useful papers relevant to this issue.

APPENDIX E

Recently Published Material

(i) Arthur Jay Klinghoffer "The Soviet Union and International Oil Politics" New York: Columbia University Press 1977.

During the typing of the final script of this thesis the above work was published. Its objective is to study Soviet oil trade policy "from the vantage point of political science, rather than economics or petroleum geology" (p.2.). Klinghoffer's analysis complements the present study in that he attempts, unlike Russell ("Energy as a Factor..." 1976), to relate Soviet trade to the theoretical framework and operational reality of Soviet foreign policy, outlining the Soviet view of the economic and political role of trade. He gives a particularly detailed analysis of the Soviet role in the Middle East in the build-up to and aftermath of the Yom Yippur war, linking the Soviet Union's diplomatic moves in the area with day-to-day developments in international oil trade. Klinghoffer's perspective on Soviet involvement in discussions with Norway on development of the Barents Sea is particularly detailed and adds substantially to the analysis given in this thesis. Extensive footnotes reveal the painstaking preparation of the work.*

(ii) Z A B Zeman, J Zoubek "Comecon Oil and Gas within the Overall Energy Context", a business report published by The Financial Times Ltd, May 1977.

This is a short (137 pp.) reference work intended for the non-specialist businessman. The approach of the authors is

---

(*Note that the work is to be reviewed by this author in Soviet Studies in 1978.)

descriptive and historical, and the majority of the data relate to the Soviet Union. Specific examples of changes in energy consumption (e.g. Czech attempts at energy conservation pp.60-63, and trends in Soviet motorisation pp.72-75) are given. Projections of Soviet oil and gas export patterns concur broadly with the conclusions reached in this thesis. Though sources of statistical data are attested, the study is written without references, and its value to the researcher is therefore limited.

BIBLIOGRAPHY

Part 1: The Development of the World Petroleum Market

Adelman M A "The World Petroleum Market" Baltimore: Johns Hopkins Press 1972.

Adelman M A "Is the Oil Shortage Real?" Foreign Policy No.9 (Winter 1972/1973), pp.69-107.

Alexander S S, Hammond P Y (eds.) "Political Dynamics in the Middle East" New York: Elsevier 1972.

Al-Otaiba M S "OPEC and the Petroleum Industry" London: Croom Helm 1975.

Alting von Geusau F A M (ed.) "Energy in the European Communities" Leiden: Sijthoff 1975.

Barrows G "1985: A Dual Impact Study of our World in 1985 Before and After the Oil Crisis" New York: International Petroleum Institute 1975.

Berreby J-J "Le Pétrole dans la Stratégie Mondiale" Tournai: Casterman 1974.

Berreby J-J "Fondements Historiques et Politiques des Conflits Petroliers" Revue Française de Science Politique, December 1972, pp.1256-1275.

Brookings Institution "Cooperative Approaches to World Energy Problems" Washington D C: The Brookings Institution 1974.

Daedalus Vol. 104 No.4 (Fall 1975) "The Oil Crisis in Perspective"

Darmstadter J "Energy in the World Economy" Baltimore: Johns Hopkins Press 1971.

El-Mallakh R "American-Arab Relations: Conflict or Cooperation?" Energy Policy, September 1975, pp.170-180.

Erickson E W, Waverman L (eds.) "The Energy Question: An International Failure of Policy" Toronto: University of Toronto Press 1974 (2 Vols.)

Evans D "The Politics of Energy: The Emergence of the Super-states" London: Macmillan 1976.

Ezra D "Possibilities of a World Energy Crisis" National Westminster Bank Quarterly Review November 1972, pp.22-33.

Field M "Oil, OPEC and Participation" The World Today January 1972, pp.5-13.

Fried E R, Schultze C L "Higher Oil Prices and the World Economy" Washington D C: The Brookings Institution 1975.

Gordon R L: "The Evolution of Energy Policy in Western Europe" New York: Praeger 1970.

Hill P, Vielvoye R "Energy in Crisis: A Guide to World Oil Supply and Demand and Alternative Resources" London: Robert Yeatman 1974.

Jacoby N H "Multinational Oil" New York: Macmillan 1974.

Maull H "Oil and Influence: The Oil Weapon Examined" (Adelphi Paper No.117) London: International Institute for Strategic Studies 1975.

Mikdashi Z "The Community of Oil Exporting Countries: A Study in Governmental Cooperation" London: Allen and Unwin 1972.

Mitchell E J (ed.) "Dialogue on World Oil" Washington D C: American Enterprise Institute for Public Policy Research 1974.

Monroe E, Mabro R (eds.) "Oil Producers and Consumers: Conflict or Cooperation?" New York: American Universities' Field Staff 1974.

Odell P R "Europe's Oil" National Westminster Bank Quarterly Review August 1972, pp.6-21.

Odell P R "Indigenous Oil and Gas and Western Europe's Energy Options" Energy Policy June 1973, pp.47-64.

Odell P R "The World of Oil Power in 1975" The World Today July 1975, pp.273-282.

Odell P R "Oil and World Power: Background to the Oil Crisis" Harmondsworth: Penguin 1975 (4th edit.)

Odell P R "The Western European Energy Economy" Leiden: Stenfert Kroese 1976.

OECD "Impact of Natural Gas on the Consumption of Energy in the OECD European Member Countries" Paris: OECD 1969.

OECD "Oil: The Present Situation and Future Prospects" Paris: OECD 1973.

OECD "Energy Prospects to 1985" Paris: OECD 1974.

Park J D "OPEC and the Superpowers: An Interpretation" Coexistence April 1976, pp.49-64.

Penrose E T "The Large International Firm in Developing Countries" London: Allen and Unwin 1968.

Ray G, Robinson C "The European Energy Market in 1980" London: Staniland Hall 1975.

Sinha R P "Japan and the Oil Crisis" The World Today August 1974, pp.335-344.

Smart I "The Superpowers and the Middle East" The World Today January 1974, pp.4-15.

Smart I "Oil, the Superpowers and the Middle East" International Affairs January 1977, pp.17-35.

Szyliowicz J S, O'Neill B E (eds.) "The Energy Crisis and US Foreign Policy" New York: Praeger 1975.

Tanzer M "The Political Economy of International Oil and the Underdeveloped Countries" London: Temple Smith 1970.

Valais M, Durand M (eds.) "L'Industrie du Gaz dans le Monde" Paris: Editions Technip 1975 (2nd edit.)

Windsor P "Oil: A Plain Man's Guide to the Energy Crisis" London: Temple Smith 1975.

Zarb F G "US Energy Policy" The World Today January 1976, pp.1-7.

Part 2: The Oil and Gas Industries of the Soviet Union and Eastern Europe

A. The Soviet Union

Agaeva A A "Ekonomicheskaya effektivnost' geologorazvedochnykh rabot na neft' i gaz v Azerbaidzhane" Baku AN AzSSR 1972.

Agukin P, Shakhmatov A "Neftyanaya i gazovaya promyshlennost' v shestoi pyatiletke" Planovoe khozyaistvo 1956 No.6, pp.31-44.

Akhmetvaleev S A "Kapitaloemkost' absolyutnogo prirosta dobychi nefti i vosproizvodstvennaya struktura kapitalovlozhenii" Ekonomika neftyanoi promyshlennosti 1975 No.4, pp.18-20.

Alekseev P D "Orenburgneft' v devyatoi pyatiletke" Neftyanoe khozyaistvo 1976 No.1, pp.6-9.

Aleksandrov A V "Osnovnye tendentsii nauchno-tekhnicheskogo progressa v gazovoi promyshlennosti" Gazovaya promyshlennost' 1970 No.1, pp25-26.

Amiyan V A, Muravliev V M "Tekhnicheskii progress v dobyche nefti" Moscow Nedra 1962.

Aliev T M et al. "Informatsionnye sistemy v neftyanoi promyshlennosti" Moscow Nedra 1972.

Altunin E K et al. "Osnovnye voprosy bystreishego osvoeniya mestorozhdenii Zapadnoi Sibiri" Gazovaya promyshlennost' 1974 No.8, pp.10-12.

Altunin E N "Gaz i gazosnabzhenie Sibiri" Stroitel'stvo truboprovodov 1970 No.9, pp.6-7.

Andreev D Ya, Lutsenko N E "Ob optovykh tsenakh predpriyatii na nefteprodukty" Khimiya i tekhnologiya topliv i masel 1974 No.7, pp.35-37.

Annaliev A A "Turkmengazprom na novom etape razvitiya otrasli" Gazovaya promyshlennost' 1976 No.3, pp.10-11.

Anufriev A F, Kalinina A A "Toplivno-energeticheskaya baza na Evropeiskom Severo-Vostoke SSSR" Leningrad Nauka 1973.

Arzhanov F G, Fain Yu B "Samotlor - unikal'noe neftyanoe mestorozhdenie" Neftyanoe khozyaistvo 1975 No.5, pp.38-44.

Arzhanov F G et al. "Perspektivy razvitiya neftedobyvayushchei promyshlennosti Zapadnoi Sibiri" Neftyanik 1972 No.5, pp.8-11.

Arzhanov F G et al. "Nekotorye prakticheskie resheniya po avtomatizatsii operativnogo upravleniya neftyanoi promyshlennosti Zapadnoi Sibiri" Neftyanoe khozyaistvo 1974 No.6, pp1-3.

Asan-Nuri A A "O nekotorykh problemakh tekhnicheskogo progressa v oblasti burovykh rabot" Ekonomika neftyanoi promyshlennosti 1975 No.7, pp.19-20.

Avrov V A et al. "Prognoz gazonosnosti SSSR" Leningrad Gostoptekhizdat 1963.

Babakuliev A "O sovershenstvovanii planirovaniya i material'nom stimulirovanii v geologorazvedochnykh predpriyatiyakh" Izvestiya AN Turkmenskoi SSR, Ser. obshch. nauk 1969 No.5, pp.51-55.

