SOVIET OIL AND GAS POLICY IN CENTRAL ASIA

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MASTER OF PHILOSOPHY

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CERTIFICATE

This is to certify that the dissertation entitled **'Soviet Oil and Gas Policy in Central Asia'** submitted by **Ambereen Shah** in partial fulfillment for the award of the degree of **MASTER OF PHILOSOPHY** of Jawaharlal Nehru University is her original work. This has not been published or submitted to any other University for any other purpose.

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PREFACE

Economic development involves the enhancement and the use of natural resources through human skills and technology. In recent years, energy has emerged as both the focus and symbol of global anxiety concerning the management of those natural bounties. The uneven distribution of energy resources, the massive global flows and the attendant questions of interdependence and security clearly point to the international nature of energy problem. Before the mid-fifties Soviet policy emphasised coal and hydroelectric power as the primary energy resource neglecting oil and gas. Hydroelectric power was an important energy resource than natural gas and firewood as it contributed towards the total energy supply than oil. Towards the end of fifties the Soviet economic planners became aware of their large oil and gas potential. A shift away from coal that had taken place in other countries made them accelerate the development of their oil and natural gas resources to meet the growth in domestic demand for energy and to provide export earnings.

The presence of large quantity of oil and gas in Central Asia was established by the turn of the 20th century. Central Asia gained importance in the evolution of Soviet gas industry because it served as an intermediate-producing region after the limited resources of European USSR had been developed and before the vast potential of Western Siberia could be fully exploited. Central Asian production thus became a crucial factor in the Soviet oil and gas industry in the late 1960's. The Soviet policy in Central Asia was aimed at economic extraction-creation and fostering of a long-term economic dependency. The

Central Asian economy was integrated part of this overall Soviet command system. Primarily supplying raw materials for processing the industrial centres of Europe, Western Siberia and parts of Soviet Union.

The objective of the present study is to examine the actual status of the oil and gas resources in Central Asia under the Soviet Union. The first chapter traces the general economic development of Soviet Union with an in-depth study of Central Asia. The chapter also provides a detailed account of the various energy resources available in Soviet Union and locates the change in the Soviet energy economy from coal and firewood to oil and gas.

The second chapter looks at the physical, economic and technical status of oil and gas sector in Soviet Central Asia and the relevance of Central Asia in the development of both these energy resources within the overall framework of Soviet policy.

The third chapter therefore focuses on the pattern of Soviet pipeline policy, its transportation network as laid in Central Asia and other parts of Soviet Union. It also deals with the oil and gas exports in the region.

The fourth chapter is a study of the Soviet oil and gas policy towards Central Asia particularly regarding the extraction of raw materials from the region. It also analyses the development of the Central Asian oil and gas industry within the Soviet economy.

The concluding chapter addresses the cost-benefit ratio of Central Asia's oil and gas resources for Soviet Union and vice-versa. It looks into the prospect of the growth of this sector in the post Soviet period. This chapter assesses the implication of the new policies of the independent Central Asian Republics regarding diversification of their oil and gas pipelines for the Russian energy sector in the post-Soviet era.

CHAPTER – I

CHAPTER – I

INTRODUCTION

The five former Soviet republics – Kazakhstan, Uzbekistan, Tajikistan, Kirghizia and Turkmenia are rich in mineral resources. They occupy a vast territory extending from western Siberia in the north to Afghanistan and Iran in the south, from the banks of the Volga and the Caspian sea in the west to China in the east, covering an area of 4 million sq. kms. or almost a sixth of the territory of the Soviet Union. Strictly speaking, the term Soviet Central Asia referred only to the four above mentioned five former Soviet republics, and did not include Kazakhstan, which despite its ethnic and cultural affinities, is distinct from Central Asia. It is a Steppe region and has always been considered by both Tsarist and Soviet writers as separate.

Geographically, Central Asia and Kazakhstan can be divided into four regions:

- The steppe consisting of north Kazakhstan.
- the semi-desert roughly constituting the rest of the Kazakh Soviet Republic (SSR).
- the desert region in the south of the latter, extending up to the Persian frontier in the west and the Chinese in the east.
- the mountain region of the Pamirs and the Tien Shan.

The geographical location of Central Asia and Kazkhstan has been of decisive importance for trade. Before the discovery of sea route, all the main trade routes connecting eastern and Central Asia with Eastern Europe and countries of the Near East lay across this territory.

Since Central Asia is rich in natural resources, it served to be of great importance for the Soviet economy. The region produced raw materials –

agricultural products and mineral resources that were shipped into the metropolis to feed its industries. But if the pattern of intra-Soviet trade was colonial, the method of economic organization was Soviet. Central Asia was a part of a union-wide planned economy in which quotas for inputs and targets for outputs were set in Moscow and enforced by local officials. Many of these officials were Russians. The communists in some cases, accelerated the Tsarist practice of sending ethnic Russians to Central Asia. They held many of the responsible jobs in the local economy. They also served as instruments through which Moscow exercised effective political control.

Boundaries of Central Asian Republics

Source : Mandelbaum Michael: Central Asia and the World

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The Presence of oil in the Caucasus and Central Asia is recorded as far back as the thirteenth century. Throughout the twentieth century, the Caspian oil

had played a key role in world politics, frequently the source of contention between external super powers. The nineteenth century Great Game was based on competition for wider power and influence by asserting control over Central Asian region. By the end of the nineteenth century, with technology increasingly capable of exploiting reserves, oil emerged as a pivotal factor in the competition, and the game intensified. The Caucasus and Central Asia were no longer just a point of access to the riches of South Asia in particular India, but a lucrative prize in itself. Infact the mineral wealth of Central Asia in Turkmenistan and Kazakhstan was not really discovered or exploited on a large scale until 1950's,. From the mid-nineteenth to the mid-twentieth century most competition took place over reserves on the Caucasus region. Thus, Caspian oil acquired the role of key strategic asset, playing an important part in determining the shape of the modern political landscape. In the late 1800's great oil barrens of the day- Nobel brothers, the Rothchilds and the leaders of the Royal Dutch shell helped Russia to develop Caspian oil resources. The Nobel Brothers Petroleum Production Company was considered 'one of the greatest triumphs of the business enterprise in the nineteenth century'.[1] Indeed, the exigencies of shipping oil out of the region obliged Ludwig Nobel in 1878, to invent the first operational oil tanker.[2] During that period Caucasian oil made up 30 % of the world oil trade. Oil output dropped and in 1905, the year of revolution, it was less than 8 million tons.[3]

This oil carried considerable strategic weight on both world wars. During the First World War, the Germans having exhausted their own fuel supplies tried to seize oil in the Baku region to feed the continuing war effort. In the summer of

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1 Adelphi papers, 1995-96, p.9

2 Ibid., pp.10-11.

3 Mirzoev, Kh,I,The history of oil production in Azerbaijan, Baku, 1970,p.12.

1918, the New York Times argued that safeguarding Caucasian oil fields should be priority for the allies, and that they had to be prepared to devote significant military force to the project. As the German military machine ran down, Baku instead fell under Turkish, and eventually Soviet influence. Denied Baku's precious oil, the Germans were unable to continue the war and surrendered in November 1918.

In the Second World War, Hitler seemed to have been determined to use Caucasian oil to fuel his military expansion. After the conclusion of the 1939 Nazi-Soviet Pact, Soviet oil from the Caucasian provided no less than one-third Germans imports. In 1941 Germans launched a series of campaigns to take outright possession of the region and its mineral reserves. These campaigns reached their height in 1942 when Hitler stressed at a staff meeting of the Army Group South that if he failed to gain control of the oil in the Caucasus, he would be forced to end the war.[4] But the German campaigns failed for several reasons, and the exhaustion of German forces dispersed far from the fuel and food supplies. As Daniel Yergin pointed out, 'The Germans ran out of it in their quest for oil'.

Great Game thinking from the late nineteenth century to the Second World War defined oil as a strategic raw material to be monopolised. During this period Russia and Turkey and the West were engaged in intense competition for influence over the oil producing areas. Internally, the Caucasus and Central Asia were fraught with tension and bloody confrontation between Turkic and American ethnic groups, widespread corruption and poor administration, cut through competition between large oil companies, and the proliferation of dubious

[4] Adelphi Papers, p.10.

international entrepreneurs. The danger of historical parallels not withstanding there were clear similarities between then and now, particularly in commercial competition, corruption, poor administration and ethnic tension.

In terms of commercial competitiveness, as far back as 1895, Russia, fearing overwhelming western-and particularly United States control over its oil markets, deliberately undermined a substantial deal in the region between the domestic oil company, American standard oil, the Rothschilds and the Nobels. Frequent western complaint in 1890's of arbitrary Russian transport rates and regulations and wide spread government corruption that made it very difficult to conduct stable business ventures in the region.

The first half of the nineteenth century in Russia witnessed the disintegration of the old feudal economy, and the rise of capitalism. Initially its economy was dominated by peasants and artisans and later was rapidly overtaken by factories. In 1830, the Russian textile export suffered a setback and its metal export faced stiff competition from Britain and Sweden. In order to save the market from further decline Russia riveted its interest to Central Asia, hoping it would be a potential market for Russian goods. A programme for the development of economic relations of the Russian Empire with Central Asia was formulated by P.I.Nebolsin, who visited Orenburg and the Caspian region in 1850 to collect trade information. Russians looked at Central Asia as prospective market.

THE SOVIET ECONOMY

Under the Tsarist rule, Turkestan, Bukhara and Khiva were predominantly agricultural regions. In 1913 only 19% of the total population lived in towns and urban areas.[5] According to All-Russia Agricultural Census of 1917, people engaged in agriculture in Turkestan were 5,375.538 among whom 3,581,873 were engaged in settled agriculture[6] while the remaining were nomadic cattle-breeders.

Lenin claimed that Turkestan was a colony.[7] The process of capitalist development in Central Asia followed very slowly and unevenly because Tsarism and the feudal regimes of Bukhara and Khiva tried to uphold the feudal setup. Until the October Revolution, the region remained an extremely backward agrarian colony of Tsarist Russia. The Tsarist government carried some land reforms in Turkestan which opened up the path of development of capitalist relations in the villages of Central Asia. The big landowners continued to exploit the peasants or the izodlshchick. A large section of the peasants did not possess their own animals, agricultural tools and seeds, they fell into the clutches of feudals and money lenders. During the colonial period, progress in the field of irrigation was pretty humble. In 1910, only 4,758,000 of land was irrigated in Central Asia, that is 2.65% of the total area.[8] Richard A Pierce while writing about the achievements of the colonial regime in the field of agriculture, said that in half a century only two major irrigation projects were successful in Russian Central Asia, one was in the Steppe and the other in Murghab. Neither of them fulfilled the original hopes of their designers.[9] Both agriculture and cattle-breeding in

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5 Statistical Survey Tashkent, 1964, p.8

6 Kaushik, Devendra., Central Asia in Modern Times, Moscow, Progress Publishers, 1970 p.66.

7 V.I.Lenin, Collected Works, Vol 22, p.338.

8 Kaushik, Devendra., Central Asia in Modern Times, Moscow, Progress Publishers, 1970, p.66.

9 Pierce, R.A. ,Russian Central Asia 1867-1917, Berkeley and Los Angeles. 1960, p.181.

Turkestan, Khiva and Bukhara were primitive. After Central Asia's annexation, the region was converted into a raw material supplying base for the metropolitan industries. The Tsarist administration gave emphasis to cotton culture and also encouraged the growth of wheat and agricultural products. A number of agrotechnical steps were taken by the administration to develop cotton cultivation. Uzbekistan emerged as the core Central Asian cotton belt, although cotton was grown in southern Kirghizia, and parts of Tajikistan. The cotton cultivation led to an increase in the marketability of agricultural economy leading to penetration of rudimentary capitalist relations into the village. Although Tsarism tried to keep Central Asia as its agricultural raw-material base, but the military and strategic interests of the Russians led to the construction of 3,377 kilometers[10] of railway repair workshops and depots. The financial assistance given to Central Asia by the Soviet government was important for their economic development. Central Asia was also supplied with technical equipments and machines for industries and agriculture. The increase in cotton output in Central Asia made Soviet Union independent of imports in this product. The Turkmen SSR began rapidly to raise the output of oil and oil products. Agriculture was thus regarded as the weakest link of the Soviet economy. A massive programme of capital investment resulted in post-war growth of output, amounting to 3.9% a year for grain, 6.5% for sugar beet, 2.8% for vegetables and 4.6% for cotton in 1970.[11] The rate of growth of livestock sector was somewhat lower, because of distress slaughtering due to fodder shortages caused by the failure of the grain harvest. Since 1950, the number of cattle had risen at an average annual rate of 2.2%, sheep by 1.3% and

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10 Kaushik, Devendra. , Central Asia in Modern Times, Moscow, Progress Publishers. 1970, p.72.

11 Wilson, David. , The Demand For Energy in Soviet Union, Roman and Allanhald Publishers, 1983, p.219.

pigs by 4.0%.[12] Soviet agriculture had a long way to go before it could reach its goal of providing an adequate balance diet for the population and also providing a high surplus.

Like any social system, socialism required productive forces of a definitive level, on a definitive material and technical basis. For socialism, such basis were large-scale heavy industry capable of supplying agriculture with machines and artificial fertilisers. Without large-scale industry it was impossible to build socialism. Consequently, to build a socialist economy industrially underdeveloped countries were to first indusrialise. Before the revolution, Central Asia's industry was very much underdeveloped. It was only in 1928 that industries were restored and agricultural sector also improved. The goal of fully establishing cotton cultivation on its pre-war level was successfully attained by 1927. The total area under cotton cultivation in 1913 was 4.23 thousand hectares. In 1928 it had surpassed the pre-war level and rose to 588.5 thousand hectares.[13]

The working people of Central Asia began the industrialisation of their republics in 1926-1927. In March 1927, the Second Congress of Soviets in the Uzbek SSR considered it necessary to create a textile industry, organise new branches of the industry to process agricultural raw-materials, carry out an electrification plan and organise the production of agricultural machines and implements. It was in Uzbekistan, where the first step towards industrialisation took place. That year several powerhouses were constructed. In Margelan and old Bukhara silk weaving factories were also started. In Ferghana spinning and weaving factory began. Some progress was also made in the extraction of oil. But it was in the First Five-Year Plan that the development of heavy industry was

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12 Ibid.

13 Kaushik, Devendra., Central Asia in Modern Times, Moscow, Progress Publishers, 1970, p.216.

to start. In Khirghizia between 1927-1929 steps were taken towards industrialisation. The Kyzl-Kie and Suliukut coalmines were expanded. At Kara Su a cotton cleaning plant was set up, a silk-winding factory at Osh and two leather factories were set up at Frunze. In Turkmenia, silk-winding, spinning and weaving factories were set up at Ashkabad. In Tajikistan industrialisation began with the First Five-Year Plan. Earlier in 1924-25 only a few oil mills and powerhouses had been built.

The First Five-Year Plan in 1928 ushered the beginning of industrialisation, and brought about a real industrial revolution in Soviet Central Asia. In 1927, the Third Congress of the Communist Party in Uzbekistan viewed that the plan for development of Uzbekistan was an organic part of the plan for the whole USSR. One of the important objectives of this plan was to attain self-sufficiency in cotton for the textile industry of USSR. The plan paid great attention to the development of coal and oil industries in Uzbekistan. It also laid stress on the creation of a metallurgical industry in Central Asia. Other industries connected with the processing of agricultural products were given due attention. In Tashkent an agricultural machinery plant was built which supplied machines and other implements required by agriculture in the republic, particularly for cotton cultivation. Another plant was set up for the repair of agricultural machines. The Almalyk copper processing plant and the Chirchik chemical combine came into existence during the first plan. During the First Five-Year Plan the Uzbek SSR achieved success in socialist industrialisation. In Tajikistan during the First Plan, cotton-cleaning, fruit and vegetable preservation factories and silk-winding factories were established. In Turkmenia, textile, chemical and food industries appeared. Huge constructions of cotton cleaning, textile, oil and silk factories were also started. The plan also laid the foundation for heavy

industries like oil, chemical and construction materials. Therefore the aim of Soviet Five Year Plan was to raise the level of industrial development in Central Asia. Significant measures were adopted in this direction in the post-war period.

SOVIET ENERGY RESOURCES: A GENERAL ESTIMATE

The Soviet Union had less reason than most industrial powers to fear overpopulation and the exhaustion of natural resources within the limits of its own political boundaries. In 1973, with a population of 250 million, less than 7% of the total population of the earth, the former USSR occupied a territory of 22.4 million square kilometers, about one-sixth of the inhabited area of the earth. It could claim 57% of the world's resources of coal, 45% of its natural gas, 60% of its peat, 46% of its oil shale, 12% of its potential hydroelectric power, and 37% of its oil bearing area.[14] The utilisation of energy resources had presented two central issues to both the Tsarist and Soviet policy makers, first was a complex of choices about how to find and develop these resources. The second, was how best to utilise the country's energy wealth to stimulate the growth of the economy. Many energy resources for a long time remained unexplored, their location and extent were unknown. The existence of some, such as gas, which later became a major component of the total energy resources, was not even realised. Table 1 gives an estimate of Soviet fuel and energy production, trade and apparent consumption.

[14] Elliot, Iian F., The Soviet Energy Balance and Alternative Power Sources, Praeger Publishers, 1974, p.6.

TABLE 1: Soviet Fuel and Energy Production, Trade and Apparent Consumption

Production												
	Mineral fuels						Firewood					
Year	Coal	Oil	Gas	Peat	Shale	Total	Centralized	Comprehensive	Hydropower	Total energy enc. Cent. Wood	Net trade net exports(-) net imports (+)	Apparent consumption inc. cent. Wood
1928[b]	29.8	16.6	0.4	2.1	n.a.	48.9[c]	5.7	52.9[c]	0.2	54.8	-3.9	50.9
1932	54.0	30.5	1.4	5.4	0.1	91.4	14.4	(60)	0.5[d]	106.3	-10.3	96.0
1933[b]	64.0	30.6	n.a.	5.5	n.a.	103.7[c]	16.6	63.9[c]	0.8	n.a.	-8.7	n.a.
1937	180.4	40.8	3.8	9.8	0.2	162.2	25.2	(80)	2.8	190.2	-3.8	136.4
1940	140.5	44.5	4.4	13.6	0.6	203.6	34.1	84.0[c]	2.3	241.0	+2.3	243.3
1945	115.0	27.8	4.2	9.2	0.4	156.6	28.4	n.a.	3.0	188.0	n.a.	n.a.
1950	205.7	54.2	7.3	14.8	1.3	283.3	27.9	62.6[c]	7.5	318.7	+10.0	328.7
1950	221.9	60.4	7.9	16.3	1.6	308.1	29.8	n.a.	7.3	n.a.	n.a.	n.a.
1952	236.9	67.7	8.1	15.3	1.8	329.8	28.4	n.a.	7.8	n.a.	n.a.	n.a.
1953	252.3	75.5	8.7	15.8	2.1	354.4	29.8	n.a.	9.8	n.a.	n.a.	n.a.
1954	275.3	84.8	9.5	18.5	2.4	390.5	32.7	n.a.	9.2	n.a.	n.a.	n.a.
1955	310	101.2	11.4	20.8	3.3	447.5	32.4	62.5[c]	12.3	192.4	-2.1	490.1
1956	325.1	119.8	15.2	18.4	3.5	482.0	32.0	n.a.	14.8	528.8	-7.5	521.2
1957	351.7	140.6	23.9	22.5	3.7	541.7	32.9	n.a.	19.6	594.2	-18.8	575.4
1958	362.1	161.9	33.9	21.1	4.5	583.5	32.9	56.7[c]	22.5	n.a.	-27.4	638.9
1959	370.0	185.3	42.5	23.0	4.6	625.4	34.0	n.a.	22.7	682.1	-38.2	643.9
1960	373.1	21.4	54.4	20.4	4.8	664.1	28.7	60.0[c]	23.8	716.6	-51.1	665.5
1961	370.1	237.5	70.8	19.6	5.2	703.2	26.0	59.0[c]	27.1	756.3	-65.7	690.0
1962	379.3	266.1	85.9	13.3	5.8	150.4	29.4	n.a.	32.2	812.0	-77.1	734.9
1963	388.4	294.7	105.1	21.7	6.5	816.4	30.7	n.a.	33.2	880.3	-89.1	791.2
1964	403.3	319.8	127.0	22.2	7.1	879.4	32.8	n.a.	33.1	945.3	-100.2	845.1
1965	420.2	347.3	151.3	22.0	7.5	948.3	32.0	60.0	35.5	1015.8	-103.5	912.3
1966(SYP goal)[d]	441.0	343.2	177.9	27.2	7.3	996.6	18.6	n.a.	37.4	1052.6	n.a.	n.a.
1970plan	487.0	500.5	271.4	34.3	9.8	1,303.0	32.0	n.a.	36.0	1371.0	n.a.	n.a.
1980plan[d]	850.0	1000.0	850.0	-	50.0	2750.0	-	n.a.	200.0[e]	2950.0	n.a.	n.a.

n.a. = not available or not applicable

[a] For mineral fuels, by conversion of output in natural units on the basis of 1940 conversion ratios

[b] For mineral fuels, by conversion of output in natural units on the basis of 1932 conversion ratios.

[c] Shimkin, 1962.

[d] Melentev et al., 1962, pp. 38, 173.

[e] N.G. Poleshchuk, Osnovnye voprosy toplivno-energeticheskoi bazy SSSR, M, 1965, p. 34.

[f] Firewood and peat are included with shale.

[g] Include atomic energy

Fuel output. Except as noted, data are taken directly from recetn statistical handbooks, or are based on output in natural units, converted to conventional tons by actual Soviet Statements about average heat content, or by analogy with nearby years.

Hydropower: There are many divergent statements in Soviet sources for the energy equivalents of hydroelectric power, but I have tried to choose figures to central station fuel rates for the corresponding year, have not, however, been able to find a completely consistent series on central station fuel rates.

The Russians have generally converted hydropower to fuel equivalents by using the fuel rate for central steam stations for the corresponding year. There is little to quarrel with here, except that (I) it would probably better to use the average rate for all stations rather than for central stations alone (the difference between the two is far from negligible) and (2) in figuring the central station rate the Russians attribute part of fuel consumption to by – product heat output rather than to electricity output. The share contributed by hydropower is thus somewhat understated.

Net trade is figures from detailed data on trade in physical units, converted to conventional tons by the usual conversion ratios, except that for coal and coke, one natural ton is treated as equal to one conventional ton, Up to 1940, all solid fuels are included in this correction; since then, only coal and coke among the solid fuels. Gas is included only since 1955. There has been no appreciable export of electric power.

Firewood: Centralized wood, the official series, includes only firewood produced by the lumbering industry. The comprehensive series includes tough estimates for firewood produced by the population for its own use. The comprehensive firewood figures for 1932 and 1937 are interpolated estimates. The figure for 1965 is implied in E.G. 1966: 37, p.5.

Source: Campbell Robert W, *The Economics of Soviet Oil and Gas*, John Hopkins Press, 1968, pp.5-6.

Energy resources play an important role in determining a country's economic and political strength. The United States and the Soviet Union were considered the world's main producers and consumers of energy.[15] But it must be pointed out that Soviet Union differed from most countries, which despite their wealth were inadequately supplied with energy resources within their own territory. While the other great economic powers of the world, for example the United States of America (USA) was relatively well endowed with energy supplies, its early entry into the industrial era had used up a large fraction of its original fossil supplies. The Soviet energy situation thus offered Soviet economic planners with a wide range of options in the design of an energy policy that many other countries enjoyed. For example, the USSR was unique among the industrially powerful nations or regions of the world in its ability to be self-sufficient in energy, or to consider taking a stance as either an exporter or importer of energy. Although the energy resources of Soviet Union were vast, their economic character, that is their locations, quality, cost and environmental hazard presented the makers of the Soviet energy policy with many problems thus obstructing easy access.

After describing the major components of the energy resource base, this chapter shall analyse the problems raised by their economic character.

COAL:

Soviet authorities claimed that USSR had over half the coal resources of the world. There were 266 billion tons of explored and commercially producible

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15 Campbell, Robert W., The Soviet Union, in Gerard J Mangone, Energy policies of the world Vol.2, Elsevier Scientific Publishing Company, 1977, p.236.

reserves, as on 1 January, 1972.[16] But the cheapest sources to produce were poorly located with respect to demand and were low in quality too. The high quality coal of Karaganda (Kazakhstan), Kuznetsk (Siberia) and Ekibastuz (Kazakhstan) basins were relatively cheap to produce, but the cheapest coal produced in the USSR in the Kansk-Achinosk basin in Western Siberia was lignite, it had a low heating value and poor physical characteristics, that interfered with its use, and was also a long way from the main regions of incremental demand for energy coal. Many regions lacked significant reserves of any kind of coal especially the northwest and west. Others had only low-grade resources for example, the Moscow region which had only lignite of low heat content. The best prospects for increasing coal output were in very large pitmines in Western Siberia and Kazakhstan in Kuznetsk, Karaganda, Ekibastuz and Kansk-Achinsk basins.

All of them presented problems of transportation. Moreover Kansk-Achinsk coal was so low in quality that it was difficult to use. It had a high moisture content (which complicated handling in winter), high ash content, low caloric value, and subject to spontaneous ignition, with a tendency to crumble when dry, which made it difficult to handle. It would have to be used either at mine-mouth power plants or undergo expensive processing to be transformed into versatile fuel.

