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THE PETROLEUM INDUSTRY IN ECONOMIC REGIONS IX, XI, AND XII OF THE USSR

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FOREWORD

This report is a condensation of a detailed analysis of the production, refining, distribution, and consumption of crude oil, natural gas, and petroleum products in Economic Regions IX, XI, and XII of the USSR.

Although the report contains only the data and information essential to a clear concept of the economic importance of the petroleum industry in Regions IX, XI, and XII and its relation to the Soviet economy, the full results of the detailed study are available (see Methodology, Appendix D).

This report is one of a series of regional analyses of the Soviet petroleum industry in the postwar period.

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THE PETROLEUM INDUSTRY IN ECONOMIC REGIONS IX, XI, AND XII OF THE USSR*

Summary

Economic Regions** IX, XI, and XII of the USSR, the economic divisions of Siberia and the Soviet Far East, are deficient in both crude oil resources and refining capacity. More than three-fourths of the total petroleum requirements of these regions must be supplied from petroleum-producing centers in other parts of the USSR. The petroleum economy of the area is important, however, because the majority of Soviet exports of petroleum to Communist China either originate in or pass through it. Thus the transportation of petroleum is a major problem in these eastern regions.

Commercial production of crude oil in the area is limited to Sakhalin Island, where production has increased from 0.7 million metric tons*** in 1946 to about 1.1 million tons in 1954. This increase is small in comparison with the increases in other petroleum-producing areas, for the geologic structures of the oilfields are not conducive to any significant or rapid increase in production.

Although there are great potential resources in Northern Siberia, the recent curtailment of oil exploration in several areas of Siberia makes it unlikely that any important new oil deposits will be developed

* The estimates and conclusions contained in this report represent the best judgment of ORR as of 1 July 1955.

** The term region in this report refers to the economic regions defined and numbered on CIA Map 12048, 9-51, USSR: Economic Regions.

*** Tonnages are given in metric tons throughout this report.

there in the foreseeable future. Approximately half of the crude oil produced on Sakhalin is supplied to the two refineries in Region XII. The remainder is exported to Communist China, is consumed as fuel, or is processed in the small topping plant on Sakhalin.

The only crude oil refineries in the eastern regions are located at Khabarovsk and Komsomol'sk, both in Region XII. These two refineries produced between 0.9 million and 1.0 million tons of refined products in 1954, about twice the 1948 production of less than 0.5 million tons. The increase in output is the result of an increased and continuous supply of crude oil, made possible by the completion of the pipeline from Sakhalin to the mainland and by shipments from the Ural-Volga area. In recent years the Komsomol'sk refinery has concentrated on the production of such important military products as jet fuel, aviation gasoline, and special diesel fuel for use in submarines.

In the second half of 1954, Combine 16, a synthetic liquid fuel plant near Irkutsk, began commercial production of motor gasoline, lamp kerosine, and diesel fuel. This plant was originally designed primarily to produce aviation gasoline. The apparent change in operations may reflect the great deficit in civil requirements for petroleum in the region or may indicate that construction of all elements of the plant has not been completed. If this plant reaches the type and scale of operation originally designed, it will contribute significantly to the military capabilities of the area.

The total civil consumption of petroleum products in Regions IX, XI, and XII increased from about 3.2 million tons in 1950 to about 4.2 million tons in 1954. Approximately 3.8 million tons had to be supplied from other areas in 1954. The USSR is seeking to reduce the great deficit of petroleum products in Siberia by the construction of a second unit at Combine 16 and the planning of a new crude oil refinery at Irkutsk.

The Trans-Siberian Railroad is the principal facility for the supply and distribution of petroleum to and within these regions as well as to Communist China. The loss of the rail system would completely disrupt

the petroleum economy of Siberia and the Far East. The oilfields on Sakhalin and the refineries at Komsomol'sk and Khabarovsk also represent a major vulnerability. A change-over at Combine 16 to the production of aviation gasoline and increased production of jet fuel at the Komsomol'sk refinery, at the expense of other light products, could be an indication of Sino-Soviet Bloc military intentions.

I. Introduction.

This report is designed to present an integrated analysis of all phases of the petroleum industry in Economic Regions IX (West Siberia), XI (East Siberia), and XII (Far East) of the USSR in order to contribute to an accurate understanding of, and a sound basis for the evaluation of, the Soviet petroleum industry as a whole.