Bakirov A A, Ryabukhin G E "Neftegazonosnye provintsii i oblasti SSSR" Moscow Nedra 1969.

Baraz V I "Sostoyanie i osnovnye napravleniya v ispol'zovanii neftyanogo gaza" Neftepromyslovoe delo 1973 No.10, pp.3-7.

Baraz V I "Sostoyanie i osnovnye napravleniya uluchsheniya ispol'zovaniya resursov neftyanogo gaza" Neftepromyslovoe delo 1976 No.7, pp.52-54.

Bazlov M N et al. "Podgotovka prirodnogo gaza i kondensata k transportu" Moscow Nedra 1968.

Berkhman E I "Ekonomika sistem gazosnabzheniya" Leningrad Nedra 1964.

Beschinskii A A "Osnovnye polozheniya dolgosrochnogo prognozirovaniya v energetike" Izvestiya AN SSSR Ser. energetika i transport 1972 No.1 pp.20-29.

Bogachev V "K voprosu ob intensifikatsii osvoeniya prirodnykh bogatstv Sibiri" Kommunist 1973 No.3, pp.89-100.

Bokserman Yu I "Prirodnye gazy i ikh ispol'zovanie" Moscow Gostoptekhizdat 1957.

Bokserman Yu I "Gazovye resursy SSSR" Moscow Gostoptekhizdat 1959.

Bokserman Yu I "Puti razvitiya novoi tekhniki v gazovoi promyshlennosti" Moscow Gostoptekhizdat 1964.

Bokserman Yu I "Razvitie gazovoi promyshlennosti SSSR" Neftyanik 1970 No.2, pp6-10.

Bokserman Yu I "Perspektivy razvitiya gazovoi promyshlennosti na Obskom severe" Problemy severa 15/1971, pp.49-56.

Bokserman Yu I "Nekotorye tendentsii dal'neishego razvitiya toplivnoi promyshlennosti" Neftyanik 1975 No.1, pp.4-7.

Bokserman Yu I "Puti povysheniya effektivnosti transporta topliva" Planovoe khozyaistvo 1975 No.2, pp.20-29.

Borisov P A "Poiski nefti i gaza v Sibiri, na Kamchatke i Severo-Vostoke SSSR" Moscow Gosplanizdat 1960.

Borisov P A, Zlotnikova A G "Proizvoditel'nost' truda v neftedobyvayushchei promyshlennosti SSSR" Moscow Gosplanizdat 1959.

Borodkin I A et al. "Razvitie integratsii v khimicheskoi promyshlennosti stran-chlenov SEV" Moscow Ekonomika 1974.

Bot Yu K "Sotsial'no-ekonomicheskie problemy razvitiya neftyanoi promyshlennosti Zapadnoi Sibiri" Ekonomika neftyanoi promyshlennosti 1976 No.10, pp.36-39.

Brenner M M "Ekonomika neftyanoi promyshlennosti" Moscow Nedra 1962.

Brenner M M "Ekonomicheskaya otsenka neftyanykh i gazovykh resursov SSSR" Geologiya nefti i gaza 1965 No.10, pp.29-34.

Brenner M M "Ekonomika neftyanoi i gazovoi promyshlennosti" Moscow Nedra 1968.

Brenner M M "Ekonomika neftyanoi promyshlennosti SSSR na sovremennom etape" Neftyanoe khozyaistvo 1973 No.12, pp.1-4.

Brenner M M "Effektivnost' ispol'zovaniya toplivno-energeticheskikh resursov" Voprosy ekonomiki 1977 No.6, pp.37-48.

Brents A D "O rentnykh platezhakh v gazovoi promyshlennosti" Planovoe khozyaistvo 1969 No. 2, pp.38-42.

Brod I O "Neftyanye i gazovye bogatstva nedr SSSR" Moscow Znanie 1956.

Broide I M "Finansirovanie neftyanoi i gazovoi promyshlennosti" Moscow Gostoptekhizdat 1960.

Bugrov V A, Strizhenova N F "Ekonomika, organizatsiya i planirovanie neftedobyvayushchikh predpriyatii" Moscow Nedra 1962.

Bulatov V S "O vozmozhnykh napravleniyakh transportirovaniya Tyumenskogo gaza" Izvestiya SO AN SSSR, Ser. obshch. nauk 1971 No.1, pp.37-46.

Bulatov V S "Analiz faktorov, opredelyayushchikh uroven' dobychi prirodnogo gaza na Tyumenskom severe" Izvestiya SO AN SSSR, Ser. obshch. nauk 1974 No.1, pp.12-18.

Bulatov V S "Puti povysheniya effektivnosti gazodobychi na Tyumenskom severe" Izvestiya SO AN SSSR, Ser. obshch. nauk 1976 No.6, pp.26-33.

Bulatov V S "K voprosu ob udorozhanii gazoprovodnogo stroitel'stva na Tyumenskom severe" Izvestiya SO AN SSSR, Ser. obshch. nauk 1976 No.1, pp.45-50.

Campbell R W "The Economics of Soviet Oil and Gas" Baltimore: Johns Hopkins Press 1968.

Campbell R W "Price, Rent and Decisionmaking: The Economic Reform in Soviet Oil and Gas Production" Jahrbuch der Wirtschaft Osteuropas 1972 Vol.2, pp.291-314.

Campbell R W "Some Issues in Soviet Energy Policy for the Seventies" in 'Soviet Economic Prospects for the Seventies' Washington D C: US Congress, Joint Economic Committee 1973, pp.45-55.

Campbell R W "Technological Levels in the Soviet Energy Sector" in 'East-West Technological Cooperation' Brussels: NATO 1976, pp.241-263.

Campbell R W "Issues in R and D: The Soviet Energy Case" in 'The Soviet Economy in a New Perspective' Washington D C: US Congress, Joint Economic Committee 1976, pp.97-112.

Campbell R W "Trends in the Soviet Oil and Gas Industry" Baltimore: Johns Hopkins Press 1976.

Central Intelligence Agency of the USA "Prospects for Soviet Oil Production" April 1977 Mimeo.

Chernyshov V D et al. "Zadachi osvoeniya gazovykh mestorozhdenii na severe Tyumenskoi oblasti" Stroitel'stvo truboprovodov 1974 No.6, pp.12-13.

Chesshire J H, Huggett C "Primary Energy Production in the Soviet Union" Energy Policy September 1975, pp.223-242.

Chirskov V G "Problemy kruglogodichnogo stroitel'stva truboprovodov v bolotistoi mestnosti" Stroitel'stvo truboprovodov 1976 No.1, pp.10-13.

Chirskov V G "Razvivaya truboprovodnyi transport Zapadnoi Sibiri" Stroitel'stvo truboprovodov 1976 No.4, pp.13-15.

Connolly V "East Siberian Oil" Mizan August 1971, pp.16-21.

Davarashvili K G, Timoshevskaya A D "Osobennosti kapital'nogo stroitel'stva v Sibiri" Ekonomika i organizatsiya promyshlennogo proizvodstva 1972 No.2, pp27-36.

Dienes L "Issues in Soviet Energy Policy and Conflicts over Fuel Costs" Soviet Studies July 1971, pp.26-58.

Dienes L "Energy Self-Sufficiency in the Soviet Union" Current History July/August 1975, pp.10-14, 47-51.

Dmitriev E Ya "Razvitie geologorazvedochnykh rabot na neft' i gaz v Vostochnoi Sibiri" Neftyanki 1975 No.4, pp.11-13.

Dolgopolov I V et al. "Neft' i gaz SSSR" Moscow Uchpedgiz 1960.

Driatskaya A V et al. "Nefti SSSR" Moscow Khimiya (4 Vols.); Vol.1 - 1971, Vols.2-4 - 1972.

Driatskaya Z V et al. "Nefti Komi ASSR" Khimiya i tekhnologiya topliv i masel 1975 No.4, pp.7-9.

Dunaev F F "Ekonomika i planirovanie neftyanoi promyshlennosti" Moscow Nedra, Part 1 - 1957, Part 2 - 1961.

Dvali M F, Belonin M D "Perspektivy poiskov nefti na bol'shikh glubinakh na territorii SSSR" Leningrad Nedra 1965.

Ebel R E "The Petroleum Industry of the Soviet Union" Washington D C: American Petroleum Institute 1961.

Ebel R E "Communist Trade in Oil and Gas" New York: Praeger 1970.

Ebel R E "Two Decades of Soviet Oil and Gas" World Petroleum June 1971, pp.78-93.

Economist Intelligence Unit "Soviet Oil to 1980" London: EIU 1973.

Economist Intelligence Unit "Soviet Natural Gas to 1985" London: EIU 1975.

Efreinov E P et al. "Razvitie neftyanoi promyshlennosti Zapadnoi Sibiri v 1964-1970 gody" Neftyanik 1971 No.7, pp7-11.

Egorov V I "Ekonomika neftegazodobyvayushchei promyshlennosti" Moscow Nedra 1970.

Egorov V I, Zlotnikova L G "Ekonomika neftepererabatyvayushchei i neftekhimicheskoi promyshlennosti" Moscow Khimiya 1974.

Ekonomika neftyanoi promyshlennosti 1971 No.4, pp.3-6. (editorial) "O razvitii neftyanoi promyshlennosti v svete: Direktivy 24 s"ezda KPSS"

Elliot I F "The Soviet Energy Balance" New York: Praeger 1974.

Evseenko M A "Neftyanaya promyshlennost' SSSR v shestoi pyatiletke" Moscow Gostoptekhizdat 1957.

Fedorchenko S "Na puti k novym rubezham" Neftyanki 1976 No.6, pp.5-8.

Fedorov V S Report of a conference on the development of oil, gas and the petrochemical industry of Turkmenia Gazovaya promyshlennost' 1970 No.9, p.49.

Fedorov V S "Itogi pervogo goda devyatoi pyatiletki i zadachi neftepererabatyvayushchei i neftekhimicheskoi promyshlennosti v 1972 godu" Neftepererabotka i neftekhimiya 1972 No.1, pp.1-8.