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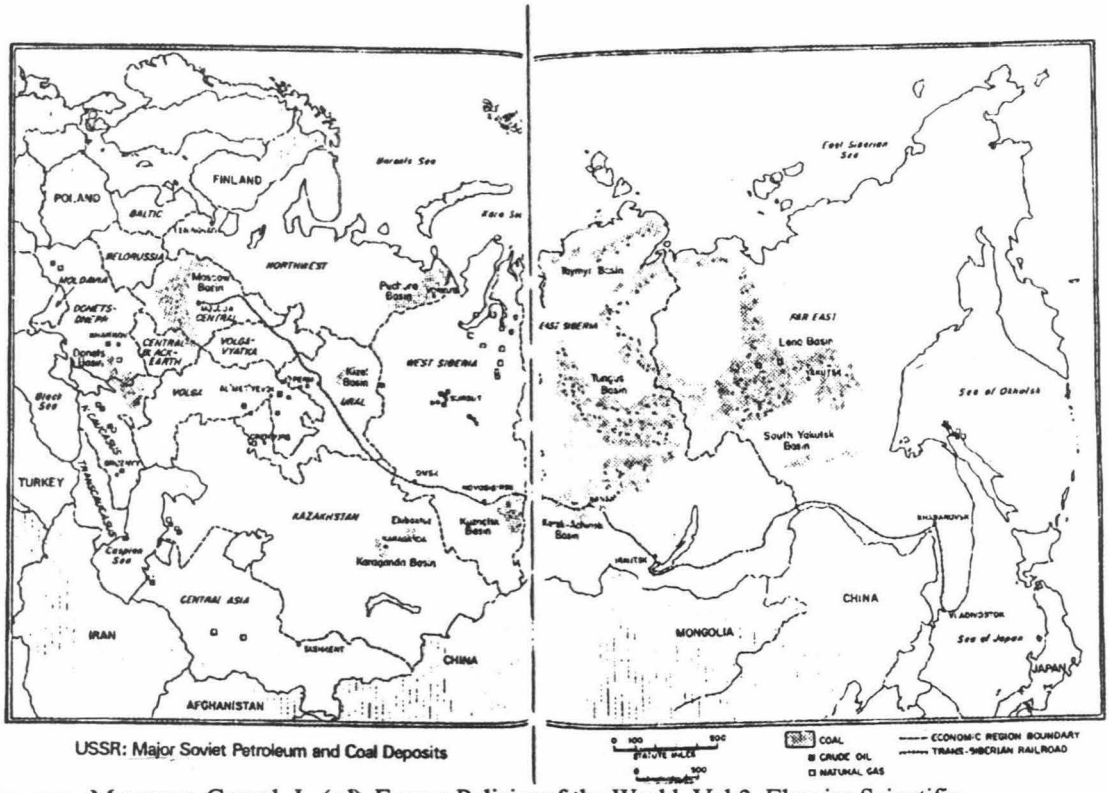
16 Campbell, Robert W., The Soviet Union, in Gerard J Mangone, Energy policies of the world Vol.2, Elsevier Scientific Publishing Company, 1977, p.236.



USSR: Major Soviet Petroleum and Coal Deposits

Source: Mangone, Gerard. J., (ed), Energy Policies of the World, Vol 2, Elsevier Scientific Publishing Co, 1972.

NATURAL GAS

The erstwhile Soviet Union was abundant in natural gas, though for a long time little was done to discover and develop them. As late as 1959, the total explored reserves of natural gas were only 988 billion cubic meters (that is about 3 years of United States production at that time) but by the mid-seventies an extensive exploration effort had raised reserves to about 25 trillion cubic meters (that is almost 900 trillion cubic feet).[17] This total was several times as large as the explored reserves in the United States of America. It was only in 1960, that a change in the energy balance of USSR occurred, which led to the importance of natural gas. By 1970 Gas was supplying a fifth of the country's energy requirements. It was being used to produce almost 40 % of the electricity, 80% of

17 Chamberlain,W.H, The Russian Revolution, Vol 2, New York,,1965, p.410.

iron and steel.[18] Over 100 million Soviet citizens were using gas as their main domestic fuel. In several important economic regions gas had become the main source of fuel. It was 45% of the energy balance in the central economic region, 34% in the northwest, 50% in North Caucasus, 55% in Central Asia.[19]

OIL

The erstwhile Soviet Union had very large volumes of sedimentary cover offering good prospects for containing oil. A serious effort was made to expand oil output in the late fifties. Modest expenditure for exploration disclosed large reserves heavily concentrated in some giant fields. These discoveries occurred first in the platform areas between the Volga and West Siberian platform along the lower portions of the Ob River. For sometime the growth of reserves had fallen behind the growth of output and the ratio of the reserves to output had narrowed. There had also been a persistent shift in the location of reserves towards Siberia as exploration shifted in that direction, and as the fields in the European USSR were depleted by heavy production rates under a production pressure maintenance by water flood. The most significant prospects for additional reserves of oil would be in the offshore areas in the arctic regions in Siberia and at depths below 3,000 meter level. The Russians drilled some wells into these deeper formations, including some deep as 7,000 meters. But the amount of drilling below 3,000 meters was small. It should be noted that the Soviet Union had not reached the situation where oil output had peaked and entered a declining phase as it had in the United States.

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18 Hodgkins J.A., Soviet Power: Energy Resources Production and Potential, London, 1961, p.13.

19 Campbell, Robert W .,Soviet Union, in Gerard J Mangone's, Energy Policies of the world, Vol 2, Elsevier Scientific Publishing Co,1977, p. 242.

HYDROELECTRIC POWER

The erstwhile Soviet Union had large resources of hydroelectric power. By 1976 enough power was produced in hydroelectric stations to save fuel equal to about 3 per cent of all primary energy output. Like other energy sources, the distribution of hydroelectric potential was skewed towards the eastern part of the country. Total exploitable potential had been estimated at about 1,095 billion kWh of annual output, of which 201 billion kWh was in the west (including the Ural region). The over 82 % was in the Asian part in the 1970's, 43 % of the economic potential in the west was in use or being developed, while in the east the corresponding share was only 16 %.[20] Much of the hydroelectric potential already developed in the west of former USSR had involved the construction of large reservoirs on big rivers in plain areas such as those on the Volga and the Dnieper. Experience with the environmental consequences of these reservoirs had changed somewhat the attitude of the policymakers who refused to project construction in the region.

In case of hydroelectric power, transport considerations were crucial in the determination of how fully it would be possible to use potential resources.

OTHER FUELS

The erstwhile Soviet Union had large reserves of several minor fuels. Because of the location problem, these had been used on a considerable scale as supplements to standard resources. Peat occurred very widely in Soviet Union, but was exploited mainly in the fuel poor west, northwest and center region. In 1940, as much as 20 % of all electric power was produced in the peat burning stations; however, the subsequent revolution in the fuel balance and in transport

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[20] Ibid., p.243.

technology for oil and gas had made peat uneconomic as an energy fuel in these regions. Total peat resource would amount to 158 billion tons and was widely distributed. However, the explored block of resources that served as the basis for current production was only about 9-10 billion tons[21]. Because of the long standing interest in peat, erstwhile Soviet Union had developed a number of distinctive technologies for extracting, transporting and processing peat into briquettes and other concentrating fuels as well as the equipment to utilise it on a fairly large scale in their electric power stations. There were a dozen or so stations with capacities of 100 mega watts (MW) or more. The Shatura power station near Moscow, had a capacity of 732 MW[22]. Most of the peat burning power stations that were built had been heat and power combined whose relatively small size permitted the use of peat.

Oil shale had played a minor role in the Soviet fuel balance for a long time. Its contribution to the energy supply in terms of heat content was only about one -third of peat. In January 1966, explored reserves of oil shale were about 6.6 billion tons, of which 5.1 billion tons were in the Baltic area. Total reserves had been estimated to be as much as 156 billion tons. The average content of kerogen (the combustible material in shale) was about 20 per cent, so that explored reserves could supply over a billion tons of fuel.

Firewood had remained a significant fuel for many small-scale local industries in lumbering areas and for household purpose. Despite modernisation firewood was still used across all sections, especially rural households in serving many of their consumption needs.

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21 Ibid., p.243.

22 Campbell, Robert W., Economics of Soviet Oil and Gas, Baltimore Maryland, John Hopkins Press, 1968, p. 9.

While giving an overall perspective of the erstwhile Soviet Union, it can be said that at that time it was one of the worlds 'have' nations with regard to energy. The situation was somewhat less favorable when the size of the resources was evaluated in terms of their economic characteristics. An important consideration was that the resources were not well located. Many were expensive to produce and the quality of many resources were low. A large share of Soviet energy resources was in environments, which would make them costly to develop, and in many cases novel technologies were required to produce and utilize them. Although the Soviet Union was a country with abundant energy resources, it would be a mistake to characterise it as a country of 'cheap' energy.

There was a gradual change in the energy trend in erst-while Soviet Union. Before the mid-fifties, Soviet policy emphasised coal and hydroelectric power as the primary energy resource, neglecting oil and gas. Because the Soviet policy makers felt that hydroelectric power was a more important primary energy resource than natural gas and firewood, as it contributed more towards total energy supply than oil. Towards the end of the fifties, however, as the Soviet economic planners became more aware of their oil and gas potential, and observed a shift away from coal that had taken place in other countries. They began a sharp and accelerated development of oil and gas resources, both to meet the growth in domestic demand for energy and to provide export earnings.

INITIAL NEGLECT OF OIL AND GAS

The share of oil and gas in total energy production fell from 1928 through the forties as total energy output grew. Oil was restricted as a fuel for internal combustion engines, and its use for boiler and furnace fuel declined sharply. Gas played no role in this period. The associated gas produced in oil fields was mostly

flared rather than used, and no attempt was made specifically to discover natural gas reserves, though even some gas fields were known in the thirties. In 1930's a number of debates took place over the fuel policy. In a discussion at the All Union Fuel Conference in 1930 (Vsesoiuznaia toplivnaia konferentiia), emphasis was made to reallocate the oil away from the furnace and boiler uses in favour of use as a motor fuel. The changeover was prompted both by engineering considerations and by the need for motor fuel for increasing numbers of internal combustion engines.

Soviet experts were aware of the desirability of expanding oil output as an alternative to solid fuel. In the year 1929 through 1931, oil out put was expanded with relatively small investments in drilling and increment in output was about 6.25 tons per meter drilled.[23] The following years brought a great rise in drilling requirements relative to output gains, and in 1934-1937 the pay-off was about 1 ton per meter of drilling. In 1937-1940 the increment was about 2 tons per meter of drilling, but the improvement was mostly an illusion. Exploratory drilling dropped from one third to about one-fourth of total footage, but failed to develop reserves at the more speculative end of the exploration process. This jeopardised future increments in output. It was much later that serious efforts to explore oil and natural gas was undertaken.

The first effort to exploit natural gas came when the Saratov and Stavropol' fields in the Russian Federation were discovered towards the end of the Second World War. Later there were some large discoveries of oil and gas in new regions and in the early fifties the emphasis began to move towards oil. But it was not until the sixties that the development of gas resources really began in earnest.

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[23] Campbell, Robert W., The Soviet Union, in Gerard J. Mangone's Energy Policies of the World, Vol.2, Elsevier Scientific Publishing Co., 1977.

For years, Soviet planners seemed to give low priority to oil and natural gas as a possible answer to expanding fuel needs, while large investments were made in other approaches synthetic liquid fuel plants, underground gasification of coal, production of artificial gas from coal and shale, none of which proved very productive. The Fourth Five-Year Plan (1946-1950) called for the creation of a synthetic liquid fuel industry based on coal and shale. Plants were to be built in Eastern Siberia, the North Caucasus and Leningrad Oblast, and the production goal was 900,00 tons[24] of synthetic liquid fuel in 1950. Little progress was made toward this goal. The direction for the Fifth Five-Year Plan (1951-1955) again called for developing the production for synthetic liquid fuel, but the planners scaled down their plan. Nothing what so ever was said about the synthetic liquid fuel either in the report on fulfillment of the Fifth Five-Year Plan or on the directives of the Sixth Five-Year Plan.

It is interesting to note that in the first post-war Five-Year Plan (1946-1950) the planners envisaged a considerable increment in gas from coal and shale; 1.8 billion cubic meters out of the 6.8 billion cubic meters,[25] total investment was to be on manufactured gas. By the Fifth Five-Year Plan, the planners seemed to have been somewhat disenchanted with this resource, but still committed to continued investment in the project already started. The turning point in Soviet policy finally came in the late fifties. A decision to turn away from the more uneconomic fuels to a more profitable one i.e. oil and gas was embodied in the Seven-Year Plan, and enunciated and approved at the 21st Party Congress, in January 1959. This change had since been proceeding very quickly. Coal output as a whole ceased to grow in the early sixties. The Soviet planners have always had

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24 Ibid.

25 Ibid.

a prediction for thinking in terms of average cost especially regarding pricing decisions and inter product competition in an extractive industry. The real issue was marginal cost rather than average cost and where the supply of capital was seen as the important obstacle to growth, incremental investment costs were crucial. Those in charge of investment allocation were surely more sensitive to these kinds of considerations than average reported cost figures. The planner's lack of interest in oil reflected the risk involved in oil as an alternative energy because of the uncertainty as of its costs be. Coal peat shale reserves were in hand and explored, thus there was a firmer basis for figuring cost incremental output for these fuels than for oil.

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SOVIET ENERGY ECONOMY: CHANGING TRENDS

The growth of the Soviet energy economy was marked by several trends:

(a) Substantial shift in the product mix, and upto 1950 a growth in the relative importance of inferior fuels, such as peat and lignite.

(b) A declining rate of growth of consumption of primary energy connected with considerable increase in efficiency in the utilisation of fuel and energy resources.

(c) A somewhat belated shift towards oil and natural gas compared to the experience of Western Europe and the United States.

As soon as economic recovery was on its rise in the twenties, the Soviets began to export a considerable share of their output primarily in the form of petroleum and petroleum products. Net exports increased until 1932, and then dwindled as industrialization proceeded. By 1940, despite large oil exports to Germany there was a significant net import of energy sources. Data on foreign trade was not available for 1941-1949 period, but a sizeable energy import no

doubt continued. During the war years there were lend-lease shipments of petroleum products, and in 1950 there was a significant net import of energy.

In the course of the Fifth Five-Year Plan 1951-1955 the trade balance in fuels were reserved and the ratio of net export to total fuel production had increased ever since. The large exports were accounted for mostly by petroleum, but there had also been a growing export of coal and coke. There was a shift from the status of net importer in coal and coke to net exporter in 1956. There was also an appreciable and rising export to countries outside the Soviet bloc as well. By 1974, over one-third of total coal exports and 24 % of coke exports went outside the bloc.

For many years the 'mineralisation' of the fuels had been one of the objectives of Soviet fuel policy. The population continued to be dependent on firewood for heating, and agriculture and rural industry still relied on it, so did other industries like the paper mills, saw mills and brick making plants in areas where it is available locally.

Within the mineral fuel portion of the fuel-balance, the dominant feature through the mid-fifties was falling off in the over-all quality of fuel owing to the decline in the share of oil and gas, and a rise in the relative share of low-grade fuel such as peat, oil shale and lignite. The relative share of peat increased appreciably. The share of lignite in total coal production increased from 8.6% in 1928 to 15% in 1940. [26] By the end of the Second World War, it had risen further to one-third though that was probably as much a result of the loss of Donbas mines than as a result of conscious policy. After the war it dropped somewhat to about 29% of the total, and stayed at this level until the sixties, when once again it began to decline

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[26] Campbell, Robert W .,The Soviet Union, Gerard. J. Mangone, in Energy Polices of the World, Vol 2 , Elsevier Publishing Co, 1977, p. 233.

slightly. The general quality of bituminous coal also fell. Even with great increase in coal-cleaning operations, the ash content of coal shipped to consumers rose from about 13% in the thirties to 19 per cent in 1959.[27] This deterioration of fuel quality was conditioned in part by Soviet transport policy because the Russians faced serious location problem in the fuel industry. Several of the largest consuming areas in the Urals, central region and the northwest had large fuel deficits and were to be supplied from outside at a great cost in transportation. In planning their fuel industry, the Russians consciously sought to rely on local resources, such as peat and shale in the north west, and sub-Moscow coal basins even when they were of low quality compared to fuel brought from outside, in an effort to reduce transport requirements. Even so the amount of transport work devoted to moving fuel around had grown much faster then fuel production and consumption. Between 1928 and 1960 transport work for coal and coke grew by more than twice as much as the energy content in coal produced. This was a compound result of several factors- that is, a rising ratio of shipments to production, a decline in average energy content, and a slight change in average length of haul. The situation had not been that bad for oil. Oil transport work did grow considerably faster than the energy value of oil produced.

Therefore it can be said that real resources inputs required for increments in oil output increased in the pre-war period, so there was no reason for the planners to reverse their basic policy decision they had made in 1930 about the role of oil in the energy sector.

Twenty years later, it was clear that the incremental costs were not too great. If the Soviet planners had more faith and were willing to spend more on a big gamble in oil exploration, they might have made a headway long ago. But the

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[27] Ibid., p.233.

cost situation in the pre-war period was not such as to encourage a differential expansion in oil output to other fuels. The main explanation for the late development of gas was that the Russians were simply unaware, during the whole pre-war period, of their potential riches. It was not a wrong policy, instead it was a policy of ignorance.

CHAPTER – II

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OIL AND NATURAL GAS RESOURCES OF CENTRAL ASIA

OIL

Oil is found in the world's sedimentary basins and is widely believed to have been generated from countless millions of marine organism which live in the shallow waters surrounding pre-historic landmasses. Through time, these drifted down to the sea-bed where the fatty acids contained in the organisms were transformed to a proto-petroleum product through bacteriological reduction. Probably through continuous and prolonged geothermal heating, this proto-petroleum was later transformed into the crude-oil as we know now. In certain areas where porus rock was covered by impervious rocks such as salt and clay, the oil and gas gradually collected in these reservoirs.

Sedimentary conditions containing oil deposits are widespread and cover about half the world's land area and much of the adjacent sea-bed. There are about 600 known sedimentary basins in the world and about 400 of these have had some oil exploration.[1] In every sedimentary area oil can be found in varying amounts. However, because formations of impervious rocks are often absent from the world's sedimentary basins, so far under half of those explored have been shown to contain oil in usable quantities.

Reservoirs containing crude oil almost invairably also contains saline water on which the oil floats. Natural gas dissolves in the oil, which has to be removed before transportation and refining. The amount of dissolved gas varies little or sometimes none to heavy viscous crudes frequently considerable

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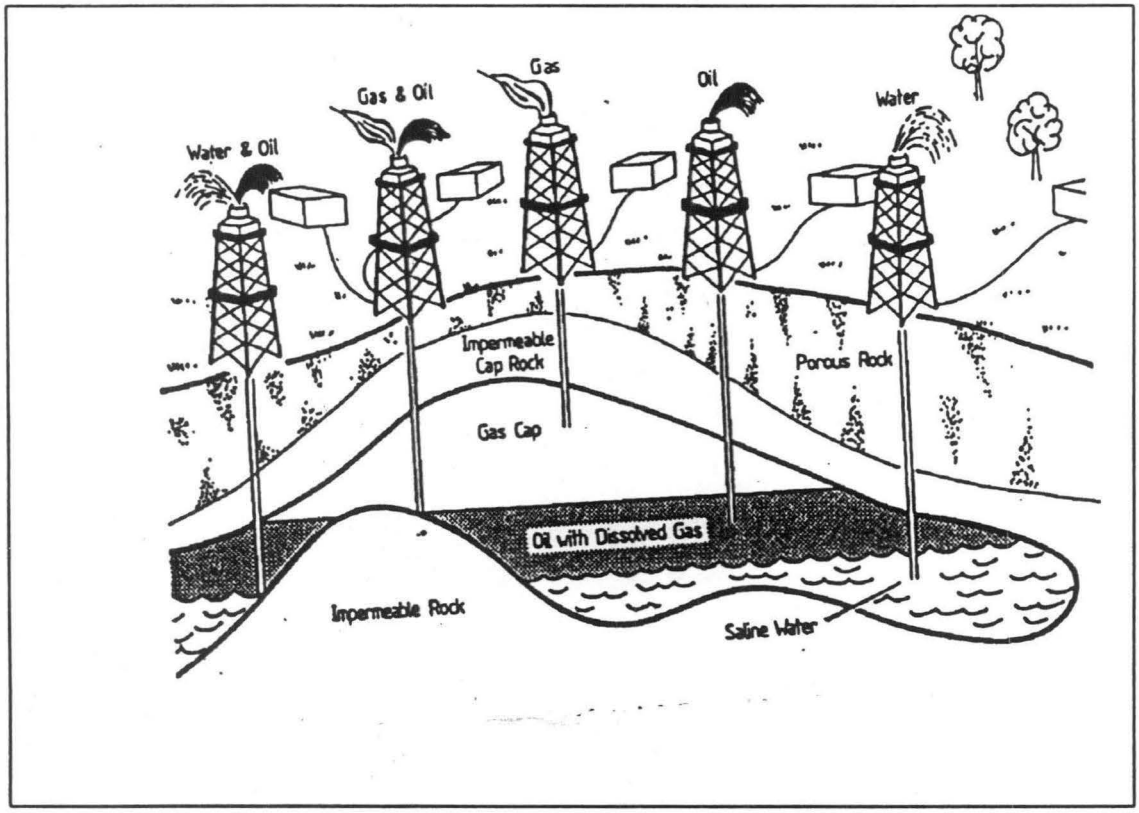
1 Energy Crisis or Opportunity, p.43.

quantities in light thin oil which are easier to extract. Natural gas may also be present as 'gas cap' above the saturated oil.



A Cross section of An Oil Reservoir in Sedimentary Basin

Source: Energy : Crisis or Opportunity

CLASSIFICATION OF RESERVES

The criteria of classification of the oil and gas reserves discovered by exploration depended on the degree to which the deposits had been studied keeping this in mind Soviet planners formulated four categories:

- Category A covered oil in the area fully outlined by wells with proved production.

- Category B, covered oil in areas where the commercial oil or gas possibility have been proved by the presence of wells with favourable logging indications, cores, and commercial flow of oil and gas from at least two wells.
- Category C1, covered reserves estimates for new structures located in established oil and gas provinces in strata whose productivity had been proved in other fields.It could also be found in distinct unexplored blocks and strata in known fields which were expected to be productive on the basis of favourable geological and geophysical data. In 1962, this category was restricted to structures "well enough defined for deep drilling" in order to distinguish it from the D categories established in the late fifties.
- Category D, described as 'predicted' or prognostic reserves was sub-divided into two classes D1 and D2. D1 covered reserves in areas with supposed oil or gas bearing qualities established on the basis of oil and gas indications in individual localities. General geological analysis of the extent of facies and horizons favourble for the accumulation of oil or gas provided the basis for assuming that local structures existed in the area and that they could contain oil deposits. D2 referred to reserves which were assumed to exist in basins favourable for the accumulation of oil and gas deposits, but had not been sufficiently studied for drawing up an idea for the details of the geological structure.

These descriptions suggested that there was nothing in the Soviet reserve system correspondent to the concepts of 'proved reserve' developed by the Committee on Proved Reserves of the American Petroleum Institute (API). API were of the view that proved reserves are both drilled and undrilled.

Category A was somewhat narrower than the American Petroleum Institute concept since it included only the undrilled units in an area out lined by contouring wells. At the same time, the A+B concept was much broader as it included the entire estimated content of a reservoir in which only two wells had commercial flow of oil. In addition to this classification by degree of exploration, Soviet reserves were also classified according to the economic feasibility of their production. Reserves, which satisfied industrial standards and the technological requirements for production, were described as balansovye reserves. While zabalansoyve were those outside the stocks considered in planning, covering the contents of deposits which were uneconomic at the present time but could be used in the future. The distinction between balansovye and zabalasovye was applied on the level of an entire deposit or field rather than within a deposit. The contents of balansovye deposits were further divided into recoverable reserves and non-recoverable reserves. The three most important categories: A, B, and C1 – appeared in the region of 100-120 billion barrels or about 14 billion tons. Of this, some 42 billion barrels, or 5-7 billion tons[2] were estimated as proved, given a 1974 proven reserve – to-production ratio of approximately 13:1 and a proven and semi proven and probable reserves – to-production ratio of 31:1. Ultimately recoverable reserves had been estimated at not less than 350 barrels or 50 billion tons. Despite abundant information on gas reserves, information on oil reserves had been unavailable at least since its inclusion in the State Secrets Act 1947.[3] Some data available from the years preceeding the Second World War is summarized in the Table below suggests that:

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2 Campbell, Robert W., Trends in Soviet Oil and Gas, 1940.

3 National Petroleum Council, Impact of Oil Exports from Soviet Bloc, vol. II,p.106.

TABLE 1

SOVIET OIL RESERVES (Million tons)

Date (As of January)	Categories			
	A	A+B	A+B+C_1	A+B+C
1937	230.7	882.7	3,877.2	6,376.3
1938	N.A.	977.06	4,679.3	8,640.0
1940	N.A.	N.A.	N.A.	10,972.0

N.A. = Not Available
Sources:Campbell, Robert W., *Economics of Soviet Oil and Gas*, Baltimore John Hopkins Press, 1968, p.68.
Third Five Year Plan.

—A+B reserves probably did not exceed about 1 billion tons in 1940, but it is unlikely that much can be given in the prewar reserve estimates.

In the post war period, there were a number of statements concerning percentage increase in reserves Most of these statements were ambiguous, and they did not clearly state what the reserve concept involved. Reference had been made to promyshlennye (commercial) or razvedannye (explored) reserves. These terms were not a part of the official reserve classification, but it was very clear that they generally referred to the A+B. As Soviet exploration and production moved eastward, the regional distribution of reserves changed sharply.

RESERVE ESTIMATES

The discovery of new reserves through exploration and estimation of their magnitude was covered by a detailed system of reporting and certification. Primary responsibility for planning, data collection and analysis in the exploration program was assigned to the Ministry of Geology and Conservation of Mineral

Resources (MGION).[4] Detailed reports on the dynamics of oil and gas reserves in categories A through C2 were presented to MGION annually by all exploratory organisation and oil field administrations. The reports showed for every deposit the stock as of the first of the year, by category distinguishing recoverable and unrecoverable: changes during the year as a result of production, new discoveries, changes in the expected recovery coefficient, reclassification and the stock at the end of the year. Intermittently during the process of exploration, reserve estimates by the exploratory organisations were to be certified by the State Commission on Mineral Reserves (Gosudarstvennaia Komissiia po zapasam poleznykh iskopaemykh, or GKZ). The purpose of the certification system was to prevent exaggeration of the reserve situation by exploratory organisations that felt pressed to report the discovery of large reserves. It was also used to forestall premature development investment in a deposit. Effectiveness of exploratory work was an important success indicator in the oil industry, and the estimation of reserves in newly discovered deposit was based on manipulation of variables that were vague to allow subjective judgement. Estimate of reserves was to be made by the volume methods, which involved moving from the volume of the reservoir rocks to the amount of oil in place by means of estimates of porosity and oil saturation, and therefore to recoverable reserves on the basins of the expected recovery coefficient. Each of these factors was only imperfectly known as the early stage of exploration.

One reason why Soviet economy suffered losses was because of the premature investment in a project before its economic feasibility was fully established. Investment in resource development projects such as a new oil field

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[4] Campbell, Robert W., Economics of Soviet Oil and Gas, Baltimore , John Hopkins Press, 1968, p.62.

could be extremely wasteful, if the size of the deposits were over estimated. The formation of GKZ in 1940 led to the prohibition of the design and construction of new enterprise and the reconstruction and expansion of the old enterprise. The GKZ certified the reserves of any mineral deposit that was to serve as the raw material base for use in the reconstructed enterprise of union or republic. In case of oil and gas, this covered all deposits. Before a plan was drawn up for producing a new oil or gas field, 30-40% of the reserves of the field was certified in categories A and B, 10 -20% in category A alone. It was also necessary to obtain a land lease and a mineral lease from the committee for industrial safety and mining supervision (Gostekhnador).