Production of crude oil east of the Ural Mountains is limited to Sakhalin Island, where in 1954 approximately 1.1 million tons, or about 2 percent of the total production of the USSR, 1/* were produced. Two crude oil refineries are located in Region XII, at Komsomol'sk and Khabarovsk, and a large synthetic fuel installation at Irkutsk began production in 1954. The petroleum industry, in the industrial complex of the area as a whole, is very minor and cannot begin to supply the area requirements for petroleum products, but the dependency of Communist China upon petroleum imports from the USSR, most of which originate in or pass through these regions, adds a great strategic importance to petroleum facilities of all kinds in Regions IX, XI, and XII.

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* For serially numbered source references, see Appendix F.

II. Exploration and Production.

A. Areas of Operation.

1. Sakhalin Island (Economic Region XII).

The production and exploration operations on Sakhalin Island are under the direction of the Far East Oil Association (Dal'neft'), which has its headquarters at Okha and is subordinate to the Chief Directorate of Crude Oil Production of Eastern Areas. 2/ The Association includes two production trusts -- the Sakhalin Oil Trust 3/ and the Katangli Oil Trust 4/ -- and one exploration trust -- the Far East Oil Prospecting Trust 5/ -- in addition to several auxiliary trusts and organizations for handling related operations. 6/ The Far East Oil Association also operates a small topping plant in Okha, which supplies some of the fuel requirements of the Association and of other local consumers. 7/

All of the producing oilfields are along the northeastern coast of the island. The largest group of fields, including Okha, Ekhabi, and Eastern Ekhabi, is under the Sakhalin Oil Trust. 8/ The Katangli oilfield, which became the Katangli Oil Trust in 1950, 9/ lies about 120 miles south of Okha. The productive formations do not lie at very great depth in any of the producing fields, usually less than 2,000 meters. 10/ Most of the important prospecting areas and new oilfields currently under development are located near the coast between Okha and Katangli.

At the present time the Ekhabi and Eastern Ekhabi oilfields are the most important fields, not only because they produce most of the Sakhalin crude oil, but also because of the high quality of the Ekhabi crude oil. * Because of its high quality, Ekhabi crude oil probably is not consumed as fuel in the fields. Most of it is sent to the refinery at Komsomol'sk, ** and some is exported to Communist China. Ekhabi

* There is no known reference to an Eastern Ekhabi crude oil as a specific type, but there is frequent mention of Ekhabi crude oil. 11/ It is probably similar to Ekhabi crude oil and is not handled separately in distribution.

** See Appendix A.

crude oil is transported from Sakhalin to Komsomol'sk by pipeline as well as by barge. 12/ The completion of a pipeline to the mainland in 1953 greatly facilitated the transportation of crude oil, but the pipeline operations are still slowed down in the winter.

Okha crude oil, because it is of relatively inferior quality and because its production is decreasing, probably is utilized now largely as fuel in the oilfields or as charge for the topping unit at Okha. The Katangli production of crude oil, with the exception of the crude oil used by the oilfield itself, is shipped to the mainland to both the Komsomol'sk and the Khabarovsk refineries.* The shipping of Katangli crude oil is complicated by the shallowness of Nabil' Bay, on which Katangli is located. Most of the Katangli crude oil goes by tanker to Moskal'vo, 13/ where it is transferred to barges for further shipment up the Amur River. Because the transport of Katangli crude oil is wholly dependent upon sea transport, 14/ movement is limited by the length of the navigation season. To avoid a shutdown of wells between navigation seasons the storage facilities at Katangli must be adequate for storing the winter output of crude oil.

The great distance from the chief sources of supply of material and equipment has been one of the major handicaps in the development of the Sakhalin oilfields. The transportation factor not only has increased the cost of developing the Sakhalin oilfields but also has retarded the introduction of new types of equipment and modern technology. The fact that the ports of North Sakhalin are icebound during almost half of the year limits the shipment of the entire year's supplies to the short navigation season. The supply problem is further increased by the poor local transportation facilities on North Sakhalin. The most serious problems in the operations of the oilfields are the result of the severe winter climate, which causes the freezing of wells and pipelines unless preventive measures are taken. 15/

Although all the current production of crude oil sent from Sakhalin comes from the four oilfields mentioned above, active exploratory

* See Appendix A.

drilling has been done in a number of other areas on North Sakhalin. At least one of these, Paromay, is believed to be ready for commercial production as soon as transport can be provided for its crude oil. Several others, such as Nutovo and Gilyako-Abunan, may begin production within the next few years, and many other potentially productive oil deposits where exploration is still in the preliminary stages have been determined.