Feigin M B "Neftyanye resursy, metodika ikh issledovaniya i otsenki" Moscow Nedra 1974.

Feigin M B, Kostyukovskaya S B "Ob otsenke kotel'nogo topliva" Khimiya i tekhnologiya topliv i masel 1974 No.6, pp.38-39.

Fel'd S D "Edinyi energeticheskii balans narodnogo khozyaistva" Moscow Ekonomika 1964.

Fel'd S, Shul'ga V "Problemy sovershenstvovaniya toplivno-energeticheskogo balansa" Planovoe khozyaistvo 1969 No.2, pp.66-77.

Furman I Ya "Ekonomicheskaya effektivnost' ispol'zovaniya gaza v promyshlennosti" Moscow Gostoptekhizdat 1963.

Galonskii P P "Neftyanaya, gazovaya i neftepererabatyvayushchaya promyshlennost' v 1971-1975 gody" Planovoe khozyaistvo 1972 No.11, pp.31-39.

Galonskii P P "Bol'shie perspektivy, vazhnye zadachi" Neftyanik 1972 No.2, pp.1-4.

Gal'person E B "Zadachi ekonomicheskikh sluzhb v 1971 godu" Ekonomika neftyanoi promyshlennosti 1971 No.1, pp.3-6.

Gazovaya promyshlennost' 1974 No.12, pp.2-4. (editorial) "Zadachi razvitiya gazovoi promyshlennosti Uzbekistana"

Gorechenkov G I "Vysokoe kachestvo - vazhnoe uslovie rosta effektivnosti proizvodstva" Stroitel'stvo truboprovodov 1976 No.5, pp.6-8.

Goryunova L K et al. "Voprosy optimizatsii tekushchego i otraslevogo plana v neftepererabatyvayushchei promyshlennosti" Moscow Tsentral'nyi ekonomiko-matematicheskii institut 1973.

Graifer V I "Perspektivy razvitiya neftyanoi promyshlennosti" Ekonomika neftyanoi promyshlennosti 1973 No.8, pp.5-10.

Grigorashchenko T I "Neftyanaya promyshlennost' v opredelyayushchem godu devyatoi pyatiletki" Neftepromyslovoe delo 1974 No.9, pp.3-7.

Gubkin I M "Zadachi neftyanoi geologii na Yuzhno-vostochnom Kavkaze v tret'ei pyatiletke" Azerbaidzhanskoe neftyanoe khozyaistvo 1938 No.12, pp.10-13.

Gudkov S F "Nauchnye issledovaniya - dvizhushchaya sila tekhnicheskogo progressa" Gazovaya promyshlennost' 1976 No.1, pp.8-12.

Gumpel W "Die Energiepolitik der Sowjetunion" Cologne: Wissenschaft und Politik 1970.

Gumpel W "Energiebilanzen als Mittel der Energieplanung in der UdSSR" in 'Jahrbuch der Wirtschaft Osteuropas' Munich 1972, pp.295-317.

Gur'evich Ya D et al. "Neftyanaya promyshlennost' SSSR" Moscow 1958.

Gzovskii V M "Perspektivnoe napravlenie razvitiya neftanoi promyshlennosti SSSR" Izvestiya AN SSSR Ser. ekon. 1977 No.3, pp.73-84.

Hanson P "The Soviet Energy Balance" Nature, 6 May 1976, pp.3-5.

Hardt J P "West Siberia - The Quest for Energy" Problems of Communism May/June 1973, pp.25-36.

Hassman H "Oil in the Soviet Union" Princeton: Princeton UP 1953.

Hodgkins J A "Soviet Power - Energy Resources, Production, Potentials" London: Prentice Hall 1961.

Ibragimova Z "Tyumenskii kompleks i ego budushchee" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No.5, pp.4-20.

Il'ichev A I, Buryndin R M "Zapadnaya Sibir': resursy, problemy perspektivy" Novosibirsk: Zapadno-Sibirskoe knizhnoe izdanie 1971.

Ismailov R G "Ocherki razvitiya neftepererabatyvayushchei, neftekhimicheskoi i khimicheskoi promyshlennosti Azerbaidzhana" Moscow Nauka 1968.

Izumskii O A "O transportnom osvoenii sredneobskogo neftenosnogo raiona" Vestnik MGU, Ser. geog. 1969 No.5, pp.89-94.

Jack E E, Lee J R, Lent H H "Outlook for Soviet Energy" in 'The Soviet Economy in a New Perspective' Washington D C: US Congress, Joint Economic Committee 1976, pp.460-478.

Judy R "Die Bedeutung der Sowjetunion für die Welterdölwirtschaft" Berlin 1963.

Kalamkarov V A "Tekhnicheskii progress v neftyanoi i gazovoi promyshlennosti" Moscow Gostoptekhizdat 1960.

Kalamkarov V A "Rezervy dal'nego razvitiya neftyanoi promyshlennosti" Neftyanoe khozyaistvo 1955 No.6, pp.1-4.

Kal'chenko V A et al. "Ekonomika gazovoi promyshlennosti" Kiev Tekhnika 1974.

Karpov P P "Organizatsiya sbyta nefteproduktov" Moscow Nedra 1959.

Karyagin I D "Ekonomicheskie problemy razvitiya neftyanoi promyshlennosti Zapadnoi Sibiri" Moscow Nedra 1975.

Kashnitskii L A "Sebestoimost' i tsenoobrazovanie v neftyanoi promyshlennosti SSSR" Moscow Nedra 1966.

Keller A A "Neftyanaya i gazovaya promyshlennost' v poslevoennye gody" Moscow Gostoptekhizdat 1958.

Kin L F "Zadachi finansovogo planirovaniya" Ekonomika neftyanoi promyshlennosti 1976 No.10, pp.29-31.

Kirillin V "Energetika: problemy i perspektivy" Kommunist 1975 No.1, pp.43-51.

Khimiya i tekhnologiya topliv i masel 1975 No.1, pp.1-6. (editorial) "Neftepererabatyvayushchaya i neftekhimicheskaya promyshlennost' v 1975 godu"

Khimiya i tekhnologiya topliv i masel 1976 No.2, pp.2-4. (editorial) "Povyshenie effektivnosti proizvodstva"

Khor'kov V G "Neftepererabotchiki i neftekhimiki na trudovoi vakhte v zavershayushchem godu devyatoi pyatiletki" Khimiya i tekhnologiya topliv i masel 1975 No.4, pp.1-4.

Kochkin D A, Eronin N M "Razvitie energetiki i neftegazodobyvayushchei promyshlennosti v Tyumenskoi oblasti" Energeticheskoe stroitel'stvo 1970 No.8, pp.7-11.

Kochurin N "Chtoby vypolnit' zadaniya Partii" Neftyanik 1976 No.5, pp.6-8.

Korotaev Yu P "Podgotovka gaza k transportu" Moscow Nedra 1973.

Korotaev Yu et al. "Dolgovremennoe obespechenie potrebitelei kondensatnym syr'em" Gazovaya promyshlennost' 1977 No.4, pp. 21-23.

Korshunov I V et al. "Voprosy effektivnosti kapital'nykh vlozhenii i novoi tekhniki v neftyanoi promyshlennosti" Baku AN AzSSR 1961.

Kortunov AK "Gazovaya promyshlennost' SSSR" Moscow Nedra 1967.

Kortunov A K "Gazovaya promyshlennost' Sovetskogo Soyuza" Gazovaya promyshlennost' 1970 No.8, pp.1-4.

Kortunov A K "Uspekhi gazovoi promyshlennosti i perspektivy ee razvitiya" Gazovaya promyshlennost' 1971 No.3, pp.1-3.

Kotlyar I Ya, Pilyak V M "Ekspluatatsiya magistral'nykh gazoprovodov" Leningrad Nedra 1971.

Kozyrev V M "Renta, tsena, khozrashchet v neftyanoi promyshlennosti" Moscow Nedra 1972.

Kudinov V I "Segodnya i zavtra Udmurtskoi nefti" Neftyanoe khozyaistvo 1975 No.7, pp.3-6.

Kudinov V, Litvak S "O toplivno-energeticheskom balanse" Vestnik statistiki 1972 No.9, pp.35-46.

Kuz'min A Z "Nekotorye itogi raboty neftepererabatyvayushchei promyshlennosti za 1966-1970 gody" Ekonomika neftyanoi promyshlennosti 1969 No.12, pp.3-5.

Kuzenko V M et al. "Sostoyanie ispol'zovaniya proizvodstvennykh fondov v dobyche gaza i puti ego uluchsheniya (Ob"edinenie 'Ukrgazprom')" Gazovaya promyshlennost' 1975 No.12, pp.7-10.

Kuznetsov A V "Neftyanaya i gazovaya promyshlennost' v 1971 godu" Neftyanik 1971 No.3, pp.4-6.

Kuznetsova O B "Analiz fondootdachi v neftedobyvayushchei promyshlennosti" Ekonomika neftyanoi promyshlennosti 1972 No.6, pp.21-27.

Kuzovatkin R I "Front i tyl Samotlora" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No.6, pp.78-87.

Krasheninin V I "Ekonomicheskaya effektivnost' i osobennosti finansirovaniya kapital'nogo stroitel'stva v Tyumenskoi oblasti" Finansy SSSR 1972 No.11, pp.52-56.

Krasnova E I "Organizatsiya finansov na magistral'nykh gazo-provodahk" Leningrad Nauka 1974.

Krylov G V "Strana nesmetnykh resursov: prirodnye zapasy Zapadnoi Sibiri i ikh kompleksnoe ispol'zovanie" Novosibirsk Nauka 1968.

Lalayants A M "Dva obshchestva - dve linii v razvitii toplivno-energeticheskogo kompleksa" Planovoe khozyaistvo 1975 No.4, pp.20-31.