EXPLORATION

In the nineteenth century the search for oil was based on the uncertain evidence of surface seepage release of gases and signs of bitumen-impregnated sand or limestone. Virgin areas were submitted to careful arial reconnaisance, when photographs were taken to reveal potential oil trap structure. Favourable areas were then prospected by geological methods. Electrical magnetic and siesmic methods had been used for many years in the USSR while certain surveys were based on sonic radioactive and electrolmagnetic tests, the potential productivity of oil-bearing area was then estimated by analysing rock specimens from drilling before a promising site for oil well was selected. The magnitude and the effectiveness of the Soviet exploratory effort can be expressed in terms of Soviet concepts, therefore it is necessary to explain briefly how the Soviets would conceptualise, organise and plan exploration for oil and gas. The overall process of exploration was divided into two stages: prospecting and exploration.

Prospecting or the search for general geological situations and ultimately specific areas thought to be worth drilling. It included both reconnaissance and detailed prospecting. Reconnaissance employed broad forms of search such as geological survey to locate promising prospects. Detailed prospecting often described by the Russians as " Preparing an area of exploration" involved mapping structures by core drilling or seismic methods, and indicated whether an area should be explored or abandoned.

Exploration began with drawing a plan for explorations drilling which covered the location of the wells, the order of drilling and the depths to which they should be drilled. Exploration was divided into two stages: first, which ended with the discovery of oil or gas, or the decision that a given prospect did not contain oil and gas. The second, involved doing whatever additional drilling and well logging to establish the character of the deposit, its areal extent, the thickness, porosity and permeability of the producing strata, the location of the gas and oil and water contacts, and the characteristics of the oil. The purpose of the second stage was to obtain adequate information for estimating reserves and for developing a production scheme.

Exploratory work was carried out by a wide variety of organisations, including exploratory trusts that were a part of the Ministry of the Oil Industry (generally organised on a regional basis), the geological services in the various republics, the Ministry of Geology and Conservation of National Resources of the USSR (MGION), and exploratory trusts under the Ministry of Gas Industry. The formulation of a plan for exploration in this system had to start with drafting of 'limits and directions', which would be modified after they had been reviewed by operating units at lower levels. These limits and directives as amended were

finally affirmed as the national economic plan for geological-exploratory work in oil and gas industry. This usually contained the following indications: increase in reserves, number of new fields to be discovered, number of structures to be placed in deep drilling, volume of exploratory drilling, number of structures studied for possible deep drilling, volume of geophysical and core drilling work. There were also a number of qualitative indexes, such as drilling speed, length of time required to prepare a structure by geophysical and other methods, reserves discovered per meter of drilling.

The plan approved by the Council of Ministers expressed the goals in fairly broad terms. Units at the lower levels then had the job of breaking down the general total into detailed working programs. The main instrument of specification was the project list, which covered a list of specific acts of exploration such as mapping of a specific area. The seismic exploration of a given structure or the drilling of individual wells or groups of wells which the enterprise was to work on or complete in a given planning period. Projects on this list had to be described in terms of technical specifications, and costed out by means of special estimation handbooks. The project list translated the gross indications of the plan into operational programmes, and once approved these programs would become the control instruments for purpose and financing.

The most striking feature of USSR was the tremendous increase in exploratory activity after the Second World War. The 1940 plan for exploratory work set a target the discovery of fifty-five new structures, compared with the annual rate of about 200 per year in the first five years after the war. This also included and completion of exploration, drilling compared with 75-100 per year in the post war period. In the prewar period emphasis was laid on geological work in

the earlier stages. The geophysical work which was done was oriented more towards general regional studies than for the preparation of structure for deep drilling. Most geophysical work in 1940 was by methods other than seismic.

During the Second World War, exploration operations at first fell drastically but with the assistance of lend-lease supplies rose towards the end of the war. By 1946, the general level of exploration seemed to have been somewhat above the 1940 level. From that point onwards, all the indicators of exploratory work showed a rapid and continued rise. There was a strong shift towards seismic geophysical work, the number of structures prepared per year rose, and the number of structures on which deep drilling was being done rose far above the prewar level. The exploratory effort shifted geographically to new areas untouched before, and the share of prospecting wells increased, and the Russians were taking exploration seriously and devoting much more effort to it. The table below indicates the oil and gas exploration

TABLE 2
OIL AND GAS EXPLORATIONS

Item	Unit	1940	1946	1950	1955	1958	1963	1965
All exploratory work[a]	Million rubles	n.a.	54.64	241.36	345.05	480.02	1,061	1,369
All exploratory drilling	Million rubles	n.a.	37.68	187.04	235.90	311.8	750	1,027
Geological and Geophysical	Million rubles	7.1	16.96	54.32	109.15	168.4	311	369
Geophysical	Million rubles	3.3	4.0	17.6	n.a.	70.5	200	129
Geophysical	%of geophysical	40	n.a.	n.a.	65[b]	65	78[b]	n.a.
Seismic	1,000 meters	531	651	2,127	2,242	3,369	5,316	5,568
All exploratory drilling[c]	% of exploratory	n.a.	n.a.	n.a.	40	48.8	52.4	46.0
Prospecting drilling	1,000 meters	221	214	1,127	2,187	3,041	3,600	n.a.
Core drilling	number	86	107	286	429	673	n.a.	n.a.
Geophysical crews[d]	number	18	24	118	247	432	871	n.a.
Seismic	number	21	30	52	107	143	n.a.	n.a.
Granimetric	number	16	16	21	4	6	n.a.	n.a.
Magnetic	number	31	37	88	68	92	n.a.	n.a.
Electrometric	million meters	n.a.	n.a.	n.a.	27.7	n.a.	n.a.	45[e]
Well logging								

Data for 1964

Source: Campbell, Robert W., *The Economics of Soviet Oil and Gas,* Baltimore, John Hopkins Press, 1968, p.67.

In Central Asia oil was found in three main areas- Kazakhstan and Uzbekistan and Turkmenistan. In Kazakhstan oil production was concentrated in the west and northwest. Oil was found in three large onshore fields- Tengiz, Uzen and Karachaganak. The three oil refineries were located in Pavlodar, Atyaru and Shymkent. Atyaru was known for solely refining domestic crude. In northwest Kazakhstan, oil production dates from before the 1917 revolution. Oil was extracted coming from the Dossar and Makat fields in the Emba district on the northeast shore of the Caspian Sea from 1909. Although production rose during the Soviet period and the Emba district received a pipeline outlet to a new refinery at Orsk, in the southern Urals in 1955, output levels remained modest, reaching a peak of 979,000 tons in the wartime year 1943.[5] Oil was also extracted from the Prorva field on the coast of Kenkiyak fiels in North West of Kazakhstan. In that year construction began on a local refinery, at Gur'yev, and it went into operation in 1945. In the post war period, after a temporary decline, production expanded again after additional discoveries and reached a level of 1.6 million tons in the early 1960's,[6] when the large Mangyshlak deposits were discovered to the south of the Emba district.

At the time of their discovery, the Mangyshlak finds, notably the Uzen' and Zhetyday fields, were considered as some of the giant fields of the Volga-Urals and also of west Siberia. Hot water had to be injected into the fields to ease the flow of oil to the well head. The first installation for desalting and heating water brought in from the Caspian Sea through a 90 mile aqueduct went into operation in 1970 and the second aqueduct was completed in 1974.[7] In addition, a

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5 Dienes Leslie and Shabad ,Theodore, The Soviet Energy System, V.H.Winston, 1981, p.54.

6 Ibid.

7 Pravda July 6, 1970.

"hot" pipeline, with heaters along the way keeping the oil at 60-65 degrees Centigrade was completed in 1969 to the Gur'yev refinery and the following year to the refinery complex at Kuybyshev, thousand miles away. At Kuybyshev, the Mangyshlak crude oil was mixed with other oils both for refining and for transportation by pipeline. A second "hot" pipeline opened from Uzen' to Gur'yev in early 1975. However, technical problems kept Mangyshlak productions below expectation. Starting from 335,000 tons in 1965, the first operating year, Mangyshlak production rose to 10.4 million tons in 1970 and to 20.1 million in 1975, considerably below the 26.5 million level envisaged for that year.[8] About 16 million tons, or 80 per cent of Mangyshlak oil, came from Uzen' field, and 4 million from Zhetyday. There were indications that 1975 was a year when production peaked in Mangyshlak, with output slipping to 19.3 million tons in 1976, 17 million in 1977, and 15 million in 1978.[9] The drop in Kazakhstan as a whole was slowed by a slight decrease in the output of the Emba district, where additional reserves just west of the lower Ural river (at Martyshi and Kamyshitovovye) began to be developed in 1968 and accounted for half of the Emba production, running at about 4 to 5 million tons in the late 1970's.[10]

In Uzbekistan oil was found mainly in the Fergana velley. There were around thirteen oil fields and over twenty oil. Some oil fields were discovered in 1967 and 1968, and the total yearly output was 1.8 million tons.[11]

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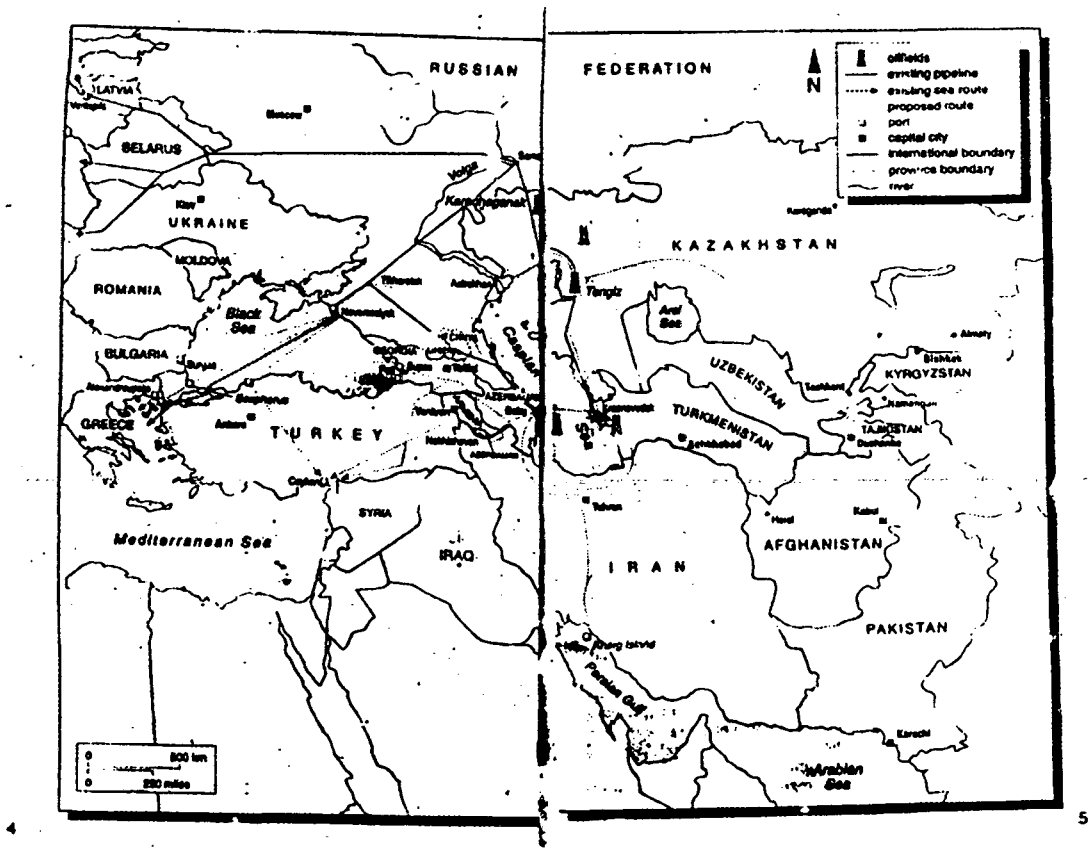
8 Dienes Leslie, The Soviet Energy System, Washington, V.H. Winston,1981, p.56.
9 Ibid.
10 Deines Leslie., The Soviet Energy System, Washington, V.H. Winston, 1986, p.56.
11 Ibid.



Oil Production In Central Asia

Source: Adelphi Papers 1995, p.4-5.

In Turkmenia oil production started in the beginning of the twentieth century in Cheleken, Kotur-Tepe, Nebit-Dag and Bersa-Gel'mes field.[12] In Turkmenia oil was extracted in the Chelken Peninsula, south of Krasnovodosk since the nineteenth century. In 1932 production started in Nebit Dag and by the Second World War, western Turkmen fields also began operations. By 1940, there were new wells in Turkmenia and the Volga-Ural area, when 121,0000 tons of oil were extracted from USSR. Central Asia and Kazakhstan provided under 5%.[13] From 1873 to 1965 around 86 million tons of oil were produced in Turkmenia, while between 1965-1970 some 64 million tons were extracted in

12 Post Soviet Geography, 1994, p.291.

13 Hodgkins, J.A., Soviet Power: Energy Resources, Production and Potential, London 1976, p.75.

1970.[14] A refinery was opened in the area in 1943 at Krasnovodsk. Production continued to rise gradually after the war with discoveries southeast of Nebit-Dag (at Kum-Dag and Kyzl-Kum) and again on Cheleken during the period 1948-1951. But the real spurt in Turkmenia came after the discovery in 1956 of the Kotur-Tepe field, between Nebit-dag and Cheleken, followed in 1962 by the Barsa-Gel'mes field, 10 miles south of Kotur-Tepe. Compared to Turkmenia, the other republics of Central Asia were not very significant producers of oil.

In the 1950's and early 1960's significant new deposits were found east of the Caspian Sea and beyond the Ural mountains. Geological prospects were so favourable that exploration efforts were stepped up, particularly in Siberia, and were rewarded by the discovery of huge deposits in the Tyumen region of West Siberia. Additional deposits were discovered in Far East on Sakhalin island and in Kazakhstan in Central Asia. Meanwhile, in the middle of 1960's, the Soviet oil industry became aware the production from the Azerbaijan, North Caucasian and Volga Ural region could not be expected to maintain the annual increases recorded over the previous decade. The problem facing the development was, that the highly promising areas were located far away from the main oil consuming regions of Soviet Union and in extreme hostile geographical and climatic conditions. Nevertheless, massive effort to develop the Siberian oil resources was authorised for the second half of the 1960's. By 1970 it became clear that by far the great part of the future increases in Soviet oil production would be coming from the Siberian fields, notably from Somotolor in the Tyumen Oblast. Meanwhile, the predicted levelling of production rates from the older established oilfields was beginning to materialise, and an increasing number of oilfield

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[14] Hodgkins, J.A., Soviet Power Energy Resources Production and Potential, London, 1960, p.104.

management problem was being encountered because of over hasty development in the past, and failure to invest adequately in secondary recovery measures. It was becoming clear that the main energy consuming centres of the Soviet Union situated to the west of the Ural mountains and in the European part of the country were becoming an energy deficit area of considerable proportions. Annual production was declining in Azerbaijan and strenuous efforts were made to maintain the level of production in the Volga-Ural region. More than one-third of all newly created production capacity was required to compensate for reduced output from other fields and in 1971 it was estimated that over 50% of production increases upto 1975 would be required for this purpose.

TABLE 3

ESTIMATED PRODUCTION OF OIL IN USSR, 1901-2000 (IN MILLIONS OF METRIC TONS)

Year	Output	Year	Output
1901	11.5	1962	186.2
1907	8.7	1963	206.1
1913	9.6	1964	223.6
1913	10.3	1965	242.9
1917	8.8	1966	265.1
1921	3.8	1967	288.1
1928	11.6	1968	309.2
1932	21.4	1969	328.3
1937	28.5	1970	352.7
1940	31.1	1971	372.0
1945	19.4	1972	394.0
1946	21.7	1973	429.0
1950	37.9	1974	461.0
1955	70.8	1975	496.0
1960	147.9	1980	700.0
1961	166.1	2000	1000.0

Source: *Pravda*, 26 January 1974

Although, Soviet Union became the world leading producer of crude oil in 1974 and ranked third in oil exports (after Saudi Arabia and Iran). Despite the

absence of fiscal reserve data, it became evident that new discoveries had not kept up with continued growth of production, and that the reserves to-production ratio, a key indicator of future prospects, had been deteriorating. By 1949, expanding Volga-Urals production had compensated for Caucasus fields, and in 1956-1958 the leading producing regions of the Volga-Urals, Tatar, Batshuki ASSR and Kuybyshev Oblast each passed the output level of Baku, becoming respectively the first, second and third producers of the Soviet Union.

Volga-Urals growth raised the Soviet Union to the second place among the world oil producers in 1961, ahead of Venezuela and behind the United States. By mid 1960's the region was accounting for 72-73% of total Soviet production. The beginning of oil operations in West Siberia together with short lived increases in a number of other areas like Grozny, Ukraine Kazakhstan and Turkmenia, reduced the percentage share of the Volga-Urals after 1965. But absolute production in the region did not peak until 1975, when the Tartar ASSR reached its record level of 104 million tons. Bashku ASSR has peaked in 1967 at 45.3 million and Kuybyshev Oblast in 1971-72 at 35.6 million[15]. The downward trend in the Volga portion of the region appeared to be slowed somewhat by an upward trend in the Urals portion, where small production increase was recorded by mid 1970 in Perm and Orenburg Oblast and in Udmurt ASSR.

The 1970's also witnessed the peaking of oil output in a number of other Soviet producing areas where the long term potential had been less significant than in the Volga-Urals province. These secondary producers included the Belorussian and Ukranian republic in the European USSR, and Kazakhstan and the Central Asian republic of Turkmenia.

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15 Russel, Jeremy., Energy a factor in Soviet Foreign Policies, pp.39-40.

Natural gas is derived from naturally occurring reserves below the earth's surface. Its main constituents are methane, butane, ethane and propane. Seepages of this natural gas have been discovered from time to time throughout history. When natural gas was first discovered and used in Fredonia in the U.S.A. in 1821, it was piped through hollowed – out logs, it was only recently that natural gas had been developed as an important source of primary energy.

Natural gas has high calorific value (about 3.8 X 10^7 J/m^3),[16] than manufactured gas and also possesses other economic and technical advantages. It can also be delivered at high pressures. Thus when manufactured gas from coal faced increasing competition from cheap oil and electricity, natural gas often found in association with petroleum, gradually replaced it, with similar distribution works and appliances being used at extremely favourable costs.

Most oil reservoirs also contain gases dissolved in the oil (solution gas). Natural gas can also exists in a reservoir above gas saturated crude oil (gas-cap gas) but such gas is almost never produced until most of the underlying economically recoverable oil has been produced. Both these gases are known as "associated natural gas'. For various technical and economic reasons, their exportation has been of secondary importance to that of oil recently.

The gas reservoirs which are located independently of oil fields, are known as 'non associated' gas. They have the commercial advantage over associated gas fields since the gas can be extracted independently of oil demand. During the late 1960s and 1970s industrialized countries such as the USA, the USSR the

16 Energy Crisis and Opportunity, p65.

Netherlands, the United Kingdom and Norway were spending considerable sums on prospecting for natural gas.

While the exploration and use of natural gas is relatively simple compared with that of oil or gas from coal, its importance as an energy source in any particular country depends on the extent of indigenous supplies and whether these merit the capital investment required for its distribution. Obviously the nearer reserves are located to available domestic and industrial markets the more economically attractive this fuel source becomes, a fact of particular relevance to natural gas development in Third World countries. However, as forest fuel become scarcer it will be increasingly attractive to transport the gas to distant market either by long distance pipeline or via the gas liquefication process. Against this must be weighed the fact that local or indigenous supplies increase an area's energy autonomy whereas international pipelines one laid down, place dependence for energy supplies on specific suppliers. This can have far-reaching economic and political repercussions. The USSR's supplies of gas to Western Europe had been expanding since 1968.

While the future of Soviet petroleum appeared to be clouded by uncertainty over the magnitude of proved and probable reserves, there was little controversy over the huge size of natural gas reserves. In contrast the secrecy surrounding Soviet oil resources official reserve figures for natural gas have been published by the Soviet Union not only for the country as a whole, but for individual regions. They showed a remarkably rapid growth of explored reserves since the late 1960s.

Regional production data for natural gas has generally been more easily available than for oil output until the Soviet Union in 1977 imposed secrecy on the

regional distribution of most fossil production. However, in contrast to oil production the output of natural gas in Soviet Union had been organised, and therefore statistically, more complex. Soviet crude oil was extracted almost entirely by the Ministry of Petroleum Industry, except for the small gas condensate component of liquid hydrocarbons that is contributed by the Ministry of the Gas Industry.

The change in the energy balance of the USSR witnessed a rise in the importance of natural gas. While only a decade before it could be claimed that gas occupied a relatively insignificant position in the energy economy of the Soviet Union.[17] By 1970 gas was supplying a fifth of the country's energy requirements. It was being used to produce almost 30% of the electricity and 80% of the iron and steel and had replaced some of the basic raw materials used in the chemical industry.[18]

In several important economic regions gas had become the main source of fuel. It was 45% of the energy balance in Central Economic Region, 34% in the North West, 50% in North Caucasia, 47% in TransCaucasia and more than 50% in Central Asia.[19] In the decade following the war (1946-1955) the average yearly increase in output was 370 million cubic meter, in the next decade (1956-1965) it reached 10,500 million, and from 1966 to 1970 it rose to 13,600 million.[20] The table below gives an account of explored reserves of natural gas.

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17 Hodgkins, J.A., Soviet Power; Energy Resources, Production and Potential, London 1961; p.135.

18 Ibid

19 Lvov, M.S.Natural Gas Resources of the USSR, Moscow, 1969 p11.

20 Hodgkins, J. A, Soviet Power; Energy Resources, Production and Potential, London 1961, p.135

TABLE 4
EXPLORED RESERVES OF SOVIET NATURAL GAS (A+B+C, CATEGORIES, IN TRILLION M^3 AT YEAR END)

Region	1950	1955	1960	1965	1970	1973	1975
USSR	0.17	0.69	2.34	3.57	15.8	22.4	25.8
RSFSR	0.089	0.45	1.08	1.70	12.3	18.1	21.3
EUROPEAN USSR	0.17	0.64	1.59	1.80	3.35	4.4	4.2
KOMI ASSR	0.021	0.21	0.017	0.038	0.41	0.37	
ORENBURG OBLAST	0.004	0.005	0.021	0.025	1.13	2.11	
KRASNODAR, KRAY	--	0.076	0.42	0.47	0.29	0.26	
STAVROPOL' KRAY	0.027	0.23	0.28	0.23	0.20	0.17	
UKRAINIAN SSR	0.070	0.23	0.54	0.66	0.81	0.87	
AZERBAIJAN SSR	0.009	0.052	0.050	0.054	0.086	0.12	
ASIAN USSR	0.004	0.050	0.75	1.76	12.4	18.0	21.6
SIBERIA	--	0.009	0.83	0.60	9.98	14.7	18.2
TYUMEN' OBLAST	--	0.004	0.050	0.40	9.25	13.8	
TOMSK NOVOSIBIRSK OBLAST	--	--	--	0.054	0.23	0.26	
KRASNOVODSK KRAY	--	--	--	--	0.15	0.30	
YAKUT ASSR	--	--	0.21	0.078	0.26	0.32[a]	
CENTRAL ASIA	**0.004**	**0.041**	**0.66**	**1.16**	**2.43**	**3.32**	
UZBEK SSR	**0.004**	**0.005**	**0.61**	**0.67**	**0.80**	**0.95**	**3.4**
TURKMEN SSR	**--**	**0.036**	**0.036**	**0.38**	**1.52**	**2.16**	

A: Reported at 0.8 trillion m3.
Source : 1950-73 from A.D. Brents et al.

The Russian had extremely large resources of natural gas but natural gas played a significant role in the fuel economy of the Soviet Union only in mid-fifties. Natural gas suffered somewhat from being a poor relation and off shoot of the oil industry. Exploration was initially concentrated around large deposits in the west and south east of the Ukraine. Later like oil majority of the significant new deposits were discovered to the east in the desert of Central Asia and in the inhospitable and undeveloped regions of Siberia often in a permafrost conditions. Problems of distance and location similar to the oil industry, faced the gas industry, 75.5 %[21] basis of the country, upto 3,000 km away from the major consuming regions of European Russia the growth of Soviet gas production and reserves.

[21] Russel, Jeremy Energy as a factor in Soviet Foreign Policy, p.59.

RELEVANCE OF CENTRAL ASIA IN NATURAL GAS PRODUCTION

The importance of Central Asia as a potential producer of natural gas emerged in the middle of 1950s, but began to be translated into actual production for the Central Russian Market only a decade later. The role of Central Asia can best be put into perspective in the evolution of the Soviet natural gas industry by considering it as an intermediate producing region, after the early limited resources of the European USSR (North Caucasus, Ukraine) had been developed and before the vast potential of West Siberia could be fully exploited. Central Asian production thus became a crucial factor in the Soviet industry in the late 1960s contributing more than 20% of national gas output through the 1970's with a maximum share of 30-31%[22] during the middle of the decade. Until the 1950s Uzbekistan had been a minor producer of natural gas for local consumption, from small fields in the eastern Fergana valley, a cotton growing centre. The new interest in gas production spurred the development of further small fields in that area, but the main developments were to be concentrated in the western deserts, the Kyzl Kum, on the right bank of Amudarya, and Turkmenia's Kara kum on the left bank. Most natural-gas production was concentrated in the giant fields of Dauletabad, Shatlyk and Chardzhou was an important refinery. The Uzbek developments were centered in the areas of the oasis city of Bukhara. The discovery of a relatively small fields at Dzharkak, in the southeast of Bukhara, led to the construction of the first Central Asian long distance gas pipeline which reached Tashkent in 1960 and was extended to Chimkent in 1961. The actual

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22 Dienes, Leslie and Shabad, Theodore, The Soviet Energy System, p.76.

source of gas for the pipeline turned to be the giant Gazli field, discovered in 1956 north of Bukhara and put into production in 1962.

But most of the output of Gazli was ear marked for transmission to the Urals and to Central Russia, and for an additional source of gas for the Central Asian market, Soviet planners turned to another small cluster of gas field in the Mubarek district, 50 miles southeast of Bukhara. A second Central Asian regional pipeline originating at Mubarek, reached Tashkent in 1968 and was extended to Frunze in 1970 and Alma- Ata in 1971. Here again the original source of gas proved inadequate, largely because much of the natural gas in the Mubarek district was high in sulfur, which tends to corrode steel pipe and must be removed before pipeline transmission. Pending the completion of sulfur recovery plant at Mubarek in 1972, non-sulfurous gas was fed into the new pipeline by the south Mubarek field and was put in production in 1966 and peaked in 1971 at 2.3 billion m^3. About 1 billion cubic meters was supplied by the North Mubarek field, which was developed in 1968[23] but required sulfur recovery for full- scale production. The rest of the gas flowed into the Mubarek–Alma-Ata line and consisted of imports from Afghanistan. The flow of Afghan gas from the Shibarghan field developed by the Soviet Union began in 1967. The gas originally crossed into the Soviet Union at Kelif through an underwater pipeline laid across the Amudarya; the border river. However, the line was subjected to breaks from shifting stream channels and was replaced in 1974 by a more secure suspended pipeline above the river.[24]

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23 Leslie Dienes, and Theodore Shabad The Soviet energy system, p. 80.