2. Siberia (Economic Regions IX and XI).

The sedimentary basins where oil deposits may possibly occur cover a large part of Siberia. They form a huge ring in the central part and, in general, occupy the basins of the great Siberian rivers. In addition, both the eastern and western coasts of Kamchatka may have oil-bearing deposits, and a few indications of oil occur along the Pacific coast of Siberia. 16/ Prospecting in nearly all parts of Siberia is extremely difficult because of the isolation of prospecting sites, the absence of roads and railroads, the severity of the climate, and the permafrost conditions. The areas in which the USSR has been doing the most intensive prospecting are in the Khatanga-Nordvik area in the Arctic, in the basin of the Lena River and its tributaries in central Yakutsk, in the Irkutsk region northwest of Lake Baikal, and on both coasts of Kamchatka.

In 1953 the prospecting operations in the far north of the Khatanga-Nordvik area were discontinued, 17/ and in the last quarter of 1954 several of the prospecting expeditions in Yakutsk 18/ and in Kamchatka 19/ also were liquidated. Although operations are continuing in the latter two areas, they are evidently on a much smaller scale. At least two reasons for the sudden cessation of much of the prospecting activity can be suggested. First, the intensive exploration activity of the last 10 years has evidently discovered no significantly large petroleum deposits which can be profitably exploited. Second, production of crude oil in other parts of the USSR has been increasing rapidly, and the demand can be supplied from areas where drilling and production operations are considerably more economical. Apparently the present policy is to make up the petroleum deficit in Siberia and the Soviet Far East by improved transport facilities from western USSR rather than by the development of new oilfields in Siberia.

B. Production.

1. Crude Oil.

Sakhalin Island is the only area of crude oil production in Regions IX, XI, and XII. The production from the Sakhalin oilfields has, therefore, been of the greatest importance in the petroleum supply of the entire Soviet Far East. Although this fact should be a great incentive for the USSR to develop the Sakhalin oilfields as rapidly as possible the development of Sakhalin has progressed very slowly, and the production of crude oil is estimated to have been no more than 1.1 million tons in 1954.* The slow increase in production, which apparently is far behind Soviet expectations, 20/ is primarily the result of many problems, such as supply, transportation, and severity of the climate. Because most of the Sakhalin oil wells are small producers, 21/ an increase in the number of wells drilled does not result in a large increase in production. 22/ The gross increase in production resulting from the development of new deposits is largely offset by a decline in production caused by the depletion of old deposits.

Although in 1945 23/ Sakhalin was reported to have at least 60 known oil deposits with huge oil reserves, only one new field, Eastern Ekhabi, has actually begun to produce oil in commercial quantities since the end of World War II. 24/ The rate of increase in production on Sakhalin will depend upon the rapidity with which new oilfields are developed. A new railroad along the coast of the island, completed in 1953, 25/ has made the most favorable prospecting areas more accessible and undoubtedly will accelerate their development. It is unlikely, however, that any of the prospects now under development will become as large or as important as the present producing fields of Okha, Ekhabi, and Katangli. Only two prospects, Paromay and Nutovo, are expected to begin production in the near future. These fields probably will increase the total production, at least temporarily, and may later offset the expected decline of the older oilfields. Without an intensive development of new fields, however, it is not believed that the total production of Sakhalin can be increased substantially, although the present rate of increase may be expected to continue or even to temporarily accelerate.

* See Table 1, p. 8, below.

The estimated production of crude oil in the Sakhalin oilfields during the 1923-54 period is shown in Table 1. The increase in

Table 1

Estimated Production of Crude Oil on Sakhalin Island in Economic Region XII of the USSR a/
1923-54

Thousand Metric Tons

Year	Soviet Production	Total Production b/
1923-27	0	140
1928-39	2,526	4,417
1940	450	505
1941	430	472
1942	460	510
1943	490	506
1944	590	590
1945	675	675
1946	700	700
1947	700	700
1948	710	710
1949	770	770
1950	830	830
1951	880	880
1952	930	930
1953	1,000	1,000
1954	1,100	1,100
Total	13,240	15,435

a. The figures are rounded to the nearest 1,000 through 1945 and to the nearest 10,000 from 1946 through 1954.

b. The difference between Total Production and Soviet Production for the period ending in 1943 represents the production in Japanese concessions on Sakhalin.

production near the end of World War II was the result of reopening Japanese oil wells after the USSR took over the Japanese concessions.* 27/ The discovery of some new producing horizons 28/ and the rapid development of the Ekhabi field during that period 29/ also resulted in increased production. Since 1950 the increase in production has been the result of better transport facilities, which have permitted greater development of Katangli, and the year-round transport of oil via the pipeline.** The development of the new Eastern Ekhabi oilfield is now an important factor in the increased production.