Lalayants A M "O povyshenii effektivnosti proizvodstva i ispol'zovanii kapital'nykh vlozhenii v neftyanoi promyshlennosti" Ekonomika neftyanoi promyshlennosti 1975 No.7, pp.30-32.

Lavrov N V, Agibalov A I "Toplivnaya baza SSSR v semiletke" Moscow Znanie 1961.

Lee J R "The Fuels Industries" in 'Economic Performance and the Military Burden in the Soviet Union' Washington D C: US Congress, Joint Economic Committee 1970, pp.33-37.

Levin S I "Trebovaniya k podgotovke stroitel'stva morskikh truboprovodov" Stroitel'stvo truboprovodov 1973 No.12, pp.4-6.

Levin S I et al. "Tsenoobrazovanie v neftyanoi promyshlennosti" Planovoe khozyaistvo 1976 No.7, pp.110-115.

Lisichkin S M "Ocherki razvitiya neftedobyvayushchei promyshlennosti SSSR" Moscow Nauka 1958.

Lisichkin S M "Energeticheskie resursy i neftegazovaya promyshlennost' mira" Moscow Nedra 1974.

Loginov V P "Ekonomicheskie problemy tekhnicheskogo progressa v dobyche mineral'nogo syr'ya" Moscow Nauka 1971.

L'vov M S "Resursy prirodnogo gaza SSSR" Moscow Nedra 1969.

L'vov M S, Keller A A "Neftyanaya i gazovaya promyshlennost' SSSR v semiletke" Moscow Gosplanizdat 1960.

Luzin V I "Ekonomicheskaya effektivnost' kapital'nykh vlozhenii v neftedobyvayushchuyu promyshlennost'" Moscow Nedra 1962.

Luzin V.I "Ekonomika promyslovoi podgotovki nefti i pererabotki" Moscow Nedra 1964.

Luzin V I "Ekonomicheskaya effektivnost' i planirovanie kapital'nykh vlozhenii i osnovnykh fondov v neftyanoi promyshlennosti" Moscow Nedra 1974.

Makarov A A, Melent'ev L A "Metody issledovaniya i optimizatsii energeticheskogo khozyaistva" Novosibirsk Nauka 1973.

Maksimov V P "Perspektivy i zadachi razvitiya proizvoditel'nykh sil Tyumenskoi oblasti" Ekonomika i organizatsiya promyshlennogo proizvodstva 1972 No.2, pp.37-42.

Mal'tsev N A "Permskaya oblast'" Neftyanoe khozyaistvo 1971 No.3, pp.33-35.

Mal'tsev N A "Neftyanaya promyshlennost' strany v desyatoi pyatiletke" Neftyanik 1976 No.2, pp.1-4.

Mal'tsev N A "Itogi i zadachi" Neftyanoe khozyaistvo 1977 No.3, pp.3-8. (Outlines the progress of the oil industry in 1976 and details the targets for 1977-1980.)

Malyshev Yu et al. "Ekonomika neftyanoi i gazovoi promyshlennosti SSSR" Moscow Nedra 1966.

Margulov R D, Selikhova E K, Furman I Ya "Razvitie gazovoi promyshlennosti i analiz tekhniko-ekonomicheskikh pokazatelei" Moscow Ministerstvo Gazovoi Promyshlennosti 1976.

Martynov B "O planirovanii tekhnicheskogo urovnya toplivno-energeticheskogo kompleksa" Planovoe khozyaistvo 1973 No.6, pp.48-55.

Maslakov D I "Toplivnyi balans SSSR" Moscow Nedra 1960.

Mazover Ya A "Toplivno-energeticheskie bazy vostoka SSSR (Sibir' i Srednyaya Aziya)" Moscow Nauka 1966.

Melent'ev L A "Toplivno-energeticheskie balans SSSR" Moscow Nauka 1963.

Melent'ev L A "Osnovnye zadachi optimizatsii i upravleniya v bol'shikh sistemakh energetiki" Izvestiya AN SSSR, Ser. energetika i transport 1971 No.2, pp.3-10.

Melent'ev L A, Makarov A A "Osobennosti optimizatsii razvitiya toplivno-energeticheskogo kompleksa" Izvestiya AN SSSR, Ser. energetika i transport 1974 No.3, pp.12-19.

Melent'ev L A, Shteingauz E O "Ekonomika energetiki SSSR" Moscow Nauka 1963.

Mel'nikov N V "Voprosy razvitiya toplivnoi promyshlennosti" Planovoe khozyaistvo 1969 No.1, pp.12-20.

Mel'nikov N V "Mineral'noe toplivo" Moscow Nedra 1971.

Mel'nikov N V "Toplivno-energeticheskie resursy SSSR" Moscow Nauka 1971.

Mel'nikov N V, Shelest V "Toplivno-energeticheskii kompleks SSSR" Planovoe khozyaistvo 1975 No.2, pp.8-19.

Mikhailov V V "Problemy ekonomiki promyshlennogo energopetrebleniya" Promyshlennaya energetika 1976 No.1, pp.8-10.

Mingareev R Sh "Osnovnye napravleniya nauchno-tekhnicheskogo progressa v dobyche nefti i neftyanogo gaza" Neftepromyslovoe delo 1975 No.1, pp.3-11.

Mingareev R Sh, Luzin V I "Ekonomika podgotovki nefti i gaza" Moscow Nedra 1972.

Mkchiyan M A et al. "Nefti Zapadnoi Sibiri" Neftyanik 1975 No.12, pp.17-18.

Mkchiyan M A et al. "Nefti sredneobskoi neftegazonosnoi oblasti Zapadnoi Sibiri" Khimiya i tekhnologiya topliv i masel 1974 No.4, pp.1-4.

Mkrtchan G M "Opredelenie optimal'nykh ov"emov zapasov dlya obespecheniya zadannykh razmerov dobychi nefti" Izvestiya SO AN SSSR, Ser. obshch. nauk, 1973 No.1, pp43-48.

Mobesyan Yu T, Parkhomenko R S "Nekotorye voprosy razvitiya neftegazovogo khozyaistva Zapadnoi Sibiri" Izvestiya SO AN SSSR, Ser. obshch. nauk 1970 No.11, pp.97-101.

Muravlenko V I "O problemakh razvitiya promyshlennosti v Zapadnoi Sibiri" Ekonomika neftyanoi promyshlennosti 1975 No.7, pp.12-13.

Namestnikovs A, Bergmanis V "Kādas ir Baltijas dļīles?" Cīņa, 19 December 1974, p.4. (Oil exploration in the Baltic Republics)

National Petroleum Council of America "Impact of Oil Exports from the Soviet Bloc" Washington D C: US Government Printing Office 1962. (2 Vols.)

National Petroleum Council of America "Supplement to the 1962 Report" Washington D C: US Government Printing Office 1964.

Nazarov F F "Sostoyanie i napravlenie rabot v oblasti podgotovki nefti na mestorozhdeniyakh Zapadnoi Sibiri" Neftepromyslovoe delo 1970 No.9, pp.20-22.

Nazarov V I et al. "K obosnovaniyu predel'nykh ekonomicheskikh pokazatelei poiskov i razvedki neftyanykh mestorozhdenii" Ekonomika neftyanoi promyshlennosti 1977 No.7, pp.3-7.

Neftyanoe khozyaistvo 1970 No.2, pp.1-5. (editorial) "Nekotorye itogi raboty neftepererabatyvayushchei promyshlennosti v 1969 godu"

Neporozhnii P "Perspektivy Sovetskoi energetiki" Planovoe khozyaistvo 1975 No.8, pp.42-49.

Nesterova N E et al. "Otraslevaya otsenka ekonomicheskoi effektivnosti kapital'nykh vlozhenii v neftedobyvayushchuyu promyshlennost' po raionam" Ekonomika neftyanoi promyshlennosti 1972 No.6, pp.34-40.

Nikitenko E A (ed.) "Dal'nii transport gaza" Moscow Nedra 1970.

North R N "Soviet Development of North-West Siberia" Soviet Studies October 1972, pp.171-199.

NATO Economic Directorate "Exploitation of Siberia's Natural Resources" Brussels: NATO 1974.

Ognev I "Postyzhenie otkrytiya" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No.4, pp.153-180. (discussion of optimal level of development of West Siberia.)

Ogorodnov E A "Osvoenie mestorozhdenii nefti i gaza v Zapadnoi Sibiri" Stroitel'stvo truboprovodov 1971 No.3, pp.27-29.

Orel V E, Stupakov V P "Ratsional'no ispol'zovat' zapasy gaza" Gazovaya promyshlennost' 1974 No.3, pp.31-34.

Orlov B P "O ratsional'nykh metodakh osvoeniya prirodnykh zapasov v novykh raionakh Sibiri" Ekonomika i organizatsiya promyshlennogo priozvodstva 1971 No.2, pp.26-38.

Orudjev S A, Muravlenko V I "Integrated Planning for Exploration, Development, Production andTransportation for Rapid Expansion of Oil Field Operations" in 'Proceedings of the Ninth World Petroleum Congress' Barking: Applied Science Publishers 1976, Vol.3, pp. 327-336.

Orudzhev S A "Nauchno-tekhnicheskii progress i sovershenstvovanie upravleniya - osnova uskorennogo razvitiya gazovoi promyshlennosti" Planovoe khozyaistvo 1975 No.1, pp.22-33.

Orudzhev S A "Osnovnye zadachi razvitiya gazovoi promyshlennosti v 1976 godu - pervom godu desyatoi pyatiletki" Gazovaya promyshlennost' 1976 No.1, pp.1-7.

Orudzhev S A "Osnovnye napravleniya povysheniya effektivnosti proizvodstva v otrasli v svete reshenii 25 s"ezda KPSS" Gazovaya promyshlennost' 1976 No.11, pp.3-6.

Orudzhev S A "Osnovnye zadachi razvitiya gazovoi promyshlennosti v iubileinom godu" Gazovaya promyshlennost' 1977 No.4, pp.3-7.