24 Dienes Leslie and Theodore Shabad, The Soviet energy system, p. 80..

The Mubarek sulfur recovery plant had been projected as smaller counter part of the Orenburg complex consisting of three stages with a gas throughput capacity of 5 billion cubic meters and a sulfur yield of 170,000 to 200, 000 tons each.[25] The raw material base was also expanded when the high sulfur gas field of Urtabulak, 50 miles west of Mubarek, was linked to the processing plant by a pipeline that had been especially treated to reduce corrosion. National gas production in the Mubarek district thus rose from 32.3 billion cubic meters in 1970 to 7.68 billion in 1975 as a result of the high sulfur operations.[26] The sulfur recovery plant encountered problems in achieving its designed capacity, and only 89,000 tons of sulfur was reported to have been recovered in 1975 out of an ultimate capacity of 200,000 tons.[27] A large portion of Uzbekistan's undeveloped reserves were of the sulfur bearing type, therefore it was essential to ensure smooth operation of the sulfur recover technology at the Mubarek plant.[28]

While the Uzbek gas producers were struggling with the problems of developing the sour gas resources is the south west, most of the republic's production came from the giant sweet gas field of Gazli. Here the initial explored reserves of 456 billion cubic meter were of the same order of magnitude as those of Shebelinka in Ukraine shortly after its discovery in 1956, the Gazli field was earmarked as source of gas for the Urals industrial region, which was suffering a growing fuel deficit. Two 40 inch lines extending more than 1,2000 miles to the Urals around the western shore of the Aral sea, were completed in 1963 and 1965 providing as annual transmission capacity of 20 billion cubic meter, which Gazli had been filling since 1966. The field, which reached a peak production of 26

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25 Pravda, July 14, 1976.
26 The Economy of Uzbek SSR, 1975, Statistical yearbook, Tashkent 1976 p. 84.
27 Pravda Vostoka, February 18, 1976.
28 Pravda, Nov 27, 1973, and Feb 1, 1974.

billion m^3 is 1968-1971, had used up about 60% of its initial reserves by the end of 1977, and a gradual decline of production became evident in the late 1970s.[29] In addition to supplying the entire flow of Central Asian gas to Urals, Gazli had also been contributing to the transmission system carrying Central Asian gas, mainly from the newer Turkmenian fields to Central Russia. In 1970, of a total Gazli production of 26.1 billion cubic meter, 19 billion moved through the Urals pipeline, 3 billion was fed into the transmission system to Central Russia, and 4 billion was transported through the regional Central Asian distribution system serving Tashkent and other major cities. As Gazli began its decline Uzbek gas production had been supplemented by two middle size sweet gas fields of more than 40 billion cubic meters in reserves each. One is Uchkyr, 30 miles west of Gazli which was put into production in 1968; the other was Shakhpakhty, started in 1971 about 130 miles west of Kungrad, in the Ustyurt Plateau, in what is perhaps the most remote location of any of the Uzbek gas fields. The two fields, producing at a rate of 2 to 3 billion cubic meters a year each, were feeding into the Central Asia – Central Russia transmission system.

The major gas transport system was inaugurated in 1967 from Gazli to Moscow. It was based almost entirely on production from the Turkmen SSR, with the Uzbek SSR contributing a relative small share. Until the middle 1960s; Turkmenia's gas production consisted of small accounts of gas (up to one billion cubic meter in 1965) associated with oil fields in the western part of the republic, on the Caspian Sea shore.

Exploration in the Kara Kum desert of Eastern Turkmenia had resulted in the discovery of gas fields as early as 1959 in the Darvaza areas of the Central

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[29] Dienes Leslie and Shabad, Theodore., The Soviet Energy System, Washington, V H Winston, 1981, p.79.

Kara Kum. Despite relatively small reserves (totaling no more than 87 billion cubic meters).[30] Low reservoir pressure and remote location, the Darvaza fields were once considered a potential source area for long distance gas transmission to Central Russia.[31] However, before these plans could be carried out, large and more accessible fields were discovered and the Darvaza area, much bruited about in the early 1960s was no longer a factor in Soviet gas prospects.

The pre-eminence of Turkmenia in gas production began with the development of the Achak field, in the north east Karakum, 40 miles south east of Khiva, the ancient Oasis town. Achak was promptly designated as a supply source for the gas transmission to Central Russia, and was placed into production in 1966; and with gas reserves of 152 billion cubic meters and condensate reserve of 3.4 million tons.[32] The valuable condensate began to be recovered in 1968 after completion of a special pipeline to the Pitnyak rail station, 40 miles away. After Achat had been put into production in November 1966, it first helped supply the Gazli-Urals pipelines for one year, and starting in late 1967, became a major source of gas for the first stage of the Central Asia–Central Russia transmission system. The supply of gas in the Achak region was supplemented by the development of nearby fields; in 1970, the Gugurtli field, South of Dargan–Ata, The growing Turkmenian production led to the completion of the second stage of the Central Asia-Central Russia transmission system, with a 48 inch line in 1970 bringing the combined transport capacity of the first two stages to 25 billion cubic meter. The actual transmission out of Central Asia in 1970 was about 35 billion

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30 Pattern of distribution and the prospecting for oil and Gas deposits in Central Asia and Kazakhastan. Moscow: Nauka, 1973 p. 138.

31 Dienes Leslie and Shabad ,Theodore., Soviet Energy system, , p. 81.

32 A.D. Brents et al, Economics of the Gas-Extracting Industry Moscow: Nedra, 1975, p. 69.

cubic meter, or 18% of the total soviet gas production, with 18 billion flowing to the urals and 16 billion to Central Russia.

The next phase in the development of the Turkmenian gas resources was focused on the Mary Oasis of southeast Turkmenia. Here the relatively small Bayram-Ali field (52 billion Cubic meters of reserves) had been discovered in 1962 and had been earmarked in early plans as a potential source of gas for Central Asia. The first gas site to be actually developed in the many district was Mayskoye, 20 miles southeast of May. It's small reserve (18 billion cubic meter) discovered in 1964, were considered adequate as a regional supply source and in 1970 the Mayskoye field began feeding gas to Ashkabad, the Turkmen Capital through a 20-inch, 300 mile line with a capacity of about one billion cubic meter a year.

These developments were overshadowed by the discovery in 1968 of the giant Shatlyk field originally called Shekhitli, 30 miles southwest of Mary, with explored reserves of 876 billion cubic meter. These were judged sufficient to sustain an annual output of 35 billion cubic meter over a period of 16 years, and Shatlyk was designated as the point of origin of third stage of the Central Asia–Central Russia pipeline system. Production in the Shatlyk field began on 1973 when the first of two 56 inch, 290 mile pipeline were laid from Shatlyk northwards across the Kara Kum to Khiva to join the Central Asia–Central Russia transmission system. The second string completed in 1975, brought the capacity of the Shatlyk–Khiva pipeline segment to 40 billion cubic meter a year. Shatlyk reached its designed production in the Sakar field, near Chardzhou, for local use, and the development of a field at Tedzhen, which feeds into the Mayskoye–Ashkabad pipeline. Meanwhile the Shatlyk-Khiva pipeline had provided on outlet

for gas fields deeper in the Kara kum. The largest, Kirpichli, started production in 1978, with reserves of 150 billion cubic meter and a designed annual output of 8 billion cubic meter. It started working in 1979 on the development of two nearby fields – North Balkui and Beurdeshik – which would raise the annual production capacity in the Kirpichili Cluster to 12 billion cubic meters.[33] By 1978, the gas fields in the oil producing districts of western Turkmenia followed a separated course under the aegis of the Oil Ministry. Although a small gas field, Kyzlkum, had been discovered in 1952 Southeast of Nebit Dag, the gas potential of the region did not become evident until the late 1950s and early 1960s when substantial gas reserves were found to be associated with the newly discovered oil field of Kotur Tepe and Basra – Gel' mes and with the more southerly fields of Kamyshldzha and Okarem, where gas proved to be more significant than oil. The combined gas reserves of these fields were put at more than 150 billion cubic meters, enough to justify the construction of a separate western branch of the Central Asia – Central Russia gas transmission system running north along the east shore of the Caspian Sea to a junction with the triple string eastern branch carrying gas from Eastern Turkmenia an Uzbekistan's Gazli Fields. Although the plan for a western pipeline branch was put forward as early as 1967, construction efforts remained focussed on the more accessible and larger eastern fields, particularly Shatlyk, and work on the western branch did not begin in earnest until late 1972; when it reached the Mangyshlak oil district in northeast Kazakhstan, with an annual gas producing potential of 5 billion cubic meter. Advancing south along the Caspian shore, the western branch reached the Kotur Tepe and Basra-Gel'mes Oil fields in late 1974, and the Kamyshldzha and Okrem field, 150 miles

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[33] Soviet Geography, November 1978, p.672.

for South, in 1976. The 48 inch pipeline was slow to attain its designed transmission capacity of 15 billion cubic meter because of delays in the installation of compressor stations along the way and in the completion of gas – processing plants at the producing fields. In late 1977, the western fields were said to be producing at the annual rate of 9 billion cubic meters,[34] with perhaps 8 billion moving through the pipeline, with perhaps 8 billion moving through the pipeline.

By mid 1970s, the Central Asia – Central Russia gas transmission system had thus been completed, with a potential capacity of 68 billion cubic meters. Actual gas movements in 1975 were 55 billion cubic meter, with 4 billion coming from the Mangyshlak fields of North West Kazakhstan, 46 billion from eastern Turkmenia, 3 billion from western Turkmenia and 3 billion from Uzbekistan. With the Shatlyk field producing at full capacity and an improvement in the gas flow from western Turkmenia, the system appeared to be approaching its designed capacity in 1978. The system consisted of four parallel lines from the junction point of Beyneu, in northwest Kazakhstan where the three eastern feeders and the western feeder converged, for a distance of 465 miles to Aleksandrov-Gay, in Saratov Oblast. Here the system divided into two lines going northwest to Moscow and two other proceeding 470 miles westward across the Volga river to the north Caucasus – Moscow transmission system at Ostrogozhsk. The gas flow from Central Asia could thus replenish the southern supply of gas that had become depleted by the exhaustion of the north Caucasus fields.

The construction of the Central Asia–Central Russia system, with an aggregate pipeline length of 13,750 km, represented an important factor in the

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[34] Soviet Geography, Dec. 2, 1977.

spurt of Soviet gas pipeline construction after 1965 as more distant sources of gas began to be developed. The length of the Soviet gas pipeline network rose from 42,300 km in 1965 to 67,500 km in 1970, or by 60% and then by 47% to 99,200 km in 1975

Moreover the need for large transmission capacity promoted a shift towards pipeline of increasingly large diameter. In 1965, the largest diameter was 40 inches and it represented about 18% of the total pipeline length, by 1975, inch and 58 inch diameter had been introduced, and the share of large pipeline diameters (40 inches and larger) had increased to 40% of the Soviet transmission network.

Thus in contrast to oil production, the output of natural gas in the Soviet Union had been organisationally and statistically more complex. Besides there was a sudden change in the importance of gas. Soviet planners realised that gas was cheaper than the other energy resources and therefore it was excessively utilised after vast reserves of gas deposits were discovered in1950. Since then the share of natural gas rose by 30% in Central Asia and Kazakhstan. Thus both oil and gas usurped the position of coal and firewood in Soviet Union and established themselves as an important energy fuel. The cheapest source of gas and oil were found in the eastern part of USSR.

CHAPTER – III

CHAPTER III

SOVIET PIPELINE POLICY AND TRANSPORTATION NETWORK

The lack of adequate infrastructure was the most difficult problem faced by Soviet Union in oil and gas transportation in Central Asia. Therefore, the chronic shortage of equipments, steel pipeline coupled with consistent record failure by construction, communication and machinery producing ministries gradually effected the development of the oil and gas industry.

The biggest part of the job had traditionally been done by railroads which through the fifties accounted for almost two-thirds of the total turnover (i.e. in ton kilometers) of oil and oil products handled by Soviet carriers. Before the Russian began their rapid expansion of oil output, pipelines were minor carriers, accounting for only 5% in1950, of the total turnover of oil and oil products, which was much less than the share of either river or sea transport that year. But pipelines soon became the fastest growing element in the Soviet oil transport complex, and by the mid-sixties they were performing about a quarter of the freight turnover in oil products. The Russians chose to handle much of their rapidly expanding petroleum exports in their own vessels. Thus the share of ocean transportation in the total oil transport work done by Soviet carrier also grew appreciably. But ocean transport as a means of handling the internal movement of crude and products in the form of coasting traffic lost out relatively. River transport had also lost much importance. The Russian ocean tanker fleet had

grown from 32 tankers of 138,000 gross tons in 1952 to 205 tankers aggregating 1,927,000 gross tons at the end of 1964.[1]

The various carriers had been assigned rather differential functions, as the breakdown of their total work between products and grade haulage. When the Russians began to expand their pipeline network after 1950 they concentrated on transport of crude oil from the field to the refineries. In the beginning these were in the form of short pipelines. In 1950 the average length of haul in pipelines was only 320 Km. Crude oil pipelines had even shorter length of haul about 236 Km. But with a shift of refineries from the producing regions to market areas, average length of haul for pipelines increased considerably and in 1965 it reached 660 km.[2] Through the mid-sixties pipeline transport remained largely devoted to moving crude oil, though by then the Russians were also planning to move some of the product flows from railroads to the pipelines. It was expected that by 1970, as much as half the long-haul products shipments could be handled by pipelines.

TABLE

RAIL OIL SHIPMENTS ORIGINATING AND TERMINATING, BY REGION, 1961 (million tons)

Region	Originating	Terminating
U.S.S.R.	168.4	167.4
R.S.F.S.R.	133.3	98.8
West Siberia	12.4	4.6
East Siberia	2.7	9.4
Central Asia	5.5	5.7
Kazakhstan	5.2	7.6

Source: Various Statistical handbooks and Sheiman, 1962, p.47.

1 U.S. Department of Commerce, Maritime administration, Merchant Fleets of the World, various issues.

2 Hodgkins, J.A, Soviet Power: Energy Resources, Production and Potential, London, 1961, p28.

Despite the growth of pipelines, the railroads had to handle a very large part of the increased oil traffic generated by Soviet oil expansion. The increment in oil traffic handled by the railroads was 22 million tons in the Fourth Five-Year Plan (1946-1950), 34 million tons in the Fifth Five-Year Plan (1951-55), and 35 million tons between 1955 and 1960.[3] After 1955, the share of railroads in the total turnover began to decline, but in absolute terms rail transport of oil was still increasing and all the projection made for oil freight implied that it would continue to rise. Haulage of products had always predominated in railroad oil turnover, but since the time the pipelines had taken over a large share of the crude transport job the railroads still handled a large volume of crude shipments. Because of the change in location of refineries the importance of crude oil transport in the total transport job had grown and the rise of crude oil and product transport work which the railroads had was about the same as before the rapid growth started.

The function of river transport was mostly to move products, like the ocean transport as long as it served as an internal carrier. About 90% of the shipments in coasting trade were products.[4]

Apparently there was limited short-distance movement of products by trucks like the United States where trucks accounted for nearly 7% of all crude shipments and over a third of all product shipment.[5] One of the complaints made about the transport pattern in the USSR was that the railroads had to handle a

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3 Campbell, Robert W., Economics of Soviet Oil and Gas, Baltimore, John Hopkins Press, p.143.

4 Markova and Smirnov, 1966, pp.7-9.

5 Campbell, Robert W., Economics of Soviet Oil and Gas, Baltimore, John Hopkins Press, p.143.

great deal of short haul movement from transfer points and that this was uneconomical.

SOVIET OIL TRANSPORT

The main flows of crude petroleum and products in the Soviet Union originated in the surplus producing areas in the Volga region, the Ural, the Caucasus and the Turkmen SSR and later moved to the deficit areas of the West, Centre and East. The rapid growth of output in the Volga-Ural area in the postwar period meant that the flows from the Caucasus area (Azerbaijan and North Caucasus) had become less important in the total interregional movement. For quite sometime the interregional traffic had consisted more of movements of crude oil, which was then refined in the regions of demand.

There is little data available to set out precisely an interregional flow matrix for the oil traffic. Detailed information was available only for railroads, but there is enough information about the carrier to make the general pattern clear. The distribution of Soviet Oil transport by carrier as it had evolved is shown in the table 1.

TABLE - 1
SELECTED INDICATORS RELATING TO TRANSPORT OF OIL AND PRODUCTS

Item	1940	1950	1955	1958	1961	1962	1966
Shipments (mn tons)	66.4	86.2	166.7	255.0	376	413	574.7
Pipelines	7.9	15.3	51.7	94.9	144.0	165.1	247.7
Crude oil	6.7	12.7	45.4	n.a.	128.9	147.3	225.6
Products	1.2	2.6	6.3	n.a.	15.1	17.8	22.1
Railroads	29.5	43.2	77.6	112.5	168.4	190.5	240.2
Crude oil only	n.a.	14.1	15.6	24.8	43.3	51.8	n.a.
River	9.7	11.9	14.4	16.1	20.5	21.2	26.9
Sea	19.6	15.8	23.0	31.5	34.8	36	59.9
Coasting trade only	19.5	n.a.	n.a.	24.4	n.a.	n.a.	n.a.
Turnover(bn ton-km)	66.7	80.8	154.5	253	387.8	436	728.4
Pipelines							
Railroads	3.8	4.9	14.7	33.8	60.0	74.5	165.0
Crude oil only	36.4	52.0	101.6	154.0	230.6	252.5	301
River	n.a.	12.0	17.0	37.2	73.8	84.9	n.a.
Sea	12.1	12.0	14.3	15.6	20.6	20.8	30.5
Average length of haul (km)	14.1	11.9	23.9	50	76.7	88.2	231.0

*1951.

Source: Campbell, Robert W., *Economics of Soviet Oil and Gas*, John Hopkins Press, 1976.

The first shipment in USSR was by rail. The most impressive part of the rail movement was the large export from the Volga-Ural region. It was enough to supply the deficit areas within the RSFSR and to provide oil and products for other areas such as Kazakhstan, the West and the South. The pattern in the eastern part of the USSR was quite simple. Oil and products moved form the Volga-Ural region to West Siberia, Eastern Siberia, the Far East and Kazakhstan, while Central Asia was supplied mostly form its own resources. The Far East, was also partly self-sufficient importing only about half its consumption. The situation in the West was more complicated, with numerous eddies in the general flow. Most of the western regions received oil from both the Caucasus and the Volga-Ural region and there was also some redistribution form one deficit region to another, as from the South and the Centre to the North West and West.

Most of the river traffic was accounted for by shipments in the Volga basin, moving oil from the Trans-Caucasus, the Turkmen SSR, and the Volga producing areas to the Centre and Northwest. There was also an appreciable reverse shipment of Volga-Ural oil refineries in the Caucasus and some high sulfur fuel oil from the Volga-Ural refineries to be used as boiler fuel in the Trans-Caucasus. The coastwise shipments were mostly within the Black and Caspian Sea basins. In the Black Sea, the main flows were from Novorossiisk, Taupse, and Batumi to Odessa in Crimea. These were mostly finished products though was some movement of crude oil supply to small refineries at Odessa and Kherson. Some oil was also shipped form Novorossiisk and Taupse to Batumi, was crude as it went to refineries in Batumi. The Black Sea was the main origin for oil exports from Odessa, Tuapse, Novorossisk and Batumi. In the Caspain, the

main movements where from Baku to Makhachkala, Astrakhan, Gur'ev and Krasnovodsk, most of them were refined products. Some crude also moved in the reverse direction, from Krasnovodsk to Makhachkala. Also the oil from the offshore field at Neftianye Kamni had to be taken by ship to Baku. The distinctive and remarkable feature of the Soviet oil transport was the limited role played by pipelines initially. The general proposition that pipeline transportation was more efficient than other forms of oil transport was in trial in the Soviet Union. But there was a slow transformation to get oil freight off the railroads and move into pipelines. If this was done earlier they could have saved tremendous amount of operating costs and investment cost as well. Some people were of view that the long standing position of steel as a deficit commodity might have discouraged the construction of pipelines, but this point of view was not very convincing. Calculation showed that the amount of steel used in the tank car stock to perform the shipment assigned to the railroads could build an impressive net of pipelines.

Another explanation for the Soviet failure to use pipelines was that the flows were so dispersed that investment in pipelines was not justified. The role assigned to pipelines in the Soviet oil transport system was to deliver crude to the refineries. Because of high concentration of production in certain localities and because refineries were so localized, the associated flows were quite large and permanent. As indicated earlier a large share of crude oil traffic was transported by pipelines. Since these flows were dispersed over very wide areas, the economic justification of pipelines in their case was less obvious. Besides the Soviet refinery was characterised by a high proportion of residual fuel oil not suitable for

shipment by pipeline. Therefore the potential pipeline volume for products in the USSR was smaller compared to crude output in the USSR, than in the U.S.

- The biggest economies come with very large pipelines and that efficiency requires a high degree of utilization of capacity. The situation was different in the prewar period. Total consumption of petroleum products in 1940 was about 24.5 million tons, but only about 11.7 million tons of these were light products that might have been shipped by pipelines.[6] The regional distribution of their consumption was as follows
- The Urals, Siberia, the Far East, and Kazakhstan together took about 2 million tons.
- The Ukraine, the Caucasus, and Central Asia took about 40 %, slightly less than 5 million tons.
- Flow from the Caucasus to the Ukraine, amounting to about 1 million ton, shipped by pipeline.

It did not seem probable that pipelines posed any special technological problem for the Russians. Some of the pipelines that were built in the thirties were quite impressive. The 12 inch line from Gur'ev to Orsk finished in 1934 was 710 Km. long, and was built under very difficult conditions across essentially desert country.[7]

The Russian were aware of the desirability of expanding pipeline shipments in the post-war period, and wanted to shift oil freight to pipeline. They were first unable to keep up given the pressure of rapidly increasing output and the shortage of large diameter pipes, aggravated by the rival claims of gas pipeline system. The

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6 Campbell Robert W, Economics of Soviet Oil and Gas, Baltimore, John Hopkins Press, 1976.

7 Sagers Matthew, Soviet Geography, 1989.

length of the pipeline network in operation and the volume of shipment by pipeline did actually increase quite rapidly after 1955. The situation was analogous to the experience in refining where under pressure of rapid growth and limited resources the Russians tried to cope.

In the Fifth Five Year Plan (1951-55), 6,650 Km. of pipelines were built and put into operation but only 5, 377 Km. were actually completed. The next attempt to built 14,600 Km. was fulfilled by 27 %.[8] Either the Russians did not set aside enough steel to cover pipeline needs, or it was the allocation for pipeline that was cut back when shortages appeared.

As of mid-1961, the size distribution of Soviet oil pipeline was approximately as follows.

TABLE 2

Inches	Thousand km	Per cent
8 or less	1.1	5.9
10	1.8	9.7
12	2.8	15.1
14	2.0	10.8
20	6.6	35.7
24	3.7	20.0
32	0.5	2.7
Total	**18.5**	**100.0**

Source: Campbell, Robert W.,*Economics of Soviet Oil and Gas*, Baltimore, John Hopkins Press, 1976

Most of the new lines constructed were in the range of 20 inches and over. Russian generally left the flow to the railroads where the flow of oil was too small for a large diameter pipeline.

The huge growth of petroleum output had resulted in corresponding increase in oil transportation and refining, and the successive shifts in the centres of production from the Caucasus, to the Volga-Urals and then West Siberia and finally Central Asia affected the pattern of transportation and refining. Oil

[8] Summary of World Broadcast, March 3, 1984.

transportation in Caucasus was predominantly carried by railroads. In 1950, railroad tank cars even carried more crude oil than was transported by the pipeline. This is evident from the table.

TABLE 3
OIL TRANSPORTATION

Carrier	1940	1945	1950	1955	1960	1965	1970	1974	1975	1976	1977	1988 plan
	Length of Oil Pipelines (thousand of km)											
Total	4.1	4.4	5.4	10.5	17.3	28.6	37.4	53.0	56.2	58.6	61.9	
Crude Oil	3.2		3.9	7.4	13.0	22.1	30.7	44.1	46.1	48.4		63.65
Products	0.9		1.5	3.1	4.3	6.5	6.7	8.3	40.1	10.2		
	Shipment of Crude Oil and Products (million of tons)											
Pipelines	7.9	5.6	15.3	51.7	130	226	340	457	498	532	559	650
Crude oil	6.8	4.0	12.6	45.3	145	205	345	424	458		514	600
Products	1.4	4.6	2.7	6.4	14.5	24.4	25.3	32.9	39.6		45	50
Railroads	29.5	21.6	43.2	77.6	151	222	302	379	388	394	406	475
Crude oil	5.3		14.1	15.6	36	50	59.6		58.3			50
Products	24.2		29.1	62	115	172	242		329			425
River Tankers	9.6	5.4	11.9	14.4	18.4	25.0	33.5	37.8	39.0	38.1	37.4	
Crude oil	9.6			2.7	2.1	2.2						
Products	9.0			11.7	16.3	23						
Sea-going tankers (domestic trade)	19.5	11.3	15.8	20.2	24.1	26.4	32.8	(35)	(36)	(36)	(36)	(38)
Crude oil	3.0			6.8	94	11.6						
Products	16.5			13.4	14.7	14.8						
Sea-going tankers (foreign trade)	0.1	-	-	2.8	8.4	27.1	42.3	(51)	(55)	(68)	(38)	(74)
total Soviet Sea-going tankers	19.6	11.3	15.8	23.0	32.5	53.5	75.1	85.9	91.4	100.9	104.4	

Source: *Soviet Geography*, November 1977, p 701.

The pipeline system developed, expanding ten folds during the period 1950-1975 an increasingly large portion of the crude oil moved from producing field to refinery by pipeline. There were around 85% of all Soviet crude oil transported by pipeline, 10% by rail, 5% by coastal tanker in the Caspian Sea and a negligible amount by river-going tanker in the Volga basin. The proportion of pipeline to rail movements was reversed in the case of refined products, which tended to be shipped mainly by rail both because of scattered distribution of destinations and because the construction of product pipelines had been lagging

even in areas of bulk movements. In 1976 only 17% of the total length of Soviet petroleum pipelines carried by pipeline consisted of products.

In order to accommodate the growing traffic of crude oil from field to refinery, there had been a steady increase in pipeline diameters since the upsurge of the Soviet petroleum industry in the mid 1950's. The table gives an account of the diameter and capacity of oil pipelines.