2. Natural Gas.

The production of natural gas is entirely of local importance, as all gas produced is consumed in the oilfields or in the towns of Okha and Ekhabi. 30/ Data on the production of gas are too incomplete to make any accurate estimates of current output. It is estimated that production of natural gas may have been about 30,000 or 40,000 tons in 1948. 31/ Because of increased local consumption of natural gas, production of gas has been increasing at a more rapid rate than production of crude oil. 32/ There was a 35.2-percent increase in production of natural gas in the first 8 months of 1954 in comparison with the production for the same period in 1953, whereas the corresponding increase in production of crude oil was only 10.5 percent. 33/

In 1948, most of the natural gas was produced at Southern Okha and at the Ekhabi oilfield. 34/ It is believed that these fields continue to produce most of the gas. The new Paromay oilfield, and probably Nutovo, also will produce natural gas when facilities are completed. 35/

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* The statement that Sakhalin production was "nearly doubled" during the war, which occurred several times in the Soviet press, 26/ is believed either to be an exaggeration or to have referred to the number of wells or area under exploitation, which did nearly double as a result of taking over the Japanese concessions.

** See Appendix C.

3. Okha Topping Plant.

Okha crude oil is believed to be the chief type used as charge for the Far East Oil Association's topping unit, which was constructed at Okha in 1931-32. 36/ The capacity of this plant is not known, but it is estimated that in 1951 it produced at least 3,500 tons of motor gasoline for the use of the Association 37/ as well as an unknown additional amount for other local consumers. In 1949 it may have supplied 10,000 to 12,000 tons of mazut or topped crude for use as fuel in the oilfields. 38/ There is no information concerning its current output, but it probably supplies most of the local needs for motor gasoline and kerosine. 39/

III. Refining and Processing.*

A. Natural Crude Oil Refineries.

The processing of crude oil in Regions IX, XI, and XII is limited mainly to two refineries, Plant No. 409 at Komsomol'sk and Plant No. 419 at Khabarovsk, both in Region XII. The small topping plant at Okha on Sakhalin Island 40/ produces only a portion of the local needs. Plans have been under way since 1953 for a crude oil refinery in the vicinity of Irkutsk, but actual construction is not believed to have begun by the fall of 1954. 41/ There were several references to a refinery at Omsk during 1953. 42/ No information is available, however, which would indicate the operating status or capabilities of this plant.

The Khabarovsk refinery, which has primary distillation and cracking facilities, is estimated to have charged approximately 550,000 to 570,000 tons of crude oil in 1954. It is now operating largely on Ural-Volga crude oil, from which it produces "sour" (high sulfur content) mazut. Other products produced at Khabarovsk include B-70 aviation gasoline, motor gasoline, tractor kerosine, diesel fuel, nigrol, axle oil, bunker oil, and bitumen.

* For details of individual plants, see Appendix A.

The Komsomol'sk refinery has only primary distillation facilities and operates principally on Ekhabi crude oil, which is particularly adaptable to processing in such facilities. It is estimated that this plant charged approximately 480,000 to 580,000 tons of crude oil in 1954. The output of the Komsomol'sk refinery consists primarily of products used in military operations. Grades B-93, B-95/113, and B-95/130 aviation gasoline are produced by blending locally produced base stock with such components as iso-octane, alkyl benzol, and toluene, which are imported from other areas of the USSR. Komsomol'sk is 1 of the 4 refineries in the USSR known to be producing jet fuel T-1.* Ekhabi crude oil has a high content of distillate suitable for the production of T-1, and it is estimated that between 20 and 25 percent of jet kerosine T-1 could be produced from a unit weight of Ekhabi crude, with concurrent production of other distillate products. Other products produced at the Komsomol'sk refinery include summer-grade diesel fuel; special-grade diesel fuel, which is suitable for use in submarines; bunker fuel; and "sweet" (low sulfur content) heating mazut.

The total product output of the Khabarovsk and Komsomol'sk refineries in 1954 is estimated to be between 85 and 90 percent of the crude oil charge -- 906,000 to 1,012,000 tons of products.