Pavlenko A S "Energetika SSSR v 1971-1975 gody" Planovoe khozyaistvo 1972 No.7, pp.29-35.

Pavlenko A S, Nekrasova A M (eds.) "Energetika SSSR v 1971-1975 gody" Moscow Energiya 1972.

Pavlov Yu M "Ekonomicheskie problemy razvitiya Sibiri i Dal'nego Vostoka" Izvestiya AN SSSR, Ser. ekon. 1976 No.2, pp.71-82.

Petlichenko N V "Dobycha gaza v pervom godu desyatoi pyatiletki" Gazovaya promyshlennost' 1976 No.2, pp.4-6.

Pinkovskii Ya I "Tekhnika i ekonomika podgotovki nefti k pererabotke" Khimiya i tekhnologiya topliv i masel 1974 No.6, pp.33-37.

Podkletnov N E "Nefti Sakhalina" Moscow Nauka 1967.

Poleshchuk N G "Osnovnye voprosy ekonomiki toplivno-energeticheskoi bazy SSSR" Moscow Mysl' 1965.

Popov G "Khimicheskaya i neftekhimicheskaya promyshlennost' v devyatoi pyatiletke" Planovoe khozyaistvo 1972 No.4, pp.18-23.

Probst A E "Puti razvitiya toplivnogo khozyaistva Vostochnoi Sibiri" Moscow Gostoptekhizdat 1960.

Probst A E "Razvitie toplivnoi bazy raionov SSSR" Moscow Nedra 1968.

Probst A E "Puti razvitiya toplivnogo khozyaistva SSSR" Voprosy ekonomiki 1971 No.6, pp.51-63.

Probst A E, Mazover Ya A (eds.) "Razvitie i razmeshchenie toplivnoi promyshlennosti" Moscow Nedra 1975.

Probst A E et al. "Sravnitel'nye tekhniko-ekonomicheskie pokazateli po dobyche i transportu topliva po raionam SSSR" Moscow Nauka 1964.

Prutyanova Z S "Tekhniko-ekonomicheskie pokazateli razvitiya truboprovodnogo transporta" Ekonomika neftyanoi promyshlennosti 1970 No.12, pp.38-41.

Prutyanova Z S "Rezervy v nefteprovodmon transporte i metodika ikh opredeleniya" Ekonomika neftyanoi promyshlennosti 1972 No3, pp.24-27.

Prutyanova Z S "Analiz ekspluatatsionnykh zatrat v nefteprovodnom transporte" Ekonomika neftyanoi promyshlennosti 1972 No.12, pp.33-38.

Rassokhin G B et al. "Opyt proektirovaniya i uskorennogo vvoda v razrabotku Vuktylskogo gazokondensatnogo mestorozhdeniya" Gazovaya promyshlennost' 1976 No.10, pp.30-33.

Razumov V V "Nefteprovodnyi transport strany" Ekonomika neftyanoi promyshlennosti 1970 No.4, pp.17-20.

Riva J P Jr. "Soviet Offshore Oil and Gas" in 'Soviet Oceans Development' Washington D C: US Congress, National Ocean Policy Committee 1976, pp.479-500.

Riznik A Ya, Litvak S E "Toplivno-energeticheskii balans SSSR" Moscow Statistika 1965.

Rostovtsev N N (ed.) "Neft' i gaz Tyumeni" Tyumen'Glavtyumen-geologiya 1969.

Saifullin R "Medvezh'e - gazovyi promysel" Gazovaya promyshlennost' 1975 No.11, pp24-26.

Savel'ev M P "Osnovnye problemy razvitiya truboprovodnogo transporta nefti v Zapadnoi Sibiri" Ekonomika neftyanoi promyshlennosti 1975 No.7, pp.23-24.

Savenko Yu N, Shteingauz E O "Energeticheskii balans" Moscow Energiya 1971.

Savitskii V B "Ekonomicheskie problemy razvitiya nefteprovodnykh sistem Zapadnoi Sibiri" Ekonomika neftyanoi promyshlennosti 1976 No.9, pp.37-40.

Shapovalov A G "Planirovanie, finansirovanie i ekonomicheskoe stimulirovanie burovykh rabot" Moscow Nedra 1974.

Shashin V D "Neftedobyvayushchaya promyshlennost' SSSR" Moscow Nedra 1968.

Shashin V D "Puti povysheniya effektivnosti neftyanoi promyshlennosti" Planovoe khozyaistvo 1973 No.4, pp.15-22.

Shashin V D "Povyshenie effektivnosti neftyanogo proizvodstva" Ekonomika neftyanoi promyshlennosti 1975 No.7, pp. 3-11.

Shebarshina N, Mokrousova N "Formirovanie optimal'nykh skhem razmeshcheniya proizvodstva i transportno-ekonomicheskikh svyazei po nefti i nefteproduktam" Planovoe khozyaistvo 1973 No.9, pp.51-61.

Shelest V A "Regional'nye energo-ekonomicheskie problemy SSSR" Moscow Nedra 1975.

Shimkin D B "The Soviet Mineral-Fuels Industries 1928-1958: A Statistical Survey" Washington D C: US Government Printing Office 1962.

Shklyar M G "Osnovnye polozheniya i predvaritel'nye rekomendatsii po metodike tekushchego i perspektivnogo planirovaniya dobychi nefti" Ekonomika neftyanoi promyshlennosti 1970 No.12, pp.22-31.

Shmyglya P T "Nauka na sluzhbe osvoeniya gazovykh mestorozhdenii Sibiri" Gazovaya promyshlennost' 1976 No.2, pp.16-19.

Sidorov A P "Transportnoe osvoenie Zapadno-Sibirskoi nizmennosti" Izvestiya SO AN SSSR Ser. obshch. nauk 1966 No.2, pp.21-28.

Slocum M "Soviet Energy - An Internal Assessment" Technology Review October/November 1974, pp.17-33.

Smirnov A S et al. "Transport i khranenie gaza" Moscow Gostoptekhizdat 1962.

Smirnov K K "Vo imya mogushchestva Velikoi Rodiny" Stroitel'stvo truboprovodov 1976 No.2, pp.1-5. (Developments in pipeline construction during the 1971-1975 Plan.)

Smirnov V A "Edinaya gazosnabzhayushchaya sistema" Izvestiya AN SSSR, Ser. energetika i transport 1970 No.2, pp.66-75.

Smirnov V A et al. "Metodicheskie voprosy otsenki ekonomicheskoi effektivnosti eksporta gaza" Izvestiya AN SSSR, Ser. ekon. 1971 No.5, pp.114-122.

Smirnov V A "Gazovaya promyshlennost'" Ekonomika i organizatsiya proizvodstva 1975 No.5, pp.43-66.

Smith A B "Soviet Dependence on Siberian Resource Development" in 'The Soviet Economy in a New Perspective' Washington D C: US Congress, Joint Economic Committee 1976, pp.479-499.

Sokolov G D "Kapital'noe stroitel'stvo v neftyanoi promyshlennosti Moscow Nedra 1973.

Sokolov G D "K voprosu otsenki effektivnosti kapital'nykh vlozhenii v neftyanuyu promyshlennost'" Ekonomika neftyanoi promyshlennosti 1974 No.7, pp.3-8.

Stowell C E "Oil and Gas Development in the USSR" Tulsa: Petroleum Publishing Company 1974.

Stroev K F et al. "Toplivno-energeticheskie resursy" Moscow Nedra 1968.

Styrikovich M A "Nauchno-tekhnicheskie problemy razvitiya energetiki SSSR" Izvestiya AN SSSR, Ser. energetika i transport 1974 No.3, pp.3-11.

Suchkova L I et al. "Effektivnost' razvitiya neftedobyvayushchei promyshlennosti evropeiskikh raionov strany v tekushchem pyatiletii" Ekonomika neftyanoi promyshlennosti 1973 No.10, pp.6-9.

Sukhanov V P "Puti razvitiya neftepererabatyvayushchei promyshlennosti v SSSR" Neftyanoe khozyaistvo 1958 No.9, pp.1-3.

Sulimenkov G P et al. "Problemy povysheniya ekonomicheskoi effektivnosti osvoeniya Tyumenskikh mestorozhdenii gaza" Gazovaya promyshlennost' 1976 No.3, pp.12-25.

Tarakanov P D "Ispol'zovanie neftyanogo poputnogo gaza na mestorozhdenii Kotur-Tepe" Neftyanik 1975 No.3, pp.12-14.

Tarakanov P D "Osvaivaya gazovye bogatstva Turkmenii" Stroitel'stvo truboprovodov 1975 No.4, pp.12-13.

Tatarchuk N "Kompleksnaya programma osvoeniya bogatstv Sibiri i ee realizatsiya" Planovoe khozyaistvo 1974 No.4, pp.85-92.

Terent'ev G A et al. "Otsenka urovnya i struktury potrebleniya energeticheskikh resursov v neftepererabatyvayushchei promyshlennosti" Khimiya i tekhnologiya topliv i masel 1974 No.3, pp.28-31.

Titkin G "Nefti Zapadnoi Sibiri" Neftyanik 1975 No.12, pp.17-18.

Tomashpol'skii L M "Nefti' i gaz: problemy i prognozy" Moscow Nedra 1975.

Topuridze G, Golenishchev B "U neftyanikov Poles'ya Neftyanik 1976 No.6, pp.8-9.

Trofimuk A A "Uralo-Povol'zhe: novaya neftyanaya baza SSSR" Moscow Gostoptekhizdat 1957.

Trofimuk A A "Razvitie gazovoi promyshlennosti Sibiri i Dal'nego Vostoka" Gazovaya promyshlennost' 1970 No.4, pp.14-15.

Trofimuk A A "Kurs na intensifikatsiyu razvedki na neft' i gaz v Sibiri i na Dal'nem Vostoke" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No.1, pp.15-17.

Troitskii A "Novye rubezhi Sovetskoi energetiki" Planovoe khozyaistvo 1976 No.12, pp.20-28.