TABLE 4
DIAMETERS AND CAPACITY OF OIL PIPELINES

Diameter (inches	Annual capacity (mill. Tons)	Length of pipelines (thousand of km.)						
		1940	1950	1955	1960	1965	1970	1975
<22		4.1	5.4	7.5	9.2	9.5	10.8	12.1
20	8	-	-	3.0	6.3	9.9	10.3	16.9
28	17	-	-	-	1.7	6.1	9.5	11.0
32	25	-	-	-	0.05	1.8	2.9	5.9
40	45	-	-	-	-	1.3	3.9	64
48	75	-	-	-	-	-	-	49
total length of pipelines		4.1	3.4	10.5	17.3	28.6	374	

Source: Campbell, Robert W., *Economics of Soviet Oil and Gas*, Baltimore, John Hopkins Press, 1976.

Previously the largest diameters in the rudimentary pipeline system were of the order of 12 inches. The size of pipeline began to increase in the mid 1950's with the construction of the first 20 inch line as refineries began to be located increasingly in market areas at greater distance from producing fields. The pipeline size rose to 40 inches in the mid-1960s and to 48 inches in the mid-1970's, as the need for transporting growing amounts of crude oil from West Siberian fields to distant refineries increased. In 1975, one quarter of the total crude-oil pipeline length consisted of 40 inch and 48 inch diameters - 11,300 out of 46,100 km, products pipelines was of similar diameter. Although the 40 inch

lines were designed to carry 45 million tons and the 48 inch lines were to carry as much as 75 million tons[9] of crude oil a year. These designed capacities were usually slow to reach because of delays in installing the required number of intermediate pumping stations.

In the early phase of the Soviet oil industry the Caucasus dominated more than 80% of the refinery capacity. It was concentrated in the two major producing areas of Baku and Grozny as well as in Batumi, the Black Sea port in Soviet Georgia, which was connected by pipeline with the Baku fields. At that time crude oil from the Caucasus moved from the Caspian Sea up the Volga river to refineries situated at rail crossings that is on Saratov, Gor'kiy, and Konstantinovsky near Yaroslavt' for distribution of products by rail. Other refineries were situated at rail to sea transfer points, such as the Caspian coastal refineries of Makhachkala and the Black Sea refineries of Tuapse and Batumi, or at sea-to-rail transfer points, such as the Ukrainian refineries at Odessa and Kherson. In this phase of limited oil production, refineries were small with an average throughput capacity of less than 2 million tons.

- The situation changed dramatically as the center of crude-oil production shifted to the Volga-Urals region itself. Large refinery complexes developed at Ufa and on the Ishimbay-Salavat area of the Bashkir ASSR, in the Kuybyshev area and at Perm. Of the major producing areas in the Volga-Urals, only the Tartar ASSR had no refinery of its own. But as crude-oil production continued to rise, it found more efficiency in building additional refineries in market areas and to develop pipeline system capable of handling

[9] Summary of World Broadcast, December 1982.

the growing flow of oil from producing field to refinery. With the Volga-Urals region as the focus the pipeline system evolved in three basic direction:

- Eastward into Siberia,, where refineries had gone into operation at Omsk in 1955, and at Angarsk near Irkutsk in 1960. The first crude oil pipeline a 20-inch line 827 miles long, from the Volga Urals to Omsk was completed in 1955. A second Trans-Siberian pipeline, of 28 inch diameter and 2,287 miles long, reached Omsk in 1960 and Angarsk in 1969.[10]
- Westward to Eastern Europe, with the D'ruzhba (Friendship) pipeline system carrying Volga-Urals oil to new refineries at Plock (Poland), Schwedt (East Germany), Bratislava (Czechoslovakia) and Szazhalombatta (Hungary). The first string of the system, with 48 inch pipe, was added in mid 1970's. In addition to export functions, the Druzhba system also played an important role in serving domestic refineries. A southern branch, starting at Michurinsk, reached the Ukrainian refinery of Kremen Chug in 1974.[11] A northern branch started in Urecha, reached the Belorussian refinery at Novopolotsk on 1965, and was extended in 1968 to the Baltic oil-export terminal of Ventspils in Latvia. This northern would also supply crude oil to a refinery to be completed in 1980 at Mazeikai in Lithuania. A 275 mile segment from Novopolotsk to Mazeikai was laid by Polish workers from 1975 to 1977, but the refineries itself had suffered delays.
- Northwestward to a cluster of market-oriented refineries in Central and Northwest Russia. They included Gor'kiy refinery at Kstovo (1958);

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10 Soviet Geography, September 1977, p.212.

11 Dienes Leslie and Shabad, Theodore, Soviet Energy System, p.64.

Ryazan' (1960); and a refinery that went on stream in 1966 at Kirishi near Leningrad.

The new market oriented refineries helped raise the apparent throughput of crude oil from about 130 million tons in 1960 to 290 million in 1970 with a view to maximizing the output of residual fuel oil. This fuel oil emphasis was particularly strong in the Volga Valley, the Caucasus and in some parts of the European USSR west of the Volga River, where an increasing large share of thermal power was generated by oil-burning plants.

In Siberia, fuel oil played a less important role as a power station fuel. Virgin Lands offered a market for diesel fuel, the fuel-oil emphasis in refinery processes was less pronounced, and a greater effort was made to derive more light distillates like gasoline and diesel fuel from crude oil. Despite these efforts to ensure a regional differentiation of the refinery mix in accordance with the market, the Soviet oil-refining industry in general was not designed to maximise the output of light factions. Because of the low level of private passenger car ownership in USSR, gasoline represented a far smaller component of the refinery mix than that in the United States. Refinery completions moreover failed to keep in step with the rapid growth of crude oil production, giving rise to a growing exportable surplus of crude oil. Crude-oil exports nearly quadrupled in the 1960's, from 16.6 million tons in 1960 to 63 million in 1970 as the gap between crude oil production and refinery capacity widened. This trend became further accentuated in the 1970's as the growing volume of West Siberian production came on line and exports were further stimulated after 1973 by the rise in world prices. Growth in refining capacity was achieved mainly by expanding existing

centres, and the completion of new refining centers logged despite an avowed aim of further decentralizing the refinery industry and bringing it closer to markets. Of the seven new refineries scheduled to be opened during the Ninth Fifth-Five Year Plan (1971-1975), including four in the Asian USSR, only the Western Mozy'r refinery, on the Druzhba pipeline system in Belorussia, came on line, in 1975. In the Tenth Five-Year Plan (1976-1980) the second largest Ukrainian refinery, opened in Lisichansk in 1976, and in 1978 the long-planned Pavoldar refinery opened in northeast Kazakhstan. The onrush of West Siberian oil required further expansion of the pipeline. In the early phase of West Siberian development, production was accommodated by the first 40 inch line, laid in 1967 from the producing fields to the Omsk refinery and by the reversal of oil transmission in 1970 in the old Trans-Siberian pipeline system. But the growth of Siberian oil output placed increasing demand on the provision of additional outputs. One of its pipelines moved southward into Kazakhstan and Central Asia. A 32 inch line designed to handle a flow of 25 million tons a year was completed from Omsk to Pavlodar, covering a distance of 238 miles in 1977. It fed West Siberian Crude oil to the first 6 million ton unit that went on stream in 1978 at the Pavlodar refinery.[12]

Opening up an entirely new flow line for West Siberian oil, the pipeline was to be extended to refineries under the construction and Neftezavodsk. A spur off at Chardara near Chimkent ran Southeastward to an existing refinery at Fergana in the Uzbek SSR. The Fergana refinery had started receiving West Siberian oil by rail.[13]

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12 Soviet Geography, October 1978, pp.583-584.

13 Leslies Dienes and Shabad, Theodore, The Soviet Energy System, pp.69.

Reflecting the overall status of the Soviet oil industry, no major new crude oil pipelines were constructed. The construction of the 600-kilometer branch line off the Omsk-Pavlodar-Chimkent-Neftezavodsk pipeline to the Fergana valley was underway in 1989. In 1989 only 284 kilometers of trunk oil pipelines were commissioned .[14] However, construction was planned to begin in 1990, on the Tengiz-Shevchenko ethane pipeline. The pipeline scheduled to be completed in 1992 was constructed to deliver ethane from Tengiz gas processing plant to the large polystrene plant at Shevchenko; the Shevchenko plant had long been operating well below the designed capacity because of the shortage of ethane to run its ethylene unit.[15]

TABLE 5
CUMULATIVE GROWTH OF MAJOR PIPELINES IN USSR AND UNITED STATES
(LENGTH IN KM.)

Year	USSR	United States
1950	2,273	176,000
1955	4,279	229,300
1960	16,494	292,500
1965	36,908	360,000
1970	60,334	428,000
1975 (Planned)	100,000	465,600

Source: *Statistical Abstract of the United States*, 1971, Washington 1971, p.504.

The long distance over which Soviet gas supplies had to be transported necessitated the installation of large numbers of compressor stations in order to maintain the pressure required for designed throughput volumes. The Soviet authorities realised that enormous pipeline distribution systems would have to be set up and it was planned that pipes of 2.5 meters in diameter capable of moving

14 Matthew Sagers, Soviet Geography, 1989.
15 Soviet Geography, May 1983, p.404, March 1980, pp.190-191.

en 80 and 100 billion cubic meters of gas[16] per year would be used. The largest pipeline in the late 70's were only 1.42 meters in diameter. The main constraint in production was the inadequacy of the distribution system, although fields in Siberia and Central Asia were ready for production. The failure to construct adequate pipelines for transportation meant that natural gas had not been able gain importance in the fuel-energy balance of the Soviet Union.

Given the regional distribution of gas reserves, their utilisation required a large expenditure for the creation of a pipeline network The gas industry constituted a system of three intimately related parts - the production sector of the industry, the transmission system, and the facilities for the utilization of gas. The rate at which natural gas output grew was more or less regulated by the possibilities of co-ordinated growth in these two 'downstream facilities.' In interpreting the growth of Soviet gas output, progress in building the pipeline network is as important as success in developing reserves.

The principle elements in the Soviet pipeline system as it had been projected through 1970, is shown in the figure below.

In comparison to USA, USSR had a higher percentage of gas pipelines with large diameter pipes. In 1970 less than 30% of transmission pipelines in United States was above 500mm in diameter as compared to 70% in the USSR. In Soviet Union the mileage of the distribution network was less than transmission network because gas was used by large consumers such as power stations and industrial plants, and only a small proportion was used for domestic consumption.[17]

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16 Russel, Jeremy, Energy as a factor of Soviet Foreign Policy, p.67.

17 Statistical Abstract of United States,1971, Washington,p.504.

The network of major pipelines consisted of the following systems of pipelines:

- In the Central System, the gas from the Stavropol and Krasnodar field was transmitted to the industries of the Centre via Rostov, Tanganrog and Amvrosievka to Donetsk. From the centre it moved to the north west by the Serpukhov-Leningrad pipeline.
- In the East Ukrainian System, the gas pipeline stretched from the fields at Shebelinka via Kharkov, Belgorod and Bryansk to Moscow, via Poltava to Kiev to Odessa. The Shebelinka-Ostrogozhsk pipeline connected this system to the Central System.
- In the western system, gas was supplied from the West Ukrainian fields to Belorussia, Lithuania and Latvia through the Dashkova-Kiev and the Dashkova-Minsk-Riga pipelines.
- In the Central Asian system, gas from Dzharkak was transported to Bukhara, Samarkand, Tashkent, Frunze and Alma-Ata. The Central Asia Central system was actually a double pipeline from Central Asia to the centre.

There had been considerable delay in the construction of the network with annual plans consistently unfulfilled. A shortage of pipes had delayed progress, and some of the lines had gone into operation far below capacity because of the failure to get the compressor stations built on time. The Soviet pipeline network had a very high proportion of mileage in the transmission part of the network compared to that in distribution lines. In the Soviet Union the length of the city distribution network was about two-thirds that of the transmission system, whereas in the United States it was double the length of the transmission system.

This reflected the low share of household consumption in the gas utilisation pattern. The Russians had deliberately avoided building extensive distribution networks in cities in order to concentrate their investment resources, specially the available supply of steel on the long distance transmission network. Most of the major transmission lines were built with very large diameter pipes. The biggest element in the whole system was the Central Asian-Ural connection built with 40 inch pipe, and the third line in the system supplying gas from the North Caucasus to the Central Industrial Region was also a 40 inch line. It was planned to build thousand of kilometers of new gas pipeline in 1966-70 with 1.22 meter (48 inch) and 1.42 meter (52 inch) pipe.[18] The success of the Russians in getting this large pipe produced on schedule was not quite certain. There were numerous Soviet statements about the pipe size distribution of the pipeline network, though there was a great deal of inconsistency among them. The table 6 gives a comparative study of US distribution system with the Soviet distribution system.

TABLE 6
COMPARATIVE PIPE SIZE DISTRIBUTION FOR U.S. AND SOVIET GAS PIPELINE NETWORKS, JANUARY 1, 1963

Pipe Diameter (inches)	Per cent of country total
U.S.S.R.	
15 and under	25.6
16.2-20.8	26.4
28.3-40.0	48.0
United States	
10.0 and under	30.5
10.1-15.0	11.6
15.1-20.0	18.3
20.1-25.0	14.3
25.1-30.0	22.7
30.1 and over	2.7

Source: *Federal Power Commission*, Statistics of Natural Gas Company, 1962, p.19

[18] Summary of World Broadcast, British Broadcasting Publication, 1985.

The Soviet distribution was not as advanced as the U.S. distribution. In 1983, the USSR surpassed the United States to become the largest producer of natural gas in the world; it also became one of the world's largest gas exporters. However, one of the major constraints affecting the utilisation of gas domestically and for exports had been the availability of sufficient pipeline capacity to transport the gas.

PRODUCTION AND TRANSPORTATION OF NATURAL GAS

The dominant economic characteristic of natural gas in the USSR was that its cost of production was extremely low compared with other fuels. In 1960, the all-USSR cost per conventional ton of fuel was about 40 Kopecks for gas, 2.4 rubles for oil and 10 rubles for Coal.[19] In addition, since gas was more economical in utilisation than other fuels, therefore the comparative advantage of gas was even greater than indicated by relative production cost. In many cases, higher thermal efficiencies could be obtained with gas-using equipment than with equipment burning other fuels. There were also savings in associated inputs, such as handling and investment that further enhanced the advantage of gas in comparison with other fuels.

Finding costs was relatively high compared with production costs. The Russian expected finding costs to be no more than 52 Kopeck per thousand Cubic meters by 1965 in the Volga region, 41 Kopecks for the Western Ukraine, 40 Kopecks for the Eastern Ukraine, 25 Kopeck's for North Caucasus, 41 Kopecks for Central Asia. These were no doubt excessively optimistic — the exploratory drilling cost alone for A+B reserves in 1959-63 was 84 Kopecks per thousand

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19 Hodgkins, J.A., Soviet Power: Energy Resources and Potential Production, London 1961, p.62..

cubic meters.[20] Thus finding cost was nearly triple the reported production costs. But even with these costs taken into account, gas at the point of production was a very cheap energy source.

But on the other hand, natural gas was very expensive to transport. In addition, there were considerable costs of intra-city distribution. The cost of gas at point of delivery to the consumer was made up by 18% production cost, 66% transmission cost, and 16% intra-city distribution cost. With transport and distribution costs accounting for such a high a share of delivered cost decisions about how gas should be allocated by potential consuming region became important.

In Uzbekistan, gas production rose slightly in 1989. In the neighbouring Turkmenia the focus of development was the deep high Sulphur natural gas deposits located in the Southern part of the republic around Mubarek. One project that was completed was a 90 km gas pipeline from Mubarek to Kagan, which allowed gas deliveries to be stabilised to Uzbek consumers as well as those of neighbouring republics. The new pipeline had a diameter of 1020 mm.[21]

OIL AND GAS EXPORT

- Soviet Union was an active participant in the world oil market. It had attained a modest position as an exporter, and supplied equipments, technological knowledge and undertook explorations in other countries. The expansion of these activities by the Russian led to two assumptions:

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20 Soviet Geography, News notes, 1979.

21 Summary of WorldBroadcast, British Broadcasting Corporation.

- The importance of Soviet Union both as an actor in the world oil market and as an exporter.
- The extent to which Soviet Union offered underdeveloped countries an effective alternative to the international oil companies in the business of developing a domestic oil industry.

Soviet Union had a long tradition as an oil exporter. The oil industry, originally developed in Russia primarily as an export industry as oil was an important source of foreign exchange for the country. As industrialization began, the Russian needed more oil for their own use, and by the late thirties it had become a net importer of crude oil and products. Since about 1950, the rapid growth of oil output had made exports an attractive possibility. The changing disposition of Soviet oil between domestic needs and exports since 1950 is shown in Tables 7.

TABLE 7

DISPOSITION OF SOVIET OIL OUTPUT BETWEEN EXPORT AND DOMESTIC USE

Year	Crude Oil output	Exports in field equivalents[a]	Imports in field equivalents[a]	Net export	Domesti c use	Share exported
	(.....Million tons .....)					(Per cent)
1950	37.8	1.3	n.a.	n.a.	n.a.	n.a.
1955	70.8	9.3	5.3	4.0	66.8	13
1956	83.8	11.7	6.2	5.4	78.4	14
1957	98.4	15.7	5.0	10.7	87.6	16
1958	113.2	20.6	5.1	15.6	97.6	18
1959	129.6	28.9	5.2	23.7	105.9	22
1960	147.9	37.6	5.2	32.4	115.4	25
1961	166.1	46.4	4.3	42.2	123.9	28
1962	186.2	51.0	3.4	47.7	138.6	27
1963	206.1	57.7	3.4	54.3	151.8	28
1964	223.6	63.0	2.5	57.3	166.3	26
1965	242.9	71.4	2.3	69.1	173.8	28

[a] Products were first converted to a crude equivalent basis on the assumption that refinery fuel expenditure and losses were 15 per cent of the fuel refined; the sum of crude oil and products the crude equivalents was then converted to field equivalents on the basis of the assumed loss rate of 5 per cent.

Source Campbell, Robert W., *Economics of Soviet Oil and gas*, Baltimore, John Hopkins Press, 1976.

The transition from net importer to net exporter occurred some time between 1950 and 1955. Exports grew very rapidly and by 1965 and reached a level of 64.4 million tons, which meant an annual average rate of growth of 23%. Growth was fairly constant on the whole, although there were slight fluctuations from year to year and some slowing down in the sixties. The rate of increase was 10% in 1964 and 14% in 1965[22].

Export of oil both crude and product went to three main regions:

- 'Soviet bloc' which covered all the communist country's including Yugoslavia, Albania and Cuba and those in Asia.
- Western Europe.
- Rest of the world.

The share of the Western European countries had risen from 30% in 1955 to 43% in 1965. The share of the bloc nations had fallen slightly over the period from over half in the early years to about 45% in 1959-65. In 1960 Cuba was an important contributor, in 1965 it received about 4.5 million tons of oil and products from USSR[23]. Yugoslavia and Alabania were small importers. For the first time in1973 there was small net export of gas. In Tengiz, a gas collection system was installed by a Canadian company, in Astra Khan this was manufactured by French and West German company providing facilities in

22 Campbell, Robert W. , Economies of Soviet Oil and Gas, John Hopkins Press, Baltimore, p. 226.

23 Ibid,p 229.

Karachaganak to ease gas transport[24]. In 1988 Soviet gas exports reached an all time high of 88.3 billion cubic meters.[25] This was due to the completion of the new export line to Eastern Europe and the beginning of gas deliveries to new customers – gas export began to Greece Turkey, Switzerland in 1988[26]. Although annual deliveries to Switzerland was small, totaling only 200 million cubic meters, deliveries to the other countries was greater. Under the 25 year contract signed with Turkey, annual deliveries were to rise from the level of 1 billion cubic meter to 5-6 billion cubic meters.

In December 1969 a twenty year contract was with the Italian state owned oil and gas corporation, E.N.I (Ente Nazionale idrocarburi) by which the USSR was to supply Italy with 110,000 million cubic meter of natural gas[27]. The Italians built a pipeline across Austria to meet 'Brastlvo', at the Australian, Czech border.

Various new policies and technical innovations were introduced to improve the efficiency of the gas supply. The separate gas pipeline systems were being joined into a single national grid and with a centralized automated control. New ways of constructing pipelines under difficult conditions were being initiated after testing in a scientific research institutes of the gas ministry. In the trackless was of the Far North and in the deserts of Central Asia it has been necessary to supply pipeline construction sites with pipes and other equipment by helicopter and airplane.

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24 Petroleum Economist, December 1987, p.441.
25 Plan Econ Report, Vol.5, No.4, January 27 1989, p. 2.
26 Summary of World Broadcast, British Broadcasting Corporation, February 3 1989, p. 2.
27 Ibid, p.4.

TABLE 8

GEOGRAPHIC DISTRIBUTION OF SOVIET ON EXPORTS.[A]

Product and destination	1955	1956	1957	1958	1959	1560	1961	1962	1963	1964	1965
World total	8,0065	10,066	13,681	18,138	25,372	33,218	41,218	45,364	51,382	56,621	64,419
Products	.090	6,170	7,758	9,045	12,887	15,393	17,830	19,104	21,139	19,930	20,987
Crude	2,916	3,897	5,923	9,093	12,485	17,825	23,388	26,279	30,243	36,619	43,432
Bloc, total[b]	4,198	5,476	7,800	9,278	11,256	15,200	18,450	21,612	22,987	25,295	28,926
Products	1,962	2,553	3,198	3,967	4,891	6,367	8,346	8,938	8,185	7,435	6,486
Crude	2,236	2,923	4,602	5,311	6,365	8,832	10,104	12,674	14,802	17,855	22,440
Asia, incl. China	1,781	1,977	2,104	2,844	3,485	3,373	3,487	3,479	2,129	1,243	752
Crude	378	397	380	689	663	593	24	31	37	40	43
Products	1,403	1,579	1,723	2,156	2,822	2,780	3,463	3,448	2,091	1,204	709
Eastern Europe	2,201	3,157	5,284	2,935	7,324	9,200	10,777	13,283	15,906	18,643	22,397
Crude	1,663	2,216	3,832	4,139	5,289	6,240	7,029	8,716	10,660	13,955	18,292
Products	538	941	1,453	1,796	2,035	2,960	3,748	4,568	5,252	4,688	4,105
Western Europe	2,364	3,341	4,561	5,624	10,297	14,395	16,607	19,035	21,892	22,629	23,833
Products	2,053	2,785	3,589	3,936	5,903	7,380	7,628	9,061	10,266	9,557	9,755
Crude	311	556	973	1,687	8,398	7,015	8,978	9,974	11,626	13,072	14,078
Rest of world (as residential)	1,443	1,250	1,319	3,236	3,820	3,623	6,162	4,737	6,504	8,697	11,660
Products	1,074	831	971	1,143	2,093	1,645	1,856	1,106	2,689	2,936	4,746
Crude	369	419	348	2,094	1,727	1,977	4,306	3,631	3,815	5,762	6,914
Exports to China only	1,589	1,732	1,803	2,507	3,048	2,963	2,928	1,„856	1,408	505	38
Crude	378	397	380	672	636	568	0	0	0	0	0
Products	1,211	1,335	1,422	1,835	2,412	2,395	2,928	1,856	1,408	505	38
Residual fuel oil, total	889	1,239	1,697	1,921	3,447	5,343	6,097	6,952	8,576	9,056	9,710
Bloc	16	47	118	148	238	732	1,393	1,515	1,779	2,481	2,524
Eastern Europe	7	39	115	139	221	332	539	1,069	1,351	1,471	1,351
Western Europe	873	1,193	1,578	1,773	3,208	4,611	4,704	5,437	5,894	5,622	5,796
Diesel fuel, total	1,257	1,866	2,464	2,623	3,398	3,897	4,511	5,410	7,488	6,581	7,361
Bloc	503	802	1,058	1,297	1,512	1,874	2,392	2,452	2,377	1,905	1,754
Eastern Europe	245	351	596	545	799	918	1,225	1,577	1,639	1,241	1,243
Western Europe	754	1,064	1,406	1,325	1,886	2,024	2,199	2,958	3,456	3,235	3,083

[a] The figures in this table represent actual exports and so differ from those in Table 43, where actual exports were adjusted to a field-equivalent basis.

[b] Exports to Cuba, Albania, and Yugoslavia are included in the Bloc total only, and not in the regional figures.

Source: *Soviet Foreign trade handbooks.*

Crude oil had traditionally dominated the fuel export pattern, but natural gas was far cheaper to produce, which meant that it was profitable from the export point of view, even after its transportation cost was taken into account. Therefore the Russians felt that the increase in gas sales would cover the decline in oil exports which had effected the Soviet industry and would help in the increase of

the total fuel export. The USSR was the only Comecon member, apart from Romania, to produce large quantities of oil, it exported oil to these countries in exchange for industrial products. It had a political as well as economic obligation to supply to the rest of Comecon and sell its oil at prices lower than the world market price. Under the 'Bucharest Formula' prices amounted to the average of the world market price for the previous five years and this meant that in 1980 Comecon countries paid only 60% of the world price of oil bought under annual contracts from USSR. The aim of the Bucharest formula was to soften the impact of world price rise on the economies of Comecon countries. Therefore oil prices rose regularly but gradually, their level for several years in advance got estimated by Comecon planners, and was lower than the world prices.

The Eastern European countries preferred Soviet to OPEC oil because its supply was less subject to political upheavels and war. While the Soviet strategy, on the other hand, was to encourage them to look elsewhere for their oil, leaving more Soviet oil available for export to the West. One of the reason why Soviet Union adopted this strategy was because the continuing sales of oil to Eastern Europe resulted in Soviet trade surplus with those countries. Eastern European countries did not raise their export to bring their trade into balance. On the contrary, the deficit increased from year to year. USSR was thus forced to choose between leaving its allies to stand on their own feet, or effectively giving its oil away. In 1980, Soviet Union supplied other Socialist countries 91 million tons of crude and products, 18.24 more than 77.7 million tons in 1975.[28] Of this 8 million tons went to Eastern Europe, while the rest went to Cuba, Mongolia,Vietnam and North·Korea. The Asian countries were dependent on Soviet oil and China was its

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[28] Wilson David, The Demand for Energy in Soviet Union, Rowman and Allan Publishers, 1983,p237.

biggest customer in the late fifties and early sixties. The principal western customers of USSR were Finland, France, West Germany and Italy, Netherlands and Belgium became more important in 1979-1980, and the Russians took advantage of soaring spot prices on the Rotterdam and Antwerp markets. But after 1979, Russians faced a lot of problems with crude oil sales to the West, because of the post 1979 decline in western demand for oil.