B. Synthetic Refineries.

Combine 16, located near Irkutsk, in the vicinity of the town of Kitoy 43/ (52°31' N - 103°48' E), is the only synthetic liquid fuel plant of potential significance to the petroleum industry in Regions IX, XI, and XII. In addition to its size and planned capabilities for the production of aviation fuels, its location in the center of a great petroleum deficit area makes it of great strategic importance. Except for Combine 16, the closest sources of refined petroleum products for Central Siberia are the Khabarovsk refinery, 2,100 miles to the east, and the Ufa refinery, 2,300 miles to the west.

Construction of Combine 16 was scheduled to begin in 1946, but there were no indications that the plant had attained commercial production of liquid fuels until June 1954. Originally the plant was designed to produce aviation gasoline. In the last half of 1954, however,

* See footnote * on p. 34, below.

significant quantities of motor gasoline, illuminating kerosine, and diesel fuel were produced. On the basis of observed shipments the total of these products shipped during 7 months of 1954 probably was not less than 50,000 tons. The absence of any reference to aviation gasoline, for which the plant was primarily designed, may indicate that construction of all elements of the plant has not been completed or that the original plan of operation has been modified.

IV. Distribution.

Transportation facilities constitute a limiting factor and a major problem in the distribution of petroleum products in Regions IX, XI, and XII. These regions are largely dependent upon the Trans-Siberian Railroad for the movement of petroleum through the southern reaches, where the major share of the population of the regions is concentrated. Distribution in the areas to the north is accomplished by river transportation, by tankers of the Far Eastern Merchant Fleet, and in the Arctic waters by ships serving the Northern Sea Route. During the winter months when marine activity is suspended, these northern areas are dependent upon vehicular transportation.

During 1954, approximately 150,000 tons of petroleum products were shipped by tanker from the Black Sea to Vladivostok and other Far Eastern ports. Before this time, practically all products imported into the regions moved over the Trans-Siberian Railroad and connecting branch lines. The Urbakh-Novosibirsk gasoline pipeline, which is still under construction, began partial operation in the latter part of 1952 and is now operating as far east as Omsk. At Omsk the products are transferred to the railroad for further shipment east. Products are also shipped westward on the Trans-Siberian Railroad from the refineries at Komsomol'sk and Khabarovsk.

A. Economic Region IX.

Available information on the distribution procedures in Region IX is insufficient to permit estimates of the flow of products into and within the region. Because the region is located close to the large producing and refining centers in the Ural-Volga area, it is probable that practically all of the requirements for Region IX, with the exception of those for some special products, are supplied by rail or pipeline from the Ural-Volga area.

B. Economic Region XI.

1. Flow of Products to the Region.

Region XI is principally dependent upon the Ural-Volga area for its supply of petroleum products. 44/ In addition, the coming-on stream of the synthetic liquid fuels plant, Combine 16, near Irkutsk, by June 1954, provided Region XI with an intrinsic source of motor gasoline, diesel fuel, and lamp kerosine. 45/ How large a volume of these products Combine 16 will be able to supply is not known. Another source of supply is the Komsomol'sk refinery, which supplied Region XI with "sweet" heating mazut in January 1954. 46/ Other sources of petroleum products include Baku and Central Asia, both of which supplied Region XI with a substantial volume of products in 1950. 47/

2. Flow of Products within the Region.

Before 1953 the distribution of petroleum products to consumers in Region XI was effected through six Oil Sales Directorates which controlled delivery of petroleum products within the territorial administrative subdivisions of the region. The locations of the headquarters of these Oil Sales Directorates and the administrative subdivisions of Region XI for which they were responsible were as follows 48/:

Chita, Chita Oblast
Ulan-Ude, Buryat-Mongol ASSR
Irkutsk, Irkutsk Oblast
Yakutsk, Yakutsk ASSR
Krasnoyarsk, Krasnoyarskiy Kray
Kyzyl, Tuva Autonomous Oblast

In August 1953 a reorganization of the administration of petroleum product deliveries in Region XI took place. At that time the Irkutsk Oil Sales Directorate became responsible for administration of delivery operations in Irkutsk Oblast, Chita Oblast,

the Buryat-Mongol ASSR, and Yakutsk ASSR. 49/ The Krasnoyarsk Oil Sales Directorate was not involved in the merger. After August 1953, therefore, there were two major Oil Sales Directorates responsible for the distribution of petroleum products in Region XI -- the Irkutsk Directorate and the Krasnoyarsk Directorate.