"Trudy konferentsii po razvitiya proizvoditel'nykh sil Vostochnoi Sibiri" Mosocw AN SSSR 1960.

Tukov G V et al. "O resursakh gaza v nefti Samotlorskogo mesto-rozhdeniya" Neftyanoe khozyaistvo 1975 No.2, pp.60-62.

Tyshlyar I S, Kevorkov A A "Ispol'zovanie mekhanizma dogovornykh tsen na gaz dlya bolee polnoi otrabotki mestorozhdenii" Gazovaya promyshlennost' 1977 No.3, pp.23-24.

Umanskii L M, Umanskii M M "Ekonomika neftyanoi i gazovoi promyshlennosti" Moscow Nedra 1965 and 1975.

Urinson G S "Ekonomika dobychi prirodnogo gaza" Moscow Nedra 1965.

Urinson G S et al. "Ekonomika razrabotki gazovykh mestorozhdenii" Moscow Nedra 1973.

Ushakov S S "Tekhniko-ekonomicheskie problemy transporta topliva" Moscow Transport 1972.

Uskov P N "Sovershenstvovanie odnotrubnogo sbora nefti i gaza" Neftepromyslovoe delo 1972 No.1, pp.31-35.

Vainer I Ya "Toplivno-energeticheskii kompleks i neft'" Neftyanik 1975 No.6, pp.6-8.

Vainer I Ya "Neftyanaya promyshlennost' v desyatoi pyatiletke" Neftyanik 1976 No.5, pp.1-4.

Varlamov V S "Probelmy transportnogo osvoeniya Zapadno-Sibirskoi nizmennosti v svyazi s formirovaniem na ee territorii novogo narodnokhozyaistvennogo kompleksa" Izvestiya AN SSSR Ser. geog. 1967 No.3, pp.48-59.

Vasil'ev V G "Prognoznye zapasy gaza SSSR" Gazovaya promyshlennost' 1967 No.1, pp.9-16.

Vasil'ev V G et al. "Gazovye mestorozhdeniya SSSR" Moscow Gostoptekhizdat 1961.

Vasil'eva V K "O tsenakh na neft'" Ekonomika neftyanoi promyshlennosti 1971 No.11, pp.22-26.

Vasil'eva V K "Sovershenstvovanie tsenoobrazovaniya v otrasli" Ekonomika neftyanoi promyshlennosti 1974 No.11, pp.58-59.

Vasil'eva V K, Kosinov N N "Kachestvo i tsena nefti" Ekonomika neftyanoi promyshlennosti 1973 No.2, pp.6-9.

Vasil'eva V K, Kosinov N N "O sisteme planovykh tsen na neft'" Ekonomika neftyanoi promyshlennosti 1975 No.5, pp.4-7.

Vasil'eva V K et al. "Nekotorye voprosy formirovaniya optovykh tsen na neftyanoi gaz" Ekonomika neftyanoi promyshlennosti 1976 No.2, pp.7-9.

Vigdorchik A et al. "Metody optimizatsii dolgosrochnogo razvitiya toplivno-energeticheskogo kompleksa SSSR" Planovoe khozyaistvo 1975 No.2, pp.29-37.

Yastremskaya V B "Organizatsiya i planirovanie proizvodstva v neftyanoi i gazovoi promyshlennosti" Moscow Nedra 1974.

Yudin E "Effektivnoe ispol'zovanie toplivno-energeticheskikh resursov strany - obshchegosudarstvennaya zadacha" Planovoe khozyaistvo 1975 No.6, pp.57-65.

Zaitsev Yu B "Itogi i perspektivy razvitiya dobychi nefti i gaza" Neftepromyslovoe delo 1972 No.1, pp.3-8.

Zaitsev Yu B "Orenburgskii gazovyi kompleks i ego perspektivy" Gazovaya promyshlennost' 1975 No.3, pp.6-8.

Zhdanov A M "Neftedobyvayushchaya promyshlennost' v 1969 godu" Ekonomika neftyanoi promyshlennosti 1970 No.1, pp.3-6.

Zhdanov M A et al. "Podshchet zapasov nefti i gaza" Moscow Gostoptekhizdat 1959.

Zhigalova I M "Organizatsiya i planirovanie na magistral'nykh gazoprovodakh" Moscow Nedra 1973.

Zhmykova N M et al. "Belorusskie nefti" Khimiya i tekhnologiya topliv i masel 1974 No.2, pp.6-9.

Zhmykova N M et al. "Nefti mestorozhdenii Pribaltiki" Neftyanik 1976 No.6, p.19.

Zieber P "Die Sowjetische Erdölwirtschaft" Hamburg Cram, de Gruyter 1962.

Zlotnikova L G et al. "O povyshenii roli tsen pri stimulirovanii nauchno-tekhnicheskogo progressa v neftepererabatyvayushchei promyshlennosti" Khimiya i tekhnologiya topliv i masel 1975 No.12, pp.30-32.

Zvyagintseva K M "O trekh zonakh toplivno-energeticheskogo khozyaistva Sibiri" Izvestiya SO AN SSSR Ser. obshch. nauk 1974 No.1, pp.19-25.

Zykin B N, Podkletnov N E "O ratsional'nykh sposobakh ispol'-zovaniya Sakhalinskoi nefti" Izvestiya SO AN SSSR, Ser. obshch. nauk, 1970 No.6, pp.109-116.

B. Eastern Europe

Alekseev A, Savenko Yu "Ekonomicheskaya integratsiya v ravitii toplivno-energeticheskikh otraslei stran-chlenov SEV" Voprosy ekonomiki 1971 No.12, pp.47-56.

Almasan B "Die Bergbauindustrie in der Sozialistischen Republik Rumänien" Neue Bergbautechnik 1973 No.6, pp.409-412.

Almasan B "Dezvoltarea industriei de petrol şi gaze din România" Mine Petrol şi Gaze 1975 No.4, pp.158-160.

Almasan B "Producţie şi utilizarea carbunelui în România" Energetica 1971 No.6, pp.252-255.

Almashan B "Sotrudnichestvo v razvitii neftyanoi i gazovoi promyshlennosti" Ekonomicheskoe sotrudnichestvo stran-chlenov SEV 1975 No.1, pp.60-67. (Also appearing in Neftyanik 1975 No.11, pp.30-33.

Armencoiu N, Misu A "Die Energiewirtschaft der Sozialistischen Republik Rumänien" Energietechnik 1971 No.9, pp.377-385.

Baufeldt S "Die künftige Erdöllücke im RGW vor dem Hintergrund des sowjetischen Engagements in Nah-Mittel-Ost" Osteuropa Wirtschaft June 1973, pp.35-54.

Bednarz L "Nowe perspektywy przeróbki ropy naftowej w Polsce" Nafta (Krakow) 1973 No.5, pp.193-196.

Bednarz L "Problemy naftowe socjalistycznej integracji gospodarczej" Nafta (Krakow) 1974 No.12, pp.529-538.

Berghianu M "Valorificarea superioară a resurselor materiale" Era socialistă 1975 No.9, pp.24-29.

Bese V "Hungary's Mineral Oil andGas Industry" Marketing in Hungary 1971 No.4, pp.8-12.

Bernstein H "Die Entwicklung der Gaswirtschaft der DDR unter besonderer Berücksichtigung der sozialistischen ökonomischen Integration" Energietechnik 1975 No.1, pp.1-6.

Bethkenhagen J "Bedeutung und Möglichkeiten des Ost-West-Handels mit Energierohstoffen" (Deutsches Institut für Wirtschafts-forschung, Sonderheft 104) Berlin: Duncker & Humblot 1975.

Bethkenhagen J "Die Zusammenarbeit der RGW-Länder auf dem Energiesektor" Osteuropa Wirtschaft 1977 No.2, pp.63-80.

Birl K "Sozialistische Wirtschaftsintegration und internationale Energiepolitik" Energieanwendung 1970 No.10, pp.289-292.

Boescu V, Ţintea L "Consumuri cît mai reduse de combustibili şi energie pe unitatea de produs" Revista economică 12/1975, pp.9-10.

Bradescu A "Exportul de produse petroliere şi indicatorii rentabilităţii acestuia" Mine, Petrol şi Gaze 1970 No.4, pp.237-240.

Bröll W "Die energetische Integration des RGW-Raumes" Osteuropa Wirtschaft March 1968, pp.26-49.

Budkov A, Budkov L "Razvitie neftegazovoi i neftekhimicheskoi promyshlennosti v plane ekonomicheskoi integratsii stran SEV" Neftyanik 1972 No.4, pp.1-4.

Carter F W "Natural Gas in Rumania" Geography, April 1970, pp.214-220.

Dienes L "Energy Prospects for Eastern Europe" Energy Policy June 1976 pp.119-129.

Dobozi I "An energiahordozók a KGST gazdaságában" Valóság January 1973, pp.18-27.

Drewry H P (Shipping Consultants) Ltd "The Role of Comecon Oil and Tankers" London: H P Drewry Ltd 1975.

Ehrenberger V "Perspektivy rozvoje palivové a energetické základny" Nova Mysl 7-8/1976, pp.97-105.

Energietechnik (editorial) "Stürmische Entwicklung der bulgarischen Energiewirtschaft" 1970 No.4, p.184.

Erb Sh "Neftyanaya promyshlennost' Narodnoi Vengrii" Neftyanik 1970 No.10, pp.28-30.

Garai T "Razvitie gazovoi promyshlennosti Vengrii" Gazovaya promyshlennost' 1970 No.5, pp.9-13.

Gas World "Prospects for Polish Natural Gas 1975-2000" July 1974, pp.384-386.

Groza O "Dezvoltarea energeticii romaneşti in contextul economice naţionale" Energetica 1971 No.6, pp.247-251.

Herescu I V "Creşterea economică şi consumul de energie" Revista economică 34/1975, pp.11-14.

Herescu I V "Dezvoltarea bazei energetice" Revista economică 28/1976, pp.1-2 (Part 1); 29/1976, pp.1-2 (Part 2).