In the middle of 1981, the Russians were badly affected by the slump in the world crude prices. The Soviet planners tried to overcome the financial consequences of declining oil sales by increasing the share of products and also upgrading its export. There had been a small decline in the volume of crude plus product sales by USSR to the OECD during 1978 to 1981, the Russians managed to maintain their market share, because of their policy of pushing products sales. North America accounted for nearly half of the OECD's total oil import, and very little oil found its way to the American market.

The All-Union Association 'Soyuzneftesport' was responsible for exporting Soviet oil. In Western Europe a number of joint oil companies had been setup in collaboration with western firms, including Suomen, Petrooli and Teboil in Finland, Nafta(B) in Britain, Nafta(It) in Italy, DFN in Denmark and Sovoil in Switzerland. At the end of 1978, Soyuzneftesport was recognised on a cost accounting basis into four specialised divisions. These were Euronafta, which coordinated the Associations efforts to sell crude oil and products to Western Europe, Internafta dealt with Eastern Europe, Vostoknafta, covered Africa, Near and Middle East , Dalnafta covers Far East and America.

Therefore it is seen that the former Soviet Union had a long tradition as an oil exporter. The oil industry originally developed primarily as an export

industry. Even after the revolution, export was one of the main motives behind the early reconstruction of the oil industry. As industrialisation began, Soviets needed more oil for their own use, and by the late thirties it had become net importer of crude oil and products. In 1950, the cheapening and rapid growth of oil output made export an attractive possibility and permitted the Russians to take the role of a supplier.

CHAPTER – IV

CHAPTER IV

SOVIET OIL AND GAS POLICY TOWARDS CENTRAL ASIA

The oil policy of any nation generally reflects the geophysical, economic and ideological condition of the country. The basic principal of the Soviet spatial policy contained a mixture of economic, political and social desiderata. They aimed at rapid industrialization as much as the economically socially and strategically more effective geographic distribution of economic activity.[1] The expansion of energy supplies was crucial to industrialisation, energy policy decisions were interwined with regional development issues from the beginning of the Soviet era.

The USSR, believed in the state ownership of means of production and a strong centralized system of resource allocation, therefore planners control over the energy sector was applied with particular force. This sector represented one of the most important 'commanding heights' of a socialist economy where market forces had never been allowed to intrude. Therefore the perception of specialists and planners concerning long-range energy prospects and the management of these crucial resources with respect to domestic needs and foreign trade revealed much about the possible cause of Soviet economic strategy. The institutional environment of the Soviet economy was overwhelmingly an administratively directed one.. In modern societies, the fuel energy industries were distinguished by huge investment requirement scale economies and long payoff periods, combined with few and restricted resources, a relatively narrow output mix and

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1 Hamilton, Ian F.E. , Spatial dimensions of Soviet Economic Decision-Making, in V.N. Bandera and Z.L. Melnyk ed, The Soviet Economy in Regional Perspective, New York, Praeger, 1973, p.237.

range of technical coefficients. This resulted in a more pervasive and considerably, more efficient application of the administrative method than was possible in most other industries. At the same time, the strategic significance of energy led to a strong degree of government involvement in the energy sector every where.

STRUCTURE

The Soviet economy was organized in a hierarchy working under the direction of a concentrated group of planning and executive bodies at the top. The overall structure the energy economy was administered mostly through several fuel and energy ministries. In 1976 the important ministries were:

- Ministry of the Coal Industry (Minugol)
- The Ministry of Oil Production (Minneft)
- The Ministry of Gas industry (Mingaz)
- The Ministry of Refining and Petrochemicals (Minneftekhim)
- The Ministry of the Construction of Gas and Oil Industry Enterprises;
- The Ministry of Geology (Mingeo)
- The Ministry of Power and Electrification (Minenergo)

Like other Soviet ministries each of these energy ministries were a very large organisation. Mingaz operated the gas pipeline system as well as gas production. Each ministry bore considerable responsibility for producing their own equipment, constructing their production facilities and handling the repair of their equipment and facilities. The major ministries also directed large research and development program and were responsible for educational enterprises that would train a large fraction of their personnel.

The conglomeration of functions, however, often differed significantly from those of corporations on the same field in the capitalist world. For example, Minneft, unlike many big oil multinational did not operate a tanker fleet, or any refineries, or distribution facilities. There was some overlap between the Ministry of Petroleum industry and Ministry of Gas Industry in the production of hydrocarbons. In 1975, the oil agency provided nearly a fifth[2] of all natural gas, while the gas agency was responsible for 1.5% of liquid hydrocarbons. Between them the two ministries were responsible for oil and gas withdrawal from Soviet reservoirs.

The Soviet oil and gas industry operated in a distinctive institutional setting which could be termed as "administratively organized economy". The Soviet economy as a whole could be thought of as an organization in which the goals and objectives were determined by the leadership, and the action of all component parts were coordinated by a system of direct orders about resource use and control mechanism emanating from the center. Soviet oil industry could be looked as being run by a single oil company in charge of all aspects of the industry from exploration through marketing. But the goal of the Soviet oil industry was not that of maximizing profits, and the industry did not have the same degree of flexibility and maneuverability in its relationship with the rest of the economy as a single firm in a market economy

The Soviet oil and gas industry did not seem greatly different from the oil industry anywhere else. At the lowest level of organization a more or less universal matrix of technology generated a system of basic production units unlike their counterparts in the United States industry. These units were a stable

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2 Dienes, Leslie and Shabad, Theodore., The Soviet Energy System, Washington, V.H. Winston 1981, p204

element, throughout the organizational evolution of the Soviet oil industry. The production unit of the Soviet economy analogous to a capitalist firm was what the Russian called the enterprise. The enterprise was distinguished by having a certain independence. Its director had sole control and responsibility for its performance, and it worked under a regime called Khozraschet, which meant that it was financially independent, did its own accounting, had its own bank account, that is met its expenditure out of its revenues. The principle Khozraschet enterprises of the Soviet oil and gas industry were:

- The exploration office
- The drilling company
- The oil field administration
- Refinery, distribution bases (neftebazy)
- Pipeline companies
- Construction companies
- Machinery plants

Another kind of basic organisational building block was the research organisation. Below the enterprise was still a fundamental building block, the tsekh or shop, but it was of little relevance. In the early years of Soviet planning the central executive authority for the industrial sector of the economy was the Supreme Council of the National Economy (VSNKH) which was operative from 1917 to 1932. The VSNKH conducted general supervision of industrial enterprises through specialized sectoral departments, known as committees or chief administrations. The original neftianoi komitet (committee on oil) under the VSNKH was later replaced by a 'chief administration for the oil industry'. On January 5, 1932, the VSNKH was abolished and replaced by several

commissionariats, and the responsible for oil was assigned to the Peoples Commissariat of Heavy Industry (NKTP). The NKTP originally contained a chief administration for the fuel industry (Glavtop), but subsequently two separate chief administrations were established. Glavneft for the oil industry and Glavgaz for the gas and synthetic liqued fuel industry. On January 2, 1989, the NKTP was subdivided into a number of more specialized commissariats one of which was people's commissariat of the fuel industry. The commissariat had a very short existence and was succeeded on October 12, 1939, by still more specialized agencies. One of these was the people's commissariat of the oil industry; on March 15, 1946 the term People's Commissariat was dropped and the organizations were renamed ministries.

The ministry of the oil industry was split into two separate ministries in April 4, 1946. One was for the southern and western regions and one for the eastern regions. This division was prompted by a need handle two entirely different situations. What was required in the south and the west was above all to restore oil production to the prewar levels and then develop it further. In the east where during the pre-war huge possibilities for the further increase in the volume of production had been revealed, it was necessary to master the deep oil-bearing formations in Devonian rocks, to construct new and expand existing refineries, and to develop production and refining rapidly.

The two ministries were reconsolidated on December 28, 1948. The resulting ministry of the oil industry then continued in existence until the reorganization of 1957 and attempts were made towards specialisation. In 1954, a special Ministry for the Construction of Enterprises of the Oil industry was formed by transfering existing units from the oil ministry, and in 1956,

responsibility for the development of the gas industry was given to a chief administration attached directly to the Council of Ministries of the USSR. The purpose of both these separations was to provide a new locus of authority and responsibility devoted to the problems of refinery and pipelines construction, and to the development of the gas industry. Before the reorganization in 1957, the Khozraschet enterprise, in charge of production was linked to the Ministry through two intermediate bodies, a combine representing a territorial agglomeration, and above the combine, a production administration. For refining and exploration however, the Khozraschet organizations at the bottom of the hierarchy were linked to the ministry through the production administration above.

In 1957 the administrative structure for Soviet industry was shifted from the branch principle to the terrritorial principal. The central machinery for the administration of the oil industry was in a state of flux ever since, creating new organs and abolishing old ones, redefining responsibilities and changing high – level personnel.

Under the territorial system, the production planning and supervising role of the ministry was given to regional economic council called sovnarkhoz. Around 105 economic councils were formed in the USSR coinciding with either Oblasti or Union Republics. Since production and refining of oil and gas were relatively localised only a few economic council had petroleum producing and refining organizations under their control. In the Kazakh SSR, for instance there was a chief administration for the coal and oil industry and under it a combine responsible for the production and refining of petroleum in the Republic.

The number of regional economic councils was reduced from 105-147. The economic councils had limited jurisdiction and obviously could not conduct industry-wide planning and supervision. These functions were assigned to other central organs. The Soviet policy in Central Asia was aimed at economic extraction, creation and fostering of long term dependency. The Central Asian Economy was an integrated part of the over all Soviet system supplying raw materials for processing in the industrial centres of European and Western Siberia.

OIL AND GAS SECTOR IN CENTRAL ASIA, GROWTH AND PERFORMANCE: 1976-1990

A study of the plans will provide a detailed account of the Soviet oil and gas policy in Central Asia.

In the field of energy, a new fuel policy with greater emphasis on coal, hydroelectric power and nuclear power for electricity generation had begun with a view of economising scarcer oil resources, using them to a greater extent as a petrochemical feedstock for export.

Like the earlier years, the share of oil and natural gas in fuel consumption continued to grow, but the planners felt that the rate of growth of oil production would be reduced in comparison with gas in an effort to conserve oil resources. The production of oil was expected to rise by 30% or at the average rate of growth of all fossil fuels, while natural gas was scheduled to increase by 50% in 1976. As a result of these modifications in fuel growth rates, the rate of growth of oil in Soviet fuel production was slowed, the growth of natural gas was expected to get accelerated and the decline of coal was slowed (Table 1)

Table 1 : Soviet Fuel Production
(In percent)

	Oil	Gas	Coal	Other
1950	17.4	2.3	66.1	1
1955	21.2	2.4	64.8	12.7
1960	30.5	7.9	53.9	7.7
1965	35.8	15.5	42.7	5.0
1970	41.1	19.1	35.4	4.4
1975	44.1	21.8	30.8	3.3
1980 plan	45.5	25.5	27.0	2

Note : "Other" fuels, whose relative significance has been declining over the years, include peat, oil share and wood.
Source: Soviet Geography

The fuel production pattern in the Soviet Union, with an accelerated growth of hydrocarbons compared with coal, had been similar to the one in the United States, except that the Soviet trends had lagged about two decades behind American developments. For example the oil share surpassed the coal share in United States in 1950 and in the Soviet Union in the late 1960s, the gas share surpassed the coal share in the United States in the late 1950s, and was expected to approach the coal share in Soviet Union, by 1980. In both the countries a new fuel policy sought to slow the rate of growth of hydrocarbon consumption and to give greater emphasis to more underspread coal resources.

In Turkmenia, the leading oil producer in Soviet Central Asia, the future production was bleak. The output peaked at 16.2 million tons in 1973, the 1975 level-at-15.6 million was far short of the 22-million ton goal originally envisaged under the last Five Year Plan.

In the mid-seventies natural gas was slated for the highest rate of growth. Because of the more northerly location of the Siberian gas fields, compared with the oil district, development was relatively slow. Pending the shift of production

to West Siberia, an increasing role had been played by the gas development in the Central Asian desert. Early production in western Uzbekistan reached a plateau at 36 to 37 billion cubic meters a year, and was supreceded by larger fields in adjoining eastern Turkmenia, especially the Shatlyk field, West of Mary Shatlyk. The Central Asian fields were producing about 30 percent of the Soviet total, with most of the output being delivered to the European USSR through a much strong pipeline system. In a marked departure from statistical policy, several significant oil producing republic of the USSR ceased publishing oil output statistics in 1977, apparently reflecting reluctance to publicise a decline of production, they included Kazakhstan and Azerbaijan. The only republic with the declining output was the Ukraine, where production peaked in 1976 at 14.5 million tons, it dropped to 10.5 million in 1977 as seen in table 2.

Table 2: Geographical Distribution of Soviet Oil Production
(In billion cubic meters)

				1978		1980
	1965	1970	1975	1977	Plan	plan
USSR	243	353	491	546	575	640
RSFR	200	285	411	478	511	554
Europe	144	277	221	221	(218)	(200)
Urals	12	24	40	(42)	(43)	(45)
Perm Obl.	9.7	16	22	(22)	-	-
Orenburg Obl.	2.6	704	14	(14)	-	-
Udmurt ASSR	-	0.48	3,7	5	-	-
Ukraine	7.6	13.9	12.8	10.5	(9)	8.6
Belorussia	0.04	4.2	7.95	(5)	-	-
Azerbaydzham	2.15	20.2	17.2	(14)	15.6	19.7
Georgia	0.03	0.02	17.2	(1.4)		3.0
Kazakhstan	2.02	13.2	23.9	(22)		26.9
Turkmenia	9.6	14.5	15.6	(14)		
Uzbekistan	1.8	1.8	1.4	(1.2)		
Tadzhikistan	0.05	0.18	0.27	0.34		(0.4)
Kirghizia	0.31	0.30	0.23	(0.2)		

* Oil production, figures includes natural gas liquids. The NGL component rose from 1.2 million tons in 1965 to 4.2 in 1970 and 9.0 in 1975. Natural gas liquids are a particularly large component in Komi ASSR, which produced 2 million tons in 1970 and 4 million in 1975.
** Almost all west Siberian output originates in Tyumen' Oblast, except about 5 million tons a year in adjoining Tomsk Oblast.
( ) Figures in parentheses are estimated.

Source: Shabad Theodore, *Newsnotes*, Soviet Geography, Vol.19,1979, p.274.

The West Siberian oil flowed into Ukraine through a pipeline which was completed in 1977 from Kuybyshev to the refinery at Lisichansk in the Donets basin. Another major pipeline route from the West Siberian fields was to be constructed southwards to Pavlodar and Chimkent where refineries were under development with ultimate extentions to Neftezavodsk near Chardzhou in Turkmenia and to Fergana in Uzbekistan. The new statistical restrictions on the publication of hydrocarbon production data extended to natural gas as well, republics outside the RSFSR suppressed gas output figures for 1977. Earlier it was limited to Azerbaijan and Kazakhstan. But soon it covered Uzbekistan and Turkmenia.

The major natural gas producing region was the Central Asian republic of Turkmenia, its production had increased from 62.6 billion cubic meters to about 69 billion cubic meters.[3] About 85% of Turkmen production originated on the eastern part of the republic, where the giant Shatlyk field west of Mary, accounted for more than one-half of Turkmen output. The western fields around Okarem, produced about 9 billion cubic meter.

The Soviet Union maintained an annual increment in oil production of 26 million tons in 1978. Although several refineries were under construction in the Soviet Union to handle the incremental production of the West Siberian fields, competitions had been slowed. The Pavlodar refinery of northeast Kazakhstan, which had figured in Soviet plans in the fifties and sixties went on stream in 1978. This Pavlodar refinery was only the third Soviet Asian field receiving crude oil directly from the West Siberian fields, the two others were Omsk and Angarsk.

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3 Summary of World Broadcast, Vol.1 British Broadcasting Corporation.

The widely expected slow down in the growth of Soviet oil production was underway in 1979. The industry did not even reach the lower limit of the original Five Year Plan projections of 620-640 million tons of 1980. The revised annual plan for 1980 and the 1976-80 period plan on approaching its end was placed at 606 million ton[4].

In northwest Kazakhstan, production in the Mangyshlak field was hampered by the high paraffin content of the crude oil, causing output to slide to 14 million tons in 1979. This part of Kazakhstan production was augmented by 4-5 million tons from Gury'ev Oblast[5] to the north where increasing amount of oil were being obtained from new fields west of the Ural river. Despite efforts to arrest declines in the Baku district of Azerbaijan and the west Turkmenistan field both on the Caspian Sea, production continued to slip.

In contrast to petroleum natural gas production ran close to the plan, with the original Five Year Plan goal for 1980 at 435 billion cubic meters .

In Central Asia, efforts were made to use high sulfur gas fields of the Uzbek SSR, by building additional desulfurisation capacity. A second sulfur recovery unit was oparating in Mubarek in 1979. In Turkmenia, plans for the recovery of oil fields gas in the Western side fell short because of general decline of oil production, but output in the eastern gas fields ran ahead of schedule.

The review of Soviet economic performance in 1982 and plans for 1983 in some of the extractive and other primary industries was based on economic reports for the USSR and its 15 major republics which was published in early 1983. The published plans for 1983 was a result of sessions of the National

4 Soviet Geography, News notes, Theodore Shabad 1980 p 241.
5 Ibid.

Supreme Soviet (legislative) and the Republic Supreme Soviet of November and December 1982. The gathering and collection of statistical data was made difficult since the mid 1970s, by the suppression of regional production data for petroleum, natural gas, coal, iron and steel as well as for foreign trade in these commodities. The data base deteriorated further in 1981 as publication of coal and crude steel production statistics ceased for the two principal producing republics, RSFSR and Ukraine. On the other hand, a third major republic, Kazakhstan resumed releasing coal figures in 1980 and even oil figures in 1982.

In Kazakhstan a pipeline had been extended to Chimket, where a refinery was under construction, with the ultimate destination the prospective refinery of Neftezavodsk, near Chardzhou in Turkmenia. The refineries under construction at Chimkent and Naftezavodsk were a part of a programme of expanding refining capacity in the Asian regions.

The intensive efforts of gas production in West Siberia overshadowed continuing development in the two Central Asian gas producing republic– Uzbekistan and Turkmenia. In Uzbekistan, the main issue was to find ways of utilizing the republic's high sulfur gas resources so as to establish gas production as non-sulfur gas reserves were getting depleted. In this connection the focus had been shifting from the declining gas resources of Gazli in Bukhara Oblast to the Sulfur containing gas resources of Kashkadarya Oblast designed to recover sulfur and natural gas liquids, in operation at Mubarek. A second gas processing center was projected for the Shurtan field near Karshi, in Uzbekistan. Shurtan yielded

low sulfur gas for direct pipeline transmission to the Syr Daria electric power Station at Shirin.[6]

In Turkmenia the focus shifted to the development of the Dauletabad - Sovietabad field.[7] In Uzbekistan, the purpose was to stabilize gas production so that the large gas transmission system in place between Central Asia and Central Russian would continue to be filled. The development of west Turkmenia gas production associated with the republics declining oil fields, was short of expectations. One of the four strings of the Central Asia–Central Russia gas transmission system originated in Western Turkmenia. The pipeline began transmission in 1975, and gas production in the western fields was planned to triple from 4.8 billion cubic meters in 1975 to around 15 billion by 1980. But development did not proceed as planned, and actual gas output in 1980 was only 7 to 8 billion.[8]

The Soviet energy situation recovered from a slowdown that began in the late 1970s, oil and natural gas liquids staged a remarkable increase and coal production rose to a new record level. Natural gas, which was the only major fuel to show a systematic growth of output, continued to increase in 1986. The increased fossil fuel consumption for power generation contrary to plans resulted in an apparent rise in domestic oil consumption, which declined since 1981. However, the upsurge in oil production made it possible not only to cover the increased domestic requirements, but to raise oil exports considerably, (in physical

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6 Soviet Geography, June 1980, pp.400-401, November 1981, pp.619-621.
7 Soviet Geography, March 1983, pp.262-263.
8 Dienes Leslie, Newsnotes, Soviet Geography

terms), although the drop of the world oil price resulted in a sharp decline of export revenue from outside the Soviet bloc, by as much as 30 %.

Because of the improvement in the production of both oil and coal the aggregate output of fossil fuels accelerated substantially in 1986 with the annual increment about double that of the past years.

Outside the RSFSR the other union republics extending from Belorussia, the Ukraine and Transcaucasia into Central Asia and Kazakhstan, oil output was fairly stagnant at around 55 million tons during the 1980s. However, an upsurge was scheduled for the North Caspian basin in Northwest Kazakhstan with the focus on the Tengiz oil fields, about 100 km southeast of Kul'sary in salt flats on the edge of the Caspian sea. Great expectations surrounded the Tengiz fields even though the reservoir rock were at great depths. The field was discovered in late 1979, but development was delayed. When the first well, no.37 caught fire in June 1985 the fire was extinguished in July 1986, after 400 days.[9]

In the Twelfth Five-Year Plan (1986-1990), the crude oil component of petroleum output was supplimented by natural gas liquid from the gas condensate field of Karachaganak, a Kazakh extension of the Orenburg gas field. The Karachaganak field which had its development town site at Aksay north of the Tengiz oil field at the opposite edge of the North Caspian basin. The field discovered in 1979 yielded natural gas condensate in late 1984, with about 2 billion cubic meters of gas and 1.4 million tons of condensate recovery was fulfilled, and the 1990 plan had been set at 11 billion cubic meters of gas and 8.3 million tons of condensate.[10]

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9 Shabad, Theodore and Matthew Sagers J, Newsnotes Soviet Geography, 1986, p.264.

10 Pravda, September 28,1986

The development of both Tengiz and Karachaganak was thus projected as raising hydrocarbon productions in Kazakhstan from 22.8 million tons in 1985 to 39.1 million tons in 1990.[11]

The Soviet energy sector turned in a some what mixed performance in 1988. Plan targets for the three main fossil fuels (oil, gas and coal) were nominally overfulfilled but oil output (including natural gas liquids) did not increase, it leveled off at 624 million tons. This was disappointing because, oil output was officially 4.9 million tons above the "plan" (of 619 million tons). Aside from oil, the picture appeared to be good – natural gas continued to rise, finishing the year 18 billion cubic meters over plan.[12] After registering impressive increase in 1986 and 1987, oil production, including gas condensate, leveled off in 1988, remaining at 624 million tons (it actually rose very slightly from 624.2 to 624.3 million tons – from an average of 12.48 to 12.49 million barrels a day).[13] Although the plan was officially overfulfilled by 4.9 million tons or 4 million tons in excess of the 'state order' production was expected to exceed 1987's total rise by atleast 626 million tons[14].

Production in Kazakhstan rose by 1 million tons in 1988, and the republic finished the year with 600,000 tons above plan.[15] Output had been slowly rising in Kazakhstan since 1980 with development of the North Caspian field.

The Soviet energy sector was battered in 1989 by a variety of problems, Soviet oil production including gas condensate declined. Centralising investment in the oil industry was apparently reduced by 5 percent in 1989, resulting in

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11 Soviet Geography, 1986, p.264.

12 Sagers, Matthew J., Newsnotes, Soviet Geography 1988,pp.307-308.

13 Ibid.

14 Summary of World Broadcasts, SWB, February 3, 1989, p.9

15 Pravda, January 29 1989.

widespread shortages of equipment and other supplies, and the slowing of capital repair programs. 70 percent of the production was accounted by Kazakhstan and Azerbaijan. In Kazakhstan the production declined. Although the production association at Tengiz (Tengizneftegaz) was established in 1985, by 1988 it had not produced any commercial oil. 70 percent of Kazakhstan oil was produced in Gur'yev Oblast which contained the Tengiz field. Tengiz's first commercial output had initially been expected in 1988, but it failed to occur and got delayed to 1989.[16] A variety of problems were encountered in attempting to bring Tengiz on stream. Soviet experts had described this field as being "one of the most complex and difficult to produce in the entire USSR.[17] The fields reservoir rock with fissured limestone's was not very deep causing drilling problems. Therefore, it was not surprising that a preliminary accord was assigned in 1989 with Parker Drilling Company, a U.S. oil field service firm to sink a deep well at US Tengiz. Other development problems were posed by abnormally high reservoir pressure as well as the high sulfur and condensate content of oil and associated gas. Soviet oil-men doubted their domestic equipment and technology for the North Caspian fields. Various other problems were encountered in creating an infrastructural base to support the fields development. The field was located in barren salt flats on the edge of the Caspian, and major efforts were required to supply the new base town of Kul'sany, with such bases as drinking water and electricity.

Another problems that slowed the development of Tengiz was Hungary's re-evaluation of its participation in the project. Hungarian workers had been constructing the first two of Tengiz's production lines installing equipment supplied by western firms (Lurgi, Litvin and Lavalin), each of these units

16 Soviet Geography, April 1989, p.314.
17 Soviet Geography, April 1988, pp.431.

designed to extract sulfur from 3 million tons of oil per year. At the peak, there were as many as 5,3000 Hungarian workers at Tengiz.[18] Hungary's concern was that for its participation in Tengiz, it should receive Soviet natural gas, but calculations indicated that the extra gas it would receive as compensation, would infact be double the price for regular deliveries. Despite these shortcoming, the Hungarians did begin work on the second line of the Tengiz gas processing plant in 1990.

Partly because of the difficulties in bringing Tengiz into production its further exploration and development was turned over to the Chevron Corporation in an agreement signed on June 2, 1990 in Washington D.C.[19] Earlier Chervon had been given the rights to the neighboring Korolevskoye fields.[20] Another factor in the new deal was that the Korolevskoye field was turning out to be too small for Chevron to develop without Tengiz.

One key development in the republic was that the new Kumkol' field yielded its first commercial oil at the end of 1989. It was expected to produce 300,000 tons for the year, but this did not happen mainly because of delays in infrastructure development. The Kumkol' field located 250 kms Southwest or Kyzl-Orda Oblast, 250 km southwest of Kyzl-Orda, was discovered in 1984 and began to be developed in 1987.[21] It produced a light oil, low in tar and high in light fractions. Unlike other fields in the Caspian depression, its oil contained few corrosive element like hydrogen sulfide. Kumkol oil was being fed into the Pavlodar–Chimkent oil pipeline.

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18 Summary of the World Broadcast, July 21, 1989 pp.2-3.
19 Washington Post, June 3 1999, p. 26

20 Soviet Geography, March 1989, pp.253-254.
21 Soviet Geography, April 1988, p. 431.

A major exploration effort was mounted to survey the resources of the North Caspian area. Because of the depth of most of the hydrocarbons one of the key projects in the effort was the drilling of a very deep borehole, planned to reach 8,500 meters, to determine the areas' deep geological structure. In 1989, the exploration effort yielded 112 new fields in Kazakhstan of which 73 were oil fields, 24 were gas condensate fields, 15 were a combination oil condensate fields, total reserves of these fields were estimated as 2.5 billion tons.