C. Economic Region XII.

Region XII consists of two separate and distinct parts, Khabarovskiy Kray and Primorskiy Kray. Since the distribution patterns and problems in these two areas differ widely, they will be treated separately.

1. Khabarovskiy Kray.

a. Flow of Products to the Kray.

The petroleum products consumed in Khabarovskiy Kray are supplied in part by the local refineries and in part by rail shipment from refining centers in western areas at least 4,500 miles away. In 1949, about 250,000 tons of petroleum products were received by rail for distribution, of which approximately 38 percent came from the Ural-Volga area, 35 percent came from Central Asia, and the balance -- about 26 percent -- came from the refineries in Region XII. In 1954, about 370,000 tons of petroleum products were received by rail, of which 61 percent came from the Ural-Volga area and 4 percent came from Central Asia and other regions. The amount supplied by the refineries in Region XII increased to 35 percent.

b. Flow of Products within the Kray.

In 1949, 2 independent Oil Sales Directorates existed in Khabarovskiy Kray, 1 at Blagoveshchensk serving Amur Oblast and 1 at Khabarovsk serving the remainder of the Kray. 50/ In 1954 these Oil Sales Directorates were combined into one directorate with headquarters at Khabarovsk. 51/ The new directorate includes the southern areas which can be supplied primarily by rail

or by shipments on the Amur River.* 53/ The Sales Bases at Komsomol'sk, 54/ Nikolayevsk, 55/ and Birobidzhan 56/ are subordinate to the Khabarovsk Directorate.

c. Distribution of Refinery Production.

In addition to distributing petroleum products to consumers within the kray, the Khabarovsk Oil Sales Directorate is responsible for distributing the output of the refineries, Plant No. 419 at Khabarovsk and Plant No. 409 at Komsomol'sk. 57/ Part of the refinery output is distributed within Khabarovskiy Kray, and the remainder is distributed to Primorskiy Kray, to other directorates along the Trans-Siberian Railroad as far west as Omsk, and to military consumers and is exported to other countries, primarily Communist China and North Korea. It is estimated that in 1949 about 450,000 tons of petroleum products were shipped from the 2 refineries. Approximately 16 percent of the total was distributed within Khabarovskiy Kray, and about 22 percent was destined for military consumers and for export. The remaining 62 percent was divided about equally between shipments to Primorskiy Kray and shipments westward along the Trans-Siberian Railroad. It is estimated that about 840,000 tons of products were shipped by rail from the two refineries in 1954. About 14 percent was distributed within Khabarovskiy Kray, and shipments to military consumers and for export represented about 50 percent of the total. Shipments to Primorskiy Kray amounted to about 25 percent, and the remainder was shipped westward.

The large increase in shipments to military consumers and for export reflects not only the increased production at the refineries but also the emphasis on the output of such products as aviation gasoline and jet fuel at the Komsomol'sk refinery. It is estimated that in 1953 and in 1954 nearly 75,000 tons of aviation gasoline and jet fuel were exported from the Komsomol'sk refinery to Communist China and North Korea. In 1953 the total was estimated to consist of about

* The petroleum requirements of the Dal'stroy operations in the northern areas of Khabarovskiy Kray are supplied by sea shipments from Vladivostok. The creation of Magadan Oblast 52/ removed a large part of this northern area from Khabarovskiy Kray.

17,000 tons of aviation gasoline and 57,000 tons of jet fuel. In 1954 the total was estimated at approximately 19,000 tons of aviation gasoline and 55,000 tons of jet fuel. It seems probable that these exports are intended to be a regular part of the distribution pattern from the Komsomol'sk refinery.

2. Primorskiy Kray.

a. Flow of Products to the Kray.

All of the petroleum products consumed in Primorskiy Kray are imported from other areas. Of the products received for civil consumption, it is estimated that in 1949 approximately 70 percent originated in the Ural-Volga area, involving a rail haul of approximately 5,000 miles; 15 percent in Krasnovodsk; and 12 percent in Khabarovskiy Kray.* Occasional shipments were received from other areas, including Vannovskaya, Guryev, Groznyy, and Baku. By 1953 the Khabarovskiy Kray was supplying approximately 25 percent of civil requirements, and shipments from Krasnovodsk decreased to less than 5 percent of the total. The Ural-Volga area continued to supply about 70 percent.

In the 1948-53 period, 1 or 2 tankers a year transported petroleum products, largely diesel fuel, from the Black Sea to Region XII. 58/ The cargoes were delivered directly to consumers in areas which could be reached only by sea, principally to Nagayevo, the port for Dal'