Hinke O "Conkurence uhlí a ropy v čs energeticke" Plánované hospodářství 1969 No.3, pp.23-32.

Hinke O "Význam ropy po rozvoj čs ekonomice" Plánované hospodářství 1970 No.9, pp.63-68.

Houdek K "Palivoenergetická základna ČSSR v páté pětiletce" Plánované hospodářství 1972 No.1, pp.8-16.

Houdek K "Uspory energie jako předpoklad rozvoje národního hospodářství" Plánované hospodářství 1974 No.8, pp.24-34.

Huber G, Hübler P "Sozialistische ökonomische Integration der Mitgliedsländer des RGW in der Energie- und Brennstoffindustrie, der metallurgie sowie in Zweigen der chemischen Industrie" Zeitschrift für der Erdkundeunterricht 1972 No.3, pp.81-90.

Ioanesi N "Factorii de crestere a calităţii produselor petroliere" Petrol şi gaze 1974 No.3, pp.123-127.

Joó J K "Wärmeversorgung von Städten in der Ungarischen Volksrepublik" Energietechnik 1970 No.7, pp.322-325.

Karyagin I D "Neftyanaya promyshlennost' Rumynii" Moscow Nedra 1958.

Kaser M C "Oil and the Broader International Participation of IBEC" International Currency Review 1974 No.4, pp.25-27.

Kaser M C "Technology and Oil in Comecon's External Relations" Journal of Common Market Studies 1975 No.13, pp.161-172.

Keller A A, Kornienko N V "Sotrudnichestvo stran-chlenov SEV v oblasti neftyanoi i gazovoi promyshlennosti" Stroitel'stvo truboprovodov 1970 No.5, pp.6-8.

Khristov T "Novi tendentsii v razvitieto na energetikata v Bolgariya" Geografiya (Sofiya) Vol.20, No.8, (1970), pp.1-3.

Konchev Kh "Usovershenstvuvane na teritorialnata struktura na neftenata,khimicheskata i kauchukovata promishlenost" Planovo stopanstvo 1974 No.6, pp.29-38.

Kondov I et al. "Razshiryanvaneto na energiinata baza i rastezhot na neinata efektivnost" Planovo stopanstvo 1976 No.9, pp.33-39.

Korda B "Economic Policies and the Energy Pinch in Czechoslovakia" Bulletin of the Association for Comparative Economic Studies (The ACES Bulletin) Winter 1975, pp.3-26.

Korda B, Moravcik I "The Energy Problem in Eastern Europe and the Soviet Union" Canadian Slavonic Papers 1976 No.3, pp.1-14.

Kozlov I D "Problemy razvitiya integratsii v energeticheskom khozyaistve stran SEV" Ekonomicheskie nauki 1971 No.9, pp.52-62.

Kozlov I D, Shmakova E K "Sotrudnichestvo stran-chlenov SEV v energetike" Moscow Nauka 1973.

Labouret V, Vassilev V "Intégration à l'Est et à l'Ouest et Coopération Paneuropéenne: L'Incidence du Facteur Énergétique" Politique Étrangère 1974 No.3, pp.291-306.

Ladygin B N, Motorin I F "Problemy sotrudnichestva stran SEV v razvitii toplivno-syr'evoi bazy" Moscow Nedra 1968.

Lee J R "Petroleum Supply Problems in Eastern Europe" in 'Reorientation and Commercial Relations of the Economics of Eastern Europe' Washington D C: US Congress, Joint Economic Committee 1974, pp.406-420.

Lisichkin S M "Neftyanaya promyshlennost' stran narodnoi demokratii" Moscow Nedra 1960.

Maksakovskii V P "Toplivnye resursy sotsialisticheskikh stran Evropy" Moscow Nedra 1968.

Maksakovskii V P "Toplivnaya promyshlennost' sotsialisticheskikh stran Evropy" Moscow Nedra 1975.

Marinov V "Razvitie na nashata neftodobivna i neftoprerabotvashcha promishlenost" Planovo stopanstvo 1968 No.7, pp.75-80.

Matusek J "Komplexní program v resortu paliv a energetiky" Plánované hospodářství 1972 No.6, pp.8-20.

Mine Petrol si Gaze (editorial) "Evoluţia industriei petroliere" 1972 No.2, pp.259-262.

Mitrega J "Die Brennstoff- und Energiebasis Polens heute und im Jahre 2000" Montan Rundschau 1973 No.3, pp.69-73.

Molenda J "Rola gazu ziemnego w gospodarce Polski" Wiadomości naftowe 1973 No.10, pp.217-222.

Neumann J "Strukturalní zmeny v perspektivé československe palivové a energetické základny" Technické práce 1972 No.3, pp.9-12.

Ogawa K "Economic Conditions in Eastern Europe and the Energy Problem" Chemical Economy and Engineering Review, November 1975, pp.12-18.

Onodi A "Die Auswirkungen des verstärkten Einsatzes von Kohlenwasserstoffen auf die Volkswirtschaft der Ungarischen Volksrepublik" Energieanwendung 1971 No.2, pp.55-58.

Pacoste G "Producţia şi utilizarea ţiţeiului şi a gazelor naturale în România" Energetica 1971 No.6, pp.256-260.

Pacoste G, Aldea G "Preocupări pentru creşterea factorului final de recuparare la zăcămintele de ţiţei din R S România" Mine, Petrol şi Gaze 1975 No.4, pp.165-169.

Park J D "Oil and Gas in Comecon" in E de Keyser (ed.) 'The European Offshore Oil and Gas Yearbook' London: Kogan Page 1976, pp.257-263.

Pavlov G "Gazovaya promyshlennost' Bolgarii" Gazovaya promyshlennost' 1970 No.5, pp.7-9.

Pearton M "Oil and the Romanian State 1895-1948" Oxford: Clarendon Press 1971.

Pilch J "Stan i perspektywy rozwoju górnictwa naftowego" Wiadomości naftowe 1973 No.3, pp.54-58.

Polach J G "The Development of Energy in East Europe" in 'Economic Developments in Countries of Eastern Europe' Washington D C: US Congress, Joint Economic Committee 1970, pp.348-433.

Popa B, Mihailescu T "Aspecte din dezvoltarea exploatarii gazului metan în România" Mine, Petrol şi Gaze 1972 No.1, pp.56-60.

Popescu V "Economisirea şi valorificarea resurselor naturale" Revista economică 7/1976, pp.4-6.

Popov I V "Energetika stran narodnoi demokratii" Moscow Energiya 1961

Popov I V "Sotrudnichestvo sotsialisticheskikh stran v oblasti energetiki" Planovoe khozyaistvo 1963 No.10, pp.111-122.

Popov I V, Tomashpol'skii L M "Toplivno-energeticheskaya baza mirovoi sotsialisticheskoi sistemy" Moscow Energiya 1964.

Preliminary Observations on Long-Term problems in the Field of Basic Products and Energy and of Long-Term Trends in the Czechoslovak Economy" Document transmitted by the Government of Czechoslovakia to the Economic Commission for Europe, Ref. EC.AD(XI)/R.4/Add. 12, 30 January 1974.

Sawenko J N "Entwicklung der Energiewirtschaft der RGW-Mitgliedsländer und mehrseitige Zusammenarbeit" Energietechnik 1972 No.12, pp.539-543.

Schappelwein K F "Die Energiewirtschaft der VR Bulgarian" Osteuropa Wirtschaft 1974 No.1, pp.48-59.

Schirmer J, Wartenberg J "Zur Rolle der Energiewirtschaft im volkswirtschaftlichen Reproduktionsprozess - einige ausgewählte Probleme" Wirtschaftswissenschaft 1975 No.4, pp. 535-550.

Schürer G "Hauptrichtungen der weiteren Vervollkommnung unserer materiell-technischen Basis in den Jahren 1976 bis 1980" Einheit 1976 No.9, pp.1012-1022.

Shmakova E K "Sotrudnichestvo stran SEV v razvitii toplivno-energeticheskoi bazy" Vneshnyaya torgovlya 1973 No.2, pp.5-8.

Siebold K "Die Aufgaben der Energiewirtschaft der DDR bei der Erfüllung der Hauptaufgabe des Fünfjahrplanes" Energietechnik 1972 No.12, pp.531-538.

Siebold K "25 Jahre Deutsche Demokratische Republik - 25 Jahre Energiewirtschaft" Energietechnik 1974 No.9, pp.377-389.

Siebold K "Effektiver Einsatz der Investitionen - ein entscheidender Faktor bei der Intensivierung der Kohle- und Energiewirtschaft" Energietechnik 1975 No.7, pp.293-301.

Siegert W "Die wirtschaftliche Bedeutung des Erdöls sowie Fragen des Erdölbedarfs und der Erdölbereitstellung in den sozialistischen Ländern Europas" Energieanwendung 1969 No.7, p.168.

Taeschner E "Tendenzen und Probleme der Energiewirtschaft der RGW-Länder" Zeitschrift für den Erdkundeunterricht 1970 No.6, pp.209-220.

Ufer H "Wachstums- und Strukturprobleme der Energiewirtschaft der RGW-Länder" Wirtschaftswissenschaft 1975 No.8, pp.1121-1138.

Uhlich K "Aufgaben für die Energieplanung 1975 unter Beachtung der Erfahrung des Jahres 1974" Energieanwendung 1974 No.6, pp.163-165.

Vlad A "Aspecte ale dezvoltarii energeticii pe plan mondial" Energetica 1973 No.1, pp.10-17.

Vorov N "Osnovnye napravleniya razvitiya sotrudnichestva stran-chlenov SEV v razvitii toplivno-energeticheskoi i syr'evoi bazy" Planovoe khozyaistvo 1971 No.7, pp.49-56.

Vylkov P "Sostoyanie i perspektivy razvitiya energetiki v Narodnoi Respubliki Bolgarii" Teploenergetika 1971 No.6, pp.86-87.

Wambutt H "Planmässige Entwicklung der Energiewirtschaft der DDR" Einheit 1974 No.6, pp.704-714.

Wasowski S "The Fuel Situation in East Europe" Soviet Studies, July 1969, pp.35-51.

Zakhmatov N I, Yakushin A A "Sotrudnichestvo stran-chlenov SEV v reshenii toplivno-syr'evykh problem" Izvestiya AN SSSR Ser. ekon. 1976, No.4, pp.155-159.

Zeitschrift für den Erdkundeunterricht (Informationen) "Zur Entwicklung der Energiewirtschaft in der VR Bulgarien" 1972 No.3, pp.111-114.

Zhytka Ya "Perspektivy razvitiya gazovoi promyshlennosti Pol'shi" Gazovaya promyshlennost' 1970 No.5, pp.17-21.

Zubkov A I "Osobennosti mezhdunarodnoi kontsentratsii investitsii pri reshenii toplivno-syr'evoi problemy stran SEV" Voprosy ekonomiki 1972 No.9, pp.73-81.

Zubkov A I "SSSR i reshenie toplivno-energeticheskoi i syr'evoi problemy v stranakh SEV" Istoriya SSSR January/February 1976, pp.52-70.

C. Oil and Gas in Soviet External Relations.

Adomeit H "Soviet Policy in the Middle East: Problems of Analysis" Soviet Studies April 1975, pp.288-305.

Andreasyan R "Arabskii vostok: novoe stolknovenie s neftyanym imperializmom" Mirovaya ekonomika i mezhdunarodnye otnosheniya 1967 No.3, pp.111-113.

Andreasyan R "Neft' i problema vzaimopomoshchi" Mirovaya ekonomika i mezhdunarodnye otnosheniya 1966 No.5, pp.38-49.

Becker A S "Oil and the Persian Gulf in Soviet Foreign Policy" in M Confino, S Shamir (eds.) 'The USSR and the Middle East' Jerusalem: Israel Universities' Press 1973, pp.173-214.

Berry J A "Oil and Soviet Policy in the Middle East" The Middle East Journal December 1972, pp.1256-1275.

Burrell R M "The Soviet-Libyan Arms Deal" Soviet Analyst 5 June 1975, pp.2-3.

Dasgupta B "Soviet Oil and the Third World" World Development May 1975, pp.345-360.

Golan G "Soviet Aims and the Middle East War" Survival 1974 No.3, pp.106-114.

Golan G "Yom Kippur and After: The Soviet Union and the Middle East Crisis" London: CUP 1977.

Gumpel W "Sowjetunion: Erdöl und Nahostpolitik" Aussenpolitik 1971 No.11, pp.670-681.

Horelick A L "The Soviet Union, the Middle East and the Evolving World Energy Situation" Santa Monica: The Rand Corporation 1973.

Hoskins H L "Problems Raised by the Soviet Oil Offensive" (Occasional Paper) Washington D C: Library of Congress Print 1962.

Hunter R E "The Soviet Dilemma in the Middle East" (Adelphi Paper Nos. 59 and 60) London: International Institute for Strategic Studies, October 1969.

Hurewitz J C "Soviet-American Rivalry in the Middle East" New York: Praeger 1969.

Institute for the Study of Conflict "Soviet Objectives in the Middle East" (Conference Report) London: ISC, January 1974.

Kohler F D, Goure L, Harvey M L "The Soviet Union and the October 1973 Middle East War - The Implications for Detente" Miami: Centre for Advanced International Studies 1974.

Landis L "Politics and Oil: Moscow in the Middle East" New York: Dunellen 1973.

Laqueur W "The Soviet Union and the Middle East" London: Routledge and Kegan Paul 1972.

Nove A "On Soviet Policy and Intentions" Survey Vol.22 No.3/4 (Summer/Autumn 1976), pp.112-114.

Ofer G "The Economic Burden of Soviet Involvement in the Middle East" Soviet Studies January 1973, pp.329-347.

Rachkov B "Neftyanye monopolii i aggressiya Izraila" Kommunist 1967 No.8, pp.113-114.

Rachkov B "Neft' i mirovaya ekonomika" Moscow Mezhdunarodnye otnosheniya 1972.

Russell J L "Energy as a Factor in Soviet Foreign Policy" Farnborough: Saxon House 1976.

Russell J L "Energy Considerations in Comecon Policies" The World Today, February 1976, pp.39-48.

Spielmann K F "Security Implications of Alternative Soviet Energy Policies towards Western Europe, 1976-1981" Arlington, Virginia: Institute for Defense Analyses, July 1975.

Zevin L Z "Novye tendentsii v ekonomicheskom sotrudnichestve sotsialisticheskikh i razvivayushchikhsya stran" Moscow Nauka 1970.

Zevin L Z "Voprosy povysheniya ustoichivosti i effektivnosti ekonomicheskikh svyazei SSSR s razvivayushchimisya stranami" Planovoe khozyaistvo 1971 No.7, pp.17-26.

Zevin L Z, Kamenov E, Prokhorov G (eds.) "Mirovoi sotsializm i razvivayushchiesya strany" Moscow Mysl' 1969.

D. General Works

Askanas B, Askanas H, Levcik F "Structural Developments in CMEA Foreign Trade over the Last Fifteen Years (1960-1975)" Forschungsbericht No.23 (February 1975), Wiener Institut für Internationale Wirtschaftsvergleiche.

Askanas B, Askanas H, Levcik F "Die Wirtschaft der RWG-Länder 1971-1975 und die geplante Entwicklung bis 1980" Monatsbericht 3/1976 des Osterreichischen Instituts für Wirtschaftsforschung.

Baibakov N K (ed.) "Gosudarstvennyi pyatiletnii plan razvitiya narodnogo khozyaistvo SSSR na 1971-1975 gody" Moscow Politika 1972.

Confino M, Shamir S (eds.) "The USSR and the Middle East" Jerusalem: Israel Universities' Press 1973.

Feschbach M (Rapporteur) Report of a visit of US systems analysts to Moscow, 1974. Mimeo.

Goldman M I "Detente and Dollars: Doing Business with the Soviets" New York: Basic Books 1975.

Hanson P "USSR: Foreign Trade Implications of the 1976-1980 Plan" London: Economist Intelligence Unit 1976.

Ivanov N, Loshchakov A "Sotrudnichestvo stran SEV i vyravnivanie urovnei ikh razvitiya" Voprosy ekonomiki 1977 No.6, pp.3-24.

Kaser M C "Comecon" London: OUP 1967 (2nd edit.).

Lederer I J, Vucinich W S (eds.) "The Soviet Union and the Middle East" Stanford: Hoover Institution Press 1974.

Nove A "The Soviet Economy" London: Allen and Unwin 1968 (3rd edit.).

Nove A "An Economic History of the USSR" Harmondsworth: Penguin 1972.

Orlov B P "Perspektivy Sibirskoi promyshlennosti" Ekonomika i organizatsiya promyshlennogo proizvodstva 1976 No.5, pp.35-47.

Park J D, Clarke R A "The Ninth and Tenth Soviet Five-Year Plans" Special Section in ABSEES, July 1976.

Petroleum Economist (formerly Petroleum Press Service), published monthly in London.

Rajana C "The Chemical and Petrochemical Industries of Russia and Eastern Europe 1960-1980" London: Sussex University Press 1975.

Rostovtsev N P, Runova T G "Dobyvayushchaya promyshlennost' SSSR" Moscow Mysl' 1972.

Rodean E "Energia nucleară şi promovarea progresului tehnico-ştiinţific în ţara noastra" Era socialistă 1975 No.3, pp.38-41.

Rybakov O K "Vneshneekonomicheskie svyazi SSSR v novom pyatiletii" Izvestiya AN SSSR Ser, ekon. 1976 No.2, pp.37-46.

Shiryaev Yu S, Iovchuk S M (eds.) "Proizvodstvennaya integratsiya stran SEV" Moscow Nauka 1972.

Shmelev N P "Problemy ekonomicheskogo rosta razvivayushchikhsya stran" Moscow Nauka 1970.

Tarnovskii O I, Mitrofanova N M "Stoimost' i tsena na mirovom sotsialisticheskom rynke" Moscow Nauka 1968.

Torbin V I "Territorial'naya differentsiyatsiya tsen v tyazheloi promyshlennosti" Moscow Ekonomika 1974.

Wilczynski J "The Political Economy of East-West Trade" New York: Praeger 1969.

Wiles P J D "Communist International Economics" Oxford: Basil Blackwell 1968.

Zhavoronkova I P "Ekonomicheskie voprosy uluchsheniya ispol'-zovaniya mineral'no-syr'evykh resursov SSSR" Moscow Nauka 1973.

Zurbuchen V "Die 5 Fünfjahrplan der Ungarischen Volksrepublik 1976 bis 1980" Wirtschaftswissenschaft 1976 No.10, pp.1520-1532.

Zwass A "Monetary Cooperation between East and West" New York: IASP 1975.

E. Newspaper Sources.

Bakinskii rabochii
Ekonomicheskaya gazeta
Financial Times
Hospodářské noviny
International Herald Tribune
Izvestiya
Kazakhstanskaya pravda
Népszabadság
Neues Deutschland

New York Times
Pravda
Pravda vostoka
Rabotnichesko delo
Rudé právo
Scînteia
Słowo powszechne
Sotsialisticheskaya industriya
The Times
Trud
Trybuna ludu
Turkmenskaya iskra
Vyshka

F. Statistical Sources

Narodnoe khozyaistvo SSSR
Statisticheskii ezhegodnik stran-chlenov SEV
Statistisches Jahrbuch der DDR
Annuarul statistic al RS România
Statisticheski godishnik na NR Bolgariya
Statisztikai évkönyv
Rocznik statystyczny
Statisticka ročenka ČsSR
Vneshnyaya torgovlya SSSR
OECD Digest of Energy Statistics
United Nations Statistical Yearbook
B.P. Statistical Review of the World Oil Industry