In Uzbekistan oil production rose by 200,000 tons, and not only fulfilled the 1989 plan target but was 8 percent over plan[22]. The major factor for this was the ongoing development of the new producing areas in the Karshi steppe directly contributed in putting Uzbekistan ahead of the plan target. Another field reporting good performance in 1989 was Dzharkurgan; its growth in labour productivity was higher than expected and expenditures on materials and electric power lower, causing production to be much less than expected.

Another new field that was opened in 1989 was Kokdumlok. Located in Karshi steppe in the southern part of the Kyzl Kum desert, Kokdumlok was described as one of the largest fields ever discovered in Uzbekistan and Turkmenia, with reserves estimated at 100 million tons. The deposit was rich in associated gas and condensate. The Kokdumlok field was discovered in 1985, but was not brought into commercial production unit until 1989. The field was expected to increase annual oil production in Uzbekistan to 3.0 – 3.5 million tons.[23]

Given the ample resource base and the strong performance of the Soviet gas industry, the cutback in the plan target and resulting relatively low rate of growth

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22 Summary of World Broadcast, January 5, 1990, p.8

23 Summary of World Broadcast, December 1, 1989, November 17, 1989, p.3

was surprising. Also, with the problem in the oil and coal sectors in 1989, it was expected that gas production would show greater increase to help offset the unplanned decline of oil and coal output.

One factors for the gas industry's below average performance was the dislocation associated with the reorganization of the ministerial structure and the disruptions caused by certain other aspects of Gorbachev's reforms, but it appeared that the Soviet economy was experiencing increasing problems absorbing natural gas. During the 1980s, the Soviets were able to absorb the massive increments in gas supply by redirecting most of it into a relatively small number of very large consumers such as electric power stations, irons and steel plants, and nitrogenous fertilizer centers.[24] This was done to minimise the need for constructing an extensive network of distribution lines to serve more dispersed consumers such as the housing and municipal sector, but the lack of such a network could have proved to be a critical bottleneck.

An indicator of domestic absorption problem was that Soviet gas exports increased dramatically during 1989. They surged 17.3 percent, reaching a record level 103 billion cubic meter.[25] Compared to 87.8 percent in 1988. Soviet gas exports reportedly now accounts for 12 percent of all foreign exchange. The main customers in 1989 were still Eastern Europe, 50 billion cubic meter of gas was sold to Bulgaria. Hungary, the GDR, Poland, Romania Czechoslovakia and Yugoslavia.[26]

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24 Mathew. J Sagers, Moe Arild, Milford, Green, and Rune Cast berg "Prospects for Soviet Gas Exports: Opportunities and Constraints : Soviet Geography, vol. 29, No.10, December 1988, pp. 881-908.

25 Summary of World Broadcast, February 9, 1990, p.1.

26 Ibid.

As a part of the government reorganization the Gas ministry merged with the Oil Ministry into the Ministry of the Oil and Gas Industries. However, most of the former Gas ministry's enterprises nominally left the new combined ministry to become the USSR's first "socialist concern" known as Gazprom. This was a new kind of entity which emerged in 1989 in several industrial sectors, and it was not clear exactly how was it supposed to function. According to the former Deputy Ministry of the Gas Industry, V Budarin, the new concern was to be like one enormous enterprise, although all, enterprises and association within were independent, enjoying the operating rights specified under the law on the Socialist Enterprise.[27] However, this new 'concern' was little more than the former ministries under a different guise.

For 1990, no production targets were released in the annual plan guidelines adopted in the fall of 1989. However, Gosplan's internal control figure for expected production in 1990 was 845 billion cubic meters, and increment of 49 billion cubic meters, which was more in step with the performance during the past decade. During the first quarter of 1990 production was 3.4 percent more than for the first quarter of 1989.

There was a marked deterioration in the amount of information available on the performance of the Soviet energy industries in the 1990. Most of the union republics released only general descriptions of fuel and energy production trends, often without which the usual accompanying data table in their annual plan fulfillment reports, and several republics did not report at all. The Soviet media continued to be preoccupied with the overall deterioration of the economy, and therefore did not report in details the sectoral and regional production trends.

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[27] Ibid, September 15, 1989, p.6.

However, the situation with regard to official statistics continued to improve, with the publication of a number of data for the first time in many years, these however covered previous years rather than 1990.

There was an overall uncertainty in the process of economic reform. The conflict between the all-union government and the republic over resources and responsibilities disrupted production. Labour discipline deteriorated because money income was further debased by inflation resulting in strikes and work slow downs. Measures to raise the living standards of Soviet citizens as part of an 'emergency' economic plan was announced in August 1989 by the Gosplan Chairman Yuri-D. Maslyukov. This was a policy which authorities reversed only belatedly, in the face of mounting chaos in the major producing areas. The fuel and energy sector had absorbed an increasing share of Soviet investment in the three preceding decades. The sector broadly defined to include fuel extraction, processing, industrial investment in the 1960s, but this increased to about 35% in the early 1970s, then climbed to nearly 40% as Brezhnev's oil campaign gathered momentum in the late 1970s, and reached about 45% in the early 1980s. 1988 was a peak year for the entire sector, investments were about 40 billion rubles, or about 48% of industrial investment. In 1989, energy investment fell to about 45% of the industry total.

In 1990, it fell even more, as investment priorities were further shifted to the long neglected consumer sector, However, oil investment continued to rise peaking in 1989, followed by a significant drop in 1990.

Because of the large drop in oil output in 1990, the new Prime Minister, Vatentin Parlov announced a new 'emergency' program to shape up the ailing

industry by February 1991.[28] One of the its key measures was additional 25 billion rubles in investment to be focussed upon restoring idle wells, re-equipping already operating fields, and various social measures to improving living conditions in the oil fields.

The outlook for 1991 appeared to be rather grim. The plan target for 1991 formulated in December 1990, called for oil production to decline to only 560 million tons and the gas output to climb to 830 billion cubic meters. But the actual results in the first quarter of 1991 showed that these 'forecasts' were far too optimistic. Oil production declined by 9.0%, gas output was flat, although it had actually declined slightly in January as Soviet gas consumption dipped.

The first thousand tons of oil was produced from the Tengiz field in April 1991,[29] following about 2 billion rubles in investment on the Soviet side. Chevron was expected to invest another $10 billion in the field.[30]

Production from the big field ran years behind schedule because of a number of problems. Its further exploration and development was turned over to the Chevron Corporation in an agreement signed in 1990[31] and negotiation apparently were reaching completion with regard to Chevron's participation in the huge project. Prior to the extraction of the first oil deposits the field processing, facilities had to be completed by 1991. Test distillation of highly sulfurous crude from the Prorva deposits took place at the processing facility in early 1991.[32] Earlier the Tengiz gas processing plant received natural gas from the Central Asia – Center pipeline system. One issue which held up the project was the conflict

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28 Financial Times, February 21, 1991.
29 Summary of World Broadcast, April 26, 1991, pp.6.
30 Summary of World Broadcast, March 19, 1991, p.11.
31 Summary of World Broadcast, March 19, 1991, pp.11.
32 Soviet Geography, April 1990, p.287.

between the central government and the Kazakh republic over resource ownership, as well as a similar conflict between the republican authorities and the local Oblast officials. The local Gury'ev Oblast officials complained about being excluded from the negotiations on the project, which may have been the reason for the re-establishment of Mangyshtauz Oblast by the Kazakh government.[33] To further strengthen its position, the President of Kazkhstan's Supreme Soviet adopted a resolution transferring the oil and gas deposits located in the republic to the jurisdiction of the Kazakh SSR.

Another major development in the republic was bringing in the new Kumkol field, in Kyzl-Orda Oblast.[34] After the deposit produced its first oil in late 1989, a new production unit the South Kazakhstan Association (Yuzkhazhreft) was established in Kyzl-Orda Oblast to develop the oil and gas reserves in the lower reaches of the Syr Dar'ya river, absorbing the existing Kumkol field directorate.[35] The prospecting areas for the new enterprise included Dzezhkazgan and Chimkent Oblast as well.

The crude oil component of Kazakhstan's output was supplemented by natural gas liquids from the gas condensate field of Karachaganak, in northern Uralsk, Oblast, an extension on the Orenburg gas field in the neighbouring RSFSR. The Karachaganak, field, which had its development townsite at Aksay, was about 550 km due north of the Tengiz oil field at the opposite edge of north Caspian Basin. The field, discovered in 1979 would field natural gas and condensate in late 1984, with about 2 billion cubic meters of gas and 1.4 million tons of condensate produced in 1985. By 1988, the field was producing about 3.3

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33 Soviet Geography, 1990, p.550.

34 Summary of World Broadcast, April 19, 1991, p.9.

35 Soviet Geography, April 1990, p.287.

million tons of condensate annually, by 1990, this was around 4 million tons approximately.A new gas condensate field was discovered at a depth of more than 5,000 meters north of the Caspian Sea about 80 kilometers from Ural'sk.

In Turkmenia, oil output was more or less stable, at around 5.5-6.0 million tons throughout the late 1980s. This was mostly from the fields on the Cheleken Peninsula, such as Nebit Dag and Kotur Tepe, as well as some condensate from the large gas fields oil was strict in commercial quantities in an upland area at a depth of 3400 meters at the 'Kyrk' site in central Karakum, about 60 kilometers west of Bakhardok.

The Turkmen republic with the USSR Ministry of Geology and Turkmengeologiya association had taken the unprecedented step of offering western companies the opportunity to bid on tracts of the South Caspian and Amu Darya basins to explore for oil and gas.

The Uzbekistan, oil output rose in 1990, to 2.8 million tons, which was 110,400 tons above the plan. The republic was undergoing a 'mini' oil expansion, as it had tapped a new producing area in the Karshi steppe.[36] In 1990, Dzharkurgan, one of the new fields, was 1.2 million tons above plan at mid-year, 4,000 tons more than in 1989. Much of the success was due to another new field operated by the Dzarkurgan directorate, the Mirshad field.

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36 Soviet Geography, April 1990, p.288.

Table 3: Geographical Distribution of Gas Production in the USSR (billion cubic meters)

	1970	1975	1980	1985	1986	1987	1988	1989	1990
USSR total	197.9	289.3	435.2	642.9	686.1	727.4	770.0	796.1	814.7
RSFSR (Russian Republic)	83.3	115.2	254.0	462.0	503.0	544.3	589.8	615.8	640.4
European Russian	68.3	52.9	37.6	30.3	28.5	30.1	29.3	28.7	26.4
Komi ASSR	6.9	18.5	19.4	17.9	16.9	16.1	13.6	13.0	13.0
North Caucasus	47.1	23.2	14.1	7.5	7.0	6.5	6.2	6.0	5.4
Volga	14.3	11.2	7.8	4.9	4.6	7.3	9.5	9.7	8.0
Urals	4.1	22.7	51.0	48.9	48.1	47.2	46.6	45.0	44.0
Siberia	10.9	39.6	165.4	382.8	426.4	467.0	513.7	542.1	570.0
West Siberia	9.5	38.0	160.1	375.8	419.1	464.8	510.8	539.0	567.0
Tyumen' Oblast	9.3	38.0	160.0	375.4	418.9	464.0	510.6	538.8	567.0
Tyumengazprom	9.2	35.8	148.8	350.4	390.0	430.8	475.8	503.8	540.0
Oilfield gas	.1	2.2	11.2	23.6	25.8	27.8	30.0	29.0	22.0
Other (Noril'sk)	.2	2.5	4.2	6.6.	3.4	6.2	5.1	6.0	5.0
Krasnoyarsk Kray	.2	.3	3.7	5.2	5.3	.0	.0	.0	.0
Tomsk Oblast	.0	.0	.1	.4	.2	.2	.2	.2	.2
Other Siberian	1.2	1.3	1.6	1.8	2.0	2.2	2.9	3.1	3.0
Yakutsk ASSR	.2	.5	.8	1.0	1.2	1.3	1.3	1.4	1.3
Sakhalin	1.0	.8	.8	.8	.8	.9	1.6	1.7	1.7
Outside RSFSR	114.6	174.1	181.2	180.9	183.1	183.1	18.2	180.3	174.3
Ukraine	60.9	68.7	56.7	42.9	39.7	35.6	32.4	30.8	29.0
Azerbaijan	5.5	9.9	14.0	14.1	13.6	12.5	11.9	11.1	9.0
Kazakhstan	2.1	5.2	4.3	5.5	5.8	6.3	7.1	6.7	7.1
Uzbekistan	32.1	37.2	34.8	34.6	38.6	39.8	39.9	41.1	40.8
Turkmenia	13.1	51.8	70.5	83.2	84.7	88.1	88.3	89.9	87.8
Other republics	.9	1.3	.9	.6	.7	.8	.6	.7	.6
Georgia	–	–	.3	.1	neg.	neg.	neg.	neg.	neg.
Kirghizia	.4	.3	.1	.1	.1	.1	.1	.1	.1
Tadzhikistan	.4	.4	.2	.3	.3	.3	.2	.2	.2
Belorussia	.2	.4	.3	.2	.3	.3	.2	.3	.2

– no production
neg. negligible.
Source: Sagers, Matthew J., Newsnotes, Vol 32, 1990, p.266.

Turkmenia, the second – largest producing republic after RSFSR, gas output declined slightly, from 89.9 billion cubic meters. The Turkmen government complained that the republic had not received proper economic benefit from its huge gas industry, because it was controlled by Moscow – only 1% of the industry's profit went into the republic budget and little of the gas was used in the cities and settlements. To end the dominance of the Moscow institutions that had controlled the republic, government was contemplating the establishment of an independent energy 'concern' in Turkmenia, known as

Turkmenneft Gazprom, which included the enterprises of Turkmenneft', Turkmengazprom and Turkmengeologiya.

In almost all the other republics, gas production declined, the only exception was Kazakhstan, where the output rose slightly. In Uzbekistan, the third largest producing republic, gas production fell slightly in 1990, to 40.8 billion cubic meter, after several years slight increase, associated with the development of the deeper, high sulfur, deposits in the southern plant of the republic. Despite this Uzbekistan was 0.5 billion cubic meters above the plan. Uzbekistan's Sredazgazprom association was the key performer. In September it was already ahead of schedule by 600 million cubic meters of gas 50,000 tons for oil and condensate and 50,000 for sulfur.[37]

PROBLEMS FACED BY OIL INDUSTRY

The oil industry in Soviet Union faced certain problems:

The reserves to production – ratio fell due to the inadequate rate at which major new deposits were discovered. While the volume of annual output was rising the higher categories of reserves A+B+C1 – were not added to, i.e. proved up at a fast enough rate.

There was a rapidly increasing energy deficit in the European part of the Soviet Union – the 'Center' – which accounted for over 80% of Soviet industrial productive capacity and energy consumption. This was due to stagnating or declining production in the Volga Urals, North Caucasus, and Ukrainian oil fields and it gave rise to sharply increasing logistical difficulties and costs associated

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37 Summary of World Broadcast, September 7, 1990, p8

with the greater distance from main consumption areas of the major new production areas of western Siberia and Central Asia.

There was a shortage of equipment, steel pipeline, personnel and infrastructural accessories. There was a consistent record of failure by construction, communication and machinery producing ministries to maintain supply rates adequate to keep pace with the required development rate in the oil industry.

It was increasingly difficult and costly both to maintain existing levels of production in regions which had passed their peak and to compensate for declining production in other areas, due to deficiencies in the past planning of capital investment in secondary recovery methods.

In the high potential regions the volume of exploratory drilling carved out by the ministry of geology was inadequate, and the rate at which oil deposit could be appraised and developed had, along with the volume of exploration and appraisal drilling, remained at about the same level for the last ten years. Recommendations and directives regarding exploration had been criticized in Soviet technical literature as being too vague and the choice of exploration areas and objectives for drilling was often ill founded, geophysical techniques were inadequate, particularly in the geologically more complicated areas of the country, and the accuracy and volume of seismic data was inadequate for the successful oil outlining of non-structural traps. The accuracy of well logging, and the evaluation of carbonate reservoirs and of shale and thin bedded sequences were poor, and little attention was paid to the economic aspects of oil exploration. New equipments for exploration drilling were not available.

In some parts of the country the number of wells actually in production at any one time was lower, because of a lack of well servicing crews and bad organization of operations. Pressure maintenance techniques were not efficiently employed, would take long to install. There were delays in gathering and transport system for oil and gas condensate. Inadequate support services and poor basin with specialize scientific institute received serve criticism in the North Caucasus, Lower Volga, Ukraine, Turkmenia and Uzbekistan. New system for automatic monitoring of down hole operations and pump pressures, which would allow round the clock activity, had been introduced on a small scale, and although automation of engineering and technical services had been introduced in certain areas, many others had failed to make use of developments in these fields. Alcoholism, absenteeism, a high evident rate at drilling sites, bad reservoir management, and lack of treatment plants for the removal of salt and water from the crude oil were other criticism which were frequently encountered, inadequate use was made of computers.

Another strongly critical point was the failure to construct pipeline of the requisite length and diameter in time to allow maximum benefit to be obtained from newly prepared production potential. Difficulties in the pipelines field of operations were attributed to lack of steel of the right quality, failure to deliver pipes on time, lack of piperolling equipment and sufficiently strong pipe-laying equipment, the poor quality and conditions of pipes that arrived at the construction site, delayed in lining, insulating welding the pipe, shortages of pumps and compressors, and delays in the construction of pumping station, particularly main trunk lines.

There was an awareness of the increasing costs associated with developing the more distant new discoveries, of the failure to increase reserves at a rate sufficient to keep abreast of planned increases in production, and of all the day to day shortcomings arising from the lack of equipment or of its poor quality, bad oil field management and planning serious delays in the construction of distributional and infrastructural requirements. It was a matter for some admiration that inspite of all these problems, the oil ministry managed to complete the production task allotted to it for the rest of the 1960s. It could only be assumed that the planners in the ministry itself had a truly realistic idea of what could and could not be achieve, taking into consideration all the inefficiencies and shortcomings. The ministry, had always suggested that it could have done substantially better if it had not been let down by other ministries scrapping changes in pricing methods and in general accountability, and oil industry management economic reform. Therefore it can be said that the oil policies of any country reflects to unique circumstances, the geophysical, economic and ideological this was the case with Soviet Union.

Many western pundits believed that USSR had an energy crisis. Oil reserves were said to be running out, its technology was very primitive, with a technological level 40 years behind USA, and that there was no way that it could stop a down turn in production. According to a CIA report of April 1977, this would take place during early 1980's, when Soviet oil production would peak at a maximum 600mm tons [38] before declining between 400-450 million tons in 1985. This was nothing but a complete misconception on the part of the CIA. The Soviet petroleum industry was far more advanced than the western observers perception. The quality and the capability of some of the new Soviet machines such as the

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38 Wilson David, The Demand for Energy in Soviet Union, Rowman and Allanheld Publishers, 1983

automatic welding machine for large diameter pipelines, laminar pipe and drilling rigs designed for super deep holes, were several years ahead of the Americans.

The process of technological advance, generally referred to as intensification of the economy ,was a key element of the Russian policy in 1975. Most western analysts had failed to comprehend Soviet technology advances. Some American observers believed that the Russian were unable to progress because of the lack of a profit motive and the power of an entrenched bureaucracy which prevented new ideas to develop in research institutes from reaching the serial production stage. The belief that the USSR depends on the West, mainly USA for advanced technology goes virtually unquestioned in some quarters; that is why the US government was misled into believing that its sanctions on equipment for the Siberian gas pipeline could prevent the pipeline from being built. But within a week's imposition of the sanctions alternative equipment designed and built by Russians appeared and factories were tooling for their production.

CHAPTER – V

CHAPTER V

CONCLUSION

The erstwhile Soviet Union with its varied energy resources such as coal, firewood, peat, shale, oil and gas emerged as an important economic power. Before the mid-fifties, Soviet policy emphasised coal and hydroelectric power as the primary energy resource. By the end of the fifties, however, Soviet economic planners became more aware of their large oil and gas potential and observed a shift away from coal. For years Soviet planners gave low priority to oil and natural gas as a possible answer to the expanding fuel needs while large investments were made in synthetic-liquid fuel plants, underground gasification of coal, production of artificial gas from coal and shale, none of which proved very productive. The turning point in the Soviet oil and gas policy finally came in the late fifties. It is seen that by 1974 the former Soviet Union became the world's leading producer of crude oil and ranked third in oil export, after Saudi Arabia and Iran. By 1960's there was a remarkable growth of explored gas reserves.

The importance of the Central Asian region as a potential producer of natural gas and oil emerged in 1950's, but began to translate into actual production for the Soviet market only a decade later. The main oil producing regions were Kazhakstan, Turkmenia and Uzbekistan while natural gas was available in Turkmenistan and Uzbekistan only. The role of Central Asia can best be put into perspective in the evolution of the Soviet oil and gas industry by considering it an intermediate-producing region after the early limited resources of the European USSR (North Caucasus, Ukraine) had been developed, and before the vast potential of West Siberia could be fully exploited. Central Asian production, thus became a crucial factor in the Soviet oil and gas industry in the late 1960's, contributing more than 20% for the natural gas output through the

1970's, with a maximum share of 30-31% during the middle decade. Two of the Central Asian republics involved in the production were: The Uzbek SSR, where the gas industry developed significantly in the mid 1960's and peaked a decade later at an annual output level of 36-37 billion meters. The second important region for gas production was Turkmen SSR, which came into play in the early 1970's. By the mid 1970's the Central Asia-Central Russia gas transmission had thus been completed with a potential capacity of 68 million cubic meters. The construction of the Central Asia-Central Russia system with an aggregate pipeline length of 13,750 km. represented an important factor in the spurt of Soviet pipeline construction after 1965 as more distant sources of gas began to be developed. Moreover the need for large transmission capacities prompted a shift towards pipelines of increasingly large diameters. Thus the desert region of Central Asia served as a buffer in providing a growing supply of natural gas to the Soviet economy in 1965.

This study shows that the Soviet economy operated under a highly centralized system of economic planning and administration. With a planned economy, the USSR had a more systematically conceived a vision of what it was trying to achieve in energy matters, and this policy was administered in a relatively direct and integrated way as part of an overall economic plan. The Soviet economy was organized as a hierarchical administrative system branching out under the direction of a concentrated group of planning and executive bodies at the top. The plan for fuel and energy was made in the process of developing the national economic plan, both in its five-year version as well as in the more operational annual version. The political structure of Soviet system, however, permitted the central government to raise rents arising from the oil and gas wealth of Central Asia. Thus, the energy sector in Central Asia and the Caucasus was

built as a part of the fully integrated controlled command economy for the Soviet Union. All means of energy production had to depend on a central distribution system. Interdependence among the Soviet Republics was crucial to each entity, but central control was more important to the Union as a whole. Most projects like pipelines, power plants were built in such a way as to meet plan targets. A glance at the gas and oil pipeline network in the former Soviet Union which stretched particularly from east to west, to the harbors of the Black Sea and the Baltic revealed that the Soviet Union considered the west as a suitable partner for cooperation., and the participation of the southern Soviet republics in these associations was restricted, except the republics of Russia and Siberia which had some kind of infrastructural strategic relations. These newly independent republics faced economic problems that undermined the trend that existed during the Soviet period.

The Soviet policy in Central Asia was aimed at economic extraction-creation and fostering a long-term economic dependency. In fact the former Soviet Union formed the economic block which embodied some of the Eastern European countries. The Central Asian economy was an integrated part of the overall Soviet command system, primarily supplying raw materials to the industrial centers of European and western Siberia of the Soviet Union.

The disintegration of Soviet Union forced all the newly independent states to re-examine their energy requirement and look for new sources of supply. This was the case with the Central Asian Republics of Kazakhstan, Turkmenistan, Uzbekistan, Kyrgyzstan and Tajikistan. The energy policy that was planned in Moscow, with the whole of Soviet energy balance in mind, was no longer applicable. The break-up of the former Soviet Union resulted in significant new challenges to the energy industry of the Republics. On

the one hand, the loss of secure supplies of crude and products, maintenance of pipelines and refineries as well as the almost non-existent price for oil was a blessing for some Republics. While on the other hand, the inability to look for oil directly and then decide what happens to the oil once it is discovered was a hindrance to the development of strong oil industries. In addition to this, while certain Central Asian Republics like Kazakhstan and Turkmenistan had ample hydrocarbon resources, Tajikistan had little. The potential of Uzbekistan and Kyrgyzstan was yet to be determined.

During the period of reform in the former Soviet Union that is between 1987-1991, the independence movements in Central Asia were insignificant in comparison with those of the other Republics, and at the time of break-up of the Union no leader of any Central Asian country wanted independence. The countries of Central Asia had to confront a number of problems in domestic and international affairs arising from the absence of any historical experience of independence. The maintenance of regional stability had become the major concern for the countries of Central Asia, which were vulnerable to external influence and ethnic conflicts surrounding countries such as Afghanistan, Iran and Turkey. While studying the economic situation of Central Asian countries it was seen that these countries experienced a substantial decrease in the Gross Domestic product (GDP). This could be explained by the disruption of economic relations in Commonwealth of Independent States and several aspects of Soviet policy in the region could also be taken into account. The economy was heavily dependent on certain limited industries such as cotton and natural gas. Investment in the economic and social infrastructure was far less in Central Asia than in Slavic and Baltic republics. The process of economic reform had been slow and unsuccessful though differences among the Central Asian countries were noticeable. For

example, the pace of reform toward market economy had been relatively rapid in Kyrgyzstan and Kazakhstan. In Uzbekistan and Turkmenistan it had been slow, and in Tajikistan, the economic reform had been impeded by civil war. Foreign investment had been crucial for all countries, in particular for resource-rich Kazakhstan. In Turkmenistan and Uzbekistan, it had been delayed by inadequate legal systems. However, the situation improved in some sectors as in the Kazak oil sector. It was realised that the development of the oil and gas resources was the best way to improve the economy of Kazakhstan, Turkmenistan and Uzbekistan, as all these countries have had few export commodities except cotton and mineral resources to increase hard currency revenues. From the geopolitical point of view, transportation problems had resulted in a bottleneck for international trade including energy exports, establishing new outlets from the region was of great importance.

The main natural gas exporting countries, that is Turkmenistan and Uzbekistan attempted to raise their export price as the energy price set among the Soviet republics had been far below the prices set for countries outside the CIS (Despite the price liberalisation in Russia at the beginning of 1992, domestic energy prices had been set artificially low for a period to control inflation). The chief natural gas transit countries- Ukraine, Kazakhstan, Uzbekistan and Russia had raised their transit fees, thus obstructing trade and provoking political friction, in particular between Russia and Ukraine, Turkmenistan and Ukraine and Turkmenistan and Russia.

Kazakhstan is the most sought after country by the international oil companies in Central Asia. It is the second largest oil producer among former Soviet Republics after Russia, producing over half a million barrels a day. Kazakhstan has been eager to tap its product potential of over 3 million

barrels/day.[1] Kazakhstan initiated a number of reforms in order to develop its potential, including privatization of a number of existing energy concerns. In April 1997, Kazakhstan sold a 60%. stake in the largest oil producer, Mangistaumunaigaz to Central Asia Petroleum (Indonesia) for $248 million. [2] (United State Energy Information Administration, January 1999, p.2) It transferred public stakes in its production and refining companies to oil and gas company Kazakhoil in preparation for a possible privatization.

Kazakhstan also opened its resources to development by foreign companies. International oil projects have taken the form of joint ventures and production sharing agreements. In April 1993, Chevron concluded a $20 billion joint venture (Tengizchevroil) to develop the Tengiz oil field, with 6-9 billion barrels of estimated oil reserves. Current members of the joint ventures are Chevron (45%), Kazakhoil (25%), Mobil (25%) and Luk Arco (5% joint venture between Arco and Lukoil) Tengizchevroil exports about 170,000 million barrels/day of crude oil through the Russian pipeline system by barrage and rail to the Baltic, and by ship, pipeline and rail to the Black Sea.[3]

One major issue for Kazakhstan is the development of export routes, to bring oil to the world market. Under the former Soviet Union, all of Kazakhstan's oil was exported through the Russian pipeline system. Kazakhstan still views Russia as a viable export option, and wants to expand the existing export pipelines to Russia by 1999. In addition Caspian pipeline consortium will also pass through

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1 Miyamoto Akira, Natural Gas in Central Asia, Industries, Markets of Kazakhstan, Turkmenistan and Uzbekistan, London, Royal Institute of International Affairs, 1997, p17.

2 United State Energy Information Administration, January 1999.p2

3 Oil and Gas of Kazakhstan, Market Intelligence Group, October 1996.

Russia en route to the Black Sea. Several proposed routes for Kazakh would bring oil towards markets in Asia.

Kazakhstan's largest export line is the western Kazakhstan pipeline system that transports oil from field Atyaru and Mangistau is the northern Caspian region to Russia. This 1,800-mile pipeline runs from Uzen-Atyrau-Samara, and accounts for 75% of Kazakhstan's oil exports. The other export pipeline is the Kenkyak-Orsk line that transports oil from western Kazakhstan to Russia. This pipeline runs from the Aktybinsk field to the Orsk refining in Russia, and has a Capacity of 130,000 million barrels/day.[4] Oil is imported via the Eastern Kazakhstan and Central Asia pipeline system that transports oil, 1,268 miles from Russia to Southern Kazakhstan.[5]

In 1997, an international consortium consisting of Agip (32.5% Italy), British Gas (32.5% U.K. Russia) signed a $7 - $8 billion final production sharing agreement to develop the field for 40 years, with a planned investment of $4 billion by 2006.[6]

Table 1, presents information on deliveries of crude oil, products, and natural gas in Central Asia and Other former Soviet republics.

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4 United States Energy Information Administration. January 1999, p.3.
5 Ibid,
6 Russian region: playing Handball, Russian Petroleum Investor, 1995,p.1.

TABLE 1

Central Asian Crude Oil (thousand bbl.), products[a] (thousand bbl.), and Natural Gas Deliveries (billion ft^3), 1993

Destination	Origin	Kazakhstan	Turkmenistan	Uzbekistan	Russia
Belarus'	Crude	694	--	--	90359
	Products	--	--	--	4949.4
	Gas	--	--	--	572.6
Georgia	Crude	--	--	--	1511
	Products	--	--	20.4	65.5
	Gas	--	132.1	159.2	--
Kazakhstan	Crude	--	--	--	61846[b]
	Products	--	--	72.3	18724.5
	Gas	--	217.6	47.5	41.0
Kyrgyzstan	Crude	--	--	--	--
	Products	905.2	277.4	--	3912.8
	Gas	--	--	--	--
Moldova	Crude	--	--	5022.4[b]	--
	Products	32.1	319.7	11.7	8555.6
	Gas	--	--	--	109.1
Russia	Crude	75504[b]	--	--	--
	Products	33.6	116.8	449.0	--
	Gas	121.9	110.5	49.1	--
Tajikistan		--	--	--	--
		547.5	730	--	1766.6
		--	--	--	--
Turkmenistan		409	--	--	1832
		--	--	4.4	--
		--	--	--	--
Ukraine		2190	--	--	123326
		365	1.5	--	26958.9
		--	900.0	--	1932.0
Uzbekistan		--	--	--	29375[b]
		2763.1	284.7	537.2	2399.5
		--	206.7	--	--
Other		45267.3	2766.7		580.550
		2732.3	7029.9		251,850
		--	289.8		3565.5

No known delivery or transaction. Deliveries of crude oil to Kyrgyzstan and Tajikistan from Uzbekistan in 1993 were 767 thousand and 365 thousand barrels, respectively; no deliveries of oil products or natural gas are known.

Products include automobile gasoline, diesel fuel, and furnace fuel.

Source: Statistical reports of the Russian Federation Ministry of Fuel and Electric Power.

Turkmenistan has been a net exporter of both crude oil and oil products.[7] The main oil producing area in the west of Turkmenistan, and the domestic crude oil is sent to Turkmenbashi, formerly called Krasnovodosk refinery, whose initial throughput capacity was 6 meter of crude.[8] Natural gas production had declined significantly since 1992 because domestic demand was insignificant and trade with CIS countries had been curtailed. Although Turkmenistan has a capacity of 90 billion cubic meters annually it had been compelled to reduce its production to around one-third of the peak level of 1989, because of lack of markets.[9] Production however bottomed out in 1995 and increased by 40% during the first half of 1996, compared with the period of the previous year.[10] Turkmenistan has encouraged foreign investment in the oil and gas sector and has made an effort to establish a regulatory framework for foreign investors. However the investment climate has been worse than that of Kazakhstan. Joint ventures with foreign companies such as Larmag (Netherlands) and Bridas (Argentina) were set up by a series of international tenders in the early 1990s, but the companies faced a number of problems, such as restrictions on the export of the products of joint ventures and excessive demands on their investment programmes. For example, oil exports from the Keimir oil field by Bridas's joint venture were banned by the Turkmen government in November 1995 on the ground that Bridas had not carried out reinvestment as agreed in the contract.[11] In 1996, Bridas took the matter for international arbitration. As a result, several foreign companies withdrew from the country, prompting Turkmenistan to change its stance. There has been little

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7 Post-Soviet Geography1994, p.271.

8 Eastern Bloc Energy, March1996, p23 and September 1996,p 24

9 Ministry of Oil and Gas, Turkmenistan, November1995).

10 Eastern Bloc Energy, September.1996, p.8.

11 Miyamoto Akira, Natural Gas in Central Asia; Industries, Markets of Kazakhstan, Turkmenistan and Uzbekistan, London, Royal Institute of International affairs, London, 1997,p.52.)

investment by major companies in Turkmenistan's oil and gas sector, primarily because of the poor investment climate. Therefore in order to develop its oil and gas reserves Turkmenistan has to attract foreign investment.

Table 2 gives an account of oil producing countries, located in Central Asia.

TABLE 2
Oil Industry Statistic of Russian and Central Asia (thousand barrels/day)

		Years						
Country	Category	1990	1991	1992	1993	1994[e]	1995[e]	2000
Russia								
	Production[a]	10324	9222	7916	6908	6600	6200	7150
	Demand[b]	5016	4924	4222	3450	3150	3150	3700
	Export[c]	5408	4534	3694	3500	3950	n/a	n.a.
	Import	492	478	256	254	450	n/a	n.a.
	Balance[d]	5308	4298	3694	3458	3450	3050	3950
Kazakhstan								
	Production[a]	516	532	516	460	450	600	850
	Demand[b]	n/a	410	350	280	n.a.	400	500
	Export[c]	n/a	411	350	379	n.a.	n/a	n.a.
	Import	n/a	n/a	231	160	240	n/a	n.a.
	Balance[d]	n/a	122	166	180	n.a.	200	350
Kyrgyzstan								
	Production[a]	3	3	2	2	n.a.	0	0
	Demand[b]	n/a	55	55	n/a	n.a.	50	100
	Export[c]	3	3	2	2	n.a.	0	0
	Import	n/a	55	55	12	n.a.	n/a	n.a.
	Balance[d]	n/a	-52	-53	n/a	n.a.	-50	-100
Turkmenistan								
	Production[a]	112	108	104	88	n.a.	100	250
	Demand[b]	n/a	200	130	92	n.a.	100	100
	Export[c]	n/a	0	5	31.5	n.a.	n.a.	n.a.
	Import	n/a	n/a	26	6	n.a.	n.a.	n.a.
	Balance[d]	n/a	-92	-26	-4	n.a.	0	150
Uzbekistan								
	Production[a]	56	56	66	80	n.a.	100	250
	Demand[b]	n/a	205	180	170	n.a.	200	200
	Export[c]	n/a	0	0	16.7	n.a.	n.a.	n.a.
	Import	n/a	n/a	82	87	n.a.	n.a.	n.a.
	Balance[d]	n/a	-149	-114	-90	n.a.	-190	50
Tajikistan								
	Production[a]	3	2	2	1	n.a.	0	0
	Demand[b]	n/a	50	n/a	n/a	n.a.	50	100
	Export[c]	3	2	2	1	n.a.	-0	0
	Import	n/a	48	0	0	n.a.	n.a.	n.a.
	Balance[d]	n/a	-48	n/a	0	n.a.	-50	-10

n.a. = data not available

[a] Includes crude oil and gas condensate.
[b] includes in and direct use, processing gain, losses and changes in stocks of crude oil and refined products.
[c] Export and import figures include volumes of crude oil and product to/from former Soviet republic plus all other countries.
Trade can occur via pipeline, rail and sea.
[d] Balance:Production demand = net export + inventory change.
[e] Forecasts based on projections by World Energy Analysis and Forecasting Group (GAPMER), Moscow, 1994, and estimates developed at the east west center, Honolulu, 1994. Forecasts are estimates only and designed simply to provide a possible scenario of long-term of balances in the former Soviet states. Alternative forecasts are available that may not be as optimistic in terms of rising projection and demand.

Source: *Plan Econ Energy Report* (1994).

In Uzbekistan proven reserves amounts to around1.9-2.5 trillion cubic meters[12] and around 300 million barrels of oil are estimated to exist mainly in unexplored areas of the Fergana Valley and the Ustyurt Plateau.[13] Uzbekistan is the only republic in which oil and gas production has increased since the break-up of the Soviet Union. From 1991-1996, oil production increased by the significant rate of 171%, and natural gas production increased by 17%.[14] The Uzbek government has encouraged foreign investment not only in upstream oil and gas projects but also in downstream projects such as modernisation and expansion of refining capacities, since it still imports oil products, such as gasoline and lubricants, consumption of which has been increasing steadily. Recent increase in oil and gas output have been mainly in Amu Darya Basin and the southern region of the Aral Sea, which contains gas and gas condensate rather than oil, and partly in the fields of the Fergana Basin such as Mingbulak. Thus much of the recent output growth has resulted from an increase in gas condensate production.[15] The development of gas fields in the southern Aral Sea, such as the Urga field, has enabled the country to expand its export capacity inexpensively because the main export pipelines, the Bukhara-Ural line and the CentralAsia-Centre line are located close to it. Like the government of Turkmenistan and Kazakhstan, the Uzbek government has also made effort to attract foreign investment., which has been increasing, helped by relatively large markets in Central Asia. Uzbekistan is however less attractive to foreign investors than Kazakhstan, as reflected in the total stock of foreign direct investment, which was$287 million in Uzbekistan, in

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12 Statistical review of World Energy, 1996

13 Post-Soviet Geography1994, p.271.

14 Miyamoto Akira, Natural gas in Central Asia;Industries, Markets of Kazakhstan, Turkmenistan and Uzbekistan, London, Royal Institute of International Affairs, London,1997, p54.

15 Post-Soviet Geography, 1994, p.295.

contrast to $1,831 in Kazakhstan in the beginning of 1996.[16] Foreign investment in upstream oil and gas is minimal, while in the downstream sector progress has been made in several projects, especially in the case of the Fergana refinery and a new refinery in Bukhara. However, it must be noted that, foreign investment in Uzbekistan in the oil and gas sector has a long way to go.

Kyrgyzstan imports most of its oil and gas requirements from Turkmenistan, Kazakhstan and Russia. Oil consumption is nearly 56,000 b/d and gas consumption is approximately 18 billion cubic meters per year[17]. Denver-based Grynberg production has recently won exclusive right to explore for and develop oil in the country. The condition of the existing oil fields are not known but Grynberg is commissioned to do rehabilitation work in these fields. Production is said to be 6,000 b/d at lower Moicene. But the deeper Fergana valley is said to have a better potential

The breakup of Soviet Union and the 1992 Tajik civil war have led to a setback in the economic development of Tajikistan. In comparison to the other Central Asian republics, Tajikistan is not rich in oil and natural gas resources. Tajikistan produces about 2,000 barrels of oil per day and, therefore, needs to import almost all oil and petroleum products from states of the former Soviet Union. In June 1994, Uzbekistan reduced natural gas transmission to Tajikistan by 25% for failure to pay an estimated $46 million in outstanding gas bills. The Tajik government responded by immediately reducing gas supplies to municipal consumers.

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16 Kaser, The Economics of Kazakhstan and Uzbekistan,p.43.

17 Iranian journal of international affairs, p.14.

Even before the collapse of the Soviet Union in December 1991, the foreign oil company had begun to eye the Russian federation as a prime investment target with huge natural resource base, well-educated population and desperate need for capital, investor interest grew rapidly. Outdated oil exploration and drilling equipment in Russia needed replacement and transportation improvements were considered vital. Unlike the Russian Federation, the relatively unknown and poorly understood Central Asian republics were not targeted for investment immediately after independence, with the exception of Chevron's developing invest in Kazakhstan's Tengiz and Korolevskoye field.

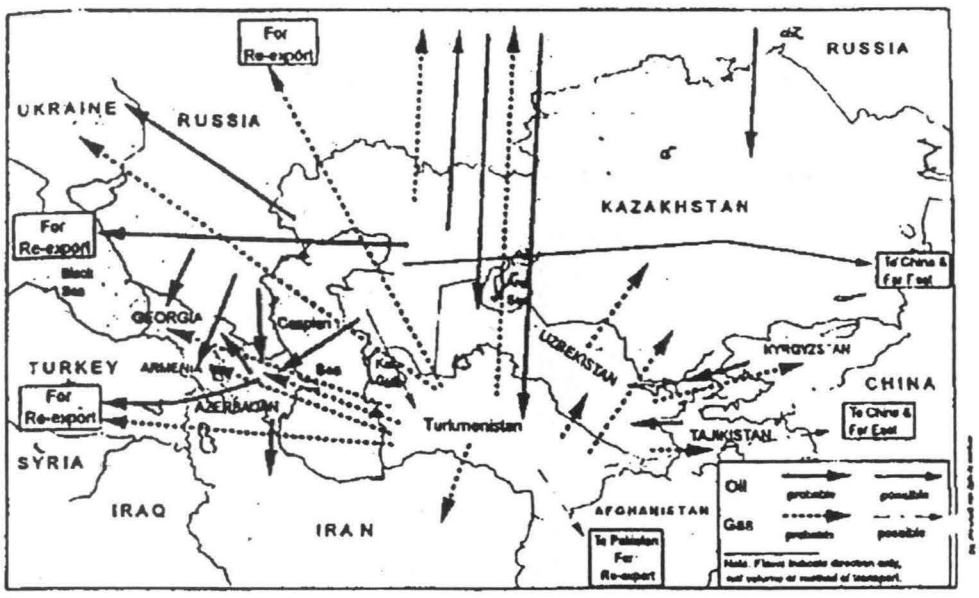

Fig. 5. Projected major crude oil and natural gas flows of Central Asia, 2010.

Source : Soviet Geography 1980.

Today, some of the investor's interests in the former Soviet Union's oil industry have reversed direction. That is, since 1992, increasing interest has been targeted at oil exploration and development activities in Central Asia. And specifically Kazakhstan, Turkmenistan and Uzbekistan. This reversal has

occurred for a number of reasons, including continued political and economic instability within the Russian government, a burdensome tax system in Russia, massive bureaucracy and growing corruption.

The map below depicts projected oil and natural gas flows in Central Asia for 2010 only major, probable and possible routes are shown.

An impressively large amount of untapped oil may exist in Central Asia's vast field, yet development prospects will remain dim until viable transport routes are established to bring crude to lucrative markets in both Europe and the Middle East. While western oil companies are eager to participate in the tremendous investment opportunities in Central Asia, a combination of economic, political cultural and historical factors currently are hindering most prospects for significant joint venture development. Turkey, Iran and China are seeking allies in Central Asia, on the one hand, whereas Russia is exerting increasing political influence on any discussions concerning new pipeline development from Kazakhstan and Azerbaijan.

What is most important is that, those who control the oil routes out of Central Asia should be able to influence all future flows (direction and quantities) as well as distribution of revenues from new production.

TABLE 3

Existing and Proposed Oil Pipeline Joint Ventures in Central Asia

Organization	Location	Description
Caspian Pipeline Consortium (Kazakhstan, Russian, Oman)	Kazakhstan-Russia (Black Sea)	Proposed rehabilitation of existing pipeline north of the Caspian to block Sea port of Novorossiysk. The rehabilitation project would cost half of the project $1.5 billion to construct a new pipeline but would carry only 15-17 m/t per year. Estimates envisage one year to complete the 750 km (470-mile) pipeline.
Caspian Pipeline Consortium	Kazakhstan – Russian (Black Sea)	Proposed 750-km pipeline from Tengiz fields through Russia to Black Sea port of Novorossiysk. The capacity of the new pipeline would be 50-55 mt/year or 1.5 mb/day at a cost of more than $ 1 billion.
Caspian pipeline Consortium	Kazakhstan-Turkey	Proposed 1,600 km pipeline north of Caspian Sea through Russia and Georgia to Turkey and the Mediterranean Sea.
Caspian pipeline Consortium	Kazakhstan – Georgia	Proposed 2,000 km pipeline from Tengiz fields through Turkmenistan across the Caspian Sea to Azerbaijan and the Black Sea Cost of Georgia.
Caspian pipeline Consortium	Kazakhstan – Iran	Proposed 800 km pipeline from Aktau fields across the Caspian Sea through Azerbaijan to Iran.
Caspian pipeline Consortium	Kazakhstan – Tajikistan	Proposed 1,650 km pipeline from Tengiz fields through Uzbekistan and Kyrgyzstan to Tajikistan.
Kazakhstan pipeline Company	Kazakhstan – Iran	Proposed 2,300 km pipeline from Tengiz fields through Turkmenistan to Kharg Island in the Persian Gulf.
Tefken Holding A.S. (Turkey)	Kazakhstan – Turkey	Proposed 1,900 km pipeline from Tengiz fields across the Caspian Sea through Azerbaijan and Iran to Mediterranean coast of Turkey via existing Turkey – Iran pipeline. Capacity for pipeline would be 40 mt/year or 800,000 b/d (500,000 b/d from Azerbaijan and 300,000 b/d from Kazakhstan)
Kazakturkbunay	Kazakhstan – Turkey	Under a new 36 year petroleum agreement signed by Kazakhstan and Turkey, a pipeline will be build to deliver Kazakh oil through Turkey.
Amoco (US) Pennzoi l(US) Unocal (US) BP (UK), Azerbaijan	Azerbaijan– Turkey	As part of anew $8 billion oil deal to develop offshore oil in the Caspian Sea. Western consortium announced preliminary plans to ship Azeri crude via a new pipeline across Turkey.
Caspian pipeline Consortium/unidentifie d Japanese firm	Kazakhstan – China	Possible pipeline from Tengiz fields through China to transport Central Asian gas and oil to markets on the Pacific Rim.
Turkmenistan-Iran	Turkmenistan-Iran	Possible pipeline from Turkmen oil fields to northern Iran.
Former Soviet Government/Transeft'	Russia-Turkmenistan-Kazakhstan-Azerbaijan-Gorgia	Existing pipeline built under control of the former Soviet Union. The existing pipeline network is composed of five major sections: (1) 3000 km pipeline linking Omsk (Russia) – Pavloding (Kazakhstan) – Shymkent (Kazakhstan) – Chardzhou (Turkmenistan); (2) 3,500 km pipeline linking Novorossiysk (Russia)- Groznyy (Russia) – Atyrau (Kazakhstan) – Tengiz (Khazakahstan) – Aktau (Kazakhstan; (3) a 1400 km pipeline linking Novorossiysk-Groznyy (Russia – Baku (Azerbaijan); (4) a 1000 – km pipeline linking Batumi (Georgia) – Baku (Azerbaijan); and (5) a 1000 km pipeline linking Atyrau (Kazakhstan) with Samara (Russia).

Source: Post Soviet Geography, 1994 V.H. Winston and Sons, p.426.

TABLE 4

Existing and Proposed Gas Pipeline Joint Ventures in Central Asia

Organization	Location	Description
BOTAS Turkmenistan	Turkmenistan – Turkey	Proposed twin gas pipeline from Ashkabad, Turkmenistan to Turkey via Caspian Sea. Azerbaijan, and Armenia; the 4800 km route would initially costs $8.5 billion and achieve a throughput capacity of 40 billion cubic meters (c/m) of gas per year.
ENRON/Wing Merrill (BOTAS/ Gemma Guris)	Turkmenistan – Azerbaijan-Turkey	Proposed gas pipeline from Turkmenistan, under the Caspian Sea to Baku, through the Caucasus Mountains to Turkey, to cost $16 billion and provide 40 billion c/m annually.
Iran, Turkey, Turkmenistan Russia	Turkmenistan-Iran Turkey	The four countries signed an agreement to build a gas pipeline with a capacity of 28 BCM per year to carry Turkmenistan gas to Turkey and Europe. The route will cross Iran sought of the Elbruz mountains via Shahrud, Somnan, Tehran, and Tabriz. Construction is scheduled to commence in the summer of 1994 at an approximate cost of $8 billion and will take 5 years to complete.
Gazprom	Russia-Central Asian republics	Existing 29,935 km of gas pipelines owned by Russian state gas concern
Unidentified Pakistan and Turkmen concerns	Turkmenistan-Afghanistan- Pakistan	Proposed 1800 km pipeline through western Afghanistan to Karachi, Pakistan. No formal negotiations have taken place.
Tefken Holding A.S. (Turkey), Iran	Turkmenistan-Iran-Turkey	Proposed 5000 km (3100 mile) pipeline would bring Turkmen gas through Iran to Turkey. Cost estimates for this overland pipeline project exceed $120 billion.

Source: *Post Soviet Geography*, V.H. Winston and Sons, 1994, p.426.

In general, there are three principal export routes out of Central Asia, either through Russia and the port of Novorossiysk, the Caucasus (Georgia or Azerbaijan) or Turkey. Routes through Russia basically involve Caspian Pipeline Consortium plans for transporting Tengiz/Korolevskoye oil to the Russian Black Sea (Novorossiysk), or Azeri oil from the Caspian Sea to the north. Routes through Transcaucasia would take Azeri oil to Turkey either through Nakhichevan or Georgia. Those to the south generally involve transport to the Turkish cities of Midyat and then Ceyhan or, alternatively, to Sivas and then to Ceyhan. All three

principal routes are fraught with problems and concerns, including the substantial costs for new pipeline construction and development of related infrastructure.

The extent of new pipeline construction or renovation not only will reflect the direction and volume of oil flows in and around Central Asia, but it also will influence levels of foreign investment in the region. Political obstacles and prohibitive investment requirement continue to pose concerns to companies considering joint venture development in the region. If difficulties in establishing viable export routes from Central Asia continue, plans for developing, the major oil and gas resources of Kazakhstan will be significantly downgraded, to the detriment of countries in the region that depend on Russian petroleum and other energy supplies.

The new geopolitics in contrast to the old is creative rather than defensive, aligned to market – oriented development rather than state management. Thus with billions of dollars and crucial strategic influence at stake, the struggle for control over the vast oil resources in Central Asia is a tale of political intrigue, fierce commercial competition, geo-strategic rivalries, ethnic feuding and elusive independence. A comparison can be drawn to the 'Great Game' – a nineteenth century rivalry between Victorian England and Tsarist Russia. The matrix of national identities, mentalities, goals and instruments, of however, has changed significantly. In addition, the new players differ in their perception of the game, with some maintaining that the competition is no longer a zero-sum game, while other still believe that it is and see the world through a traditional balance of power framework. The stakes involved however remain unchanged – power influence security wealth.

The new playing field is inherently complex and is further complicated by a vast array of problems. Within the region these include intra-regional conflict,

internal political instability, unscrupulous entrepreneurial operations, and a short fall in commercial expertise and legal infrastructures.

The gas pipeline network reflects the importance of natural gas transportation in the region. Over 10,000 km of gas trunk pipelines have been laid in order to transport gas from Uzbekistan, Turkmenistan and Kazakhstan to Russia and Europe. Furthermore, the capital cities of all five Central Asian republics are connected by gas pipelines. Currently, the Central Asian gas output primarily is concentrated in Turkmenistan a net gas exporter, which holds a dominant position among the southern former Soviet Union gas producers. Turkmenistan export just 8.2 billion cubic meters of gas in 1993 to the west, as Russia began to impede the country's exports in the process of wrangling over the proposed 1994 quota and tariff schedule. As a result of this development, Turkmenistan has been attempting to build a new export pipeline for its gas.

The competition over pipeline boils down to the question of whether Russian will be able to maintain its current near monopoly on the transport of oil and gas from the region. If new oil and gas pipelines flows only through Russia, then Russian might be able to increase its hegemony is Central Asia, and the Caucasus. If new pipelines are built in other directions, however, Russian predominance in the region will be undermined. The governments of Turkmenistan and Kazakhstan have focussed primarily on near-term efforts to get more of their current oil and gas production exported through Russia using the existing Soviet era infrastructure. The most important actor within Russia has been Lukoil, it had also been the actor most frequently misunderstood in the literature of energy. Lukoil is often portrayed as being one of the main instruments of Russian policy in Central Asia, 'Soviet Style' cartel that acts as the long arm of the Russian Government to 'obstruct progress' in Central Asian oil

development and help Russia pursue a unified 'carrot and stick approach' towards the region and resources.

In Russia, the energy arithmetic falls out of a much larger dynamic of change in almost every political and economic parameters: border, constitution, economic structure, the organization of society. It seems that the result in the energy field will be an eventual resumption of growth in oil production and continued expansion of gas production and export. So is the case with Kazakhstan and Turkmenistan where similar internal policies of political and economic reform will frame energy development policies. These countries have the added complication of their relationship with Russia, which controls many of their potential energy export routes and present a wider agenda of issues to be resolved; the treatment of Russian populations, the security of the borders of the former Soviet Union, and the challenges of reducing the economic support from Russia which these countries enjoyed in Soviet times.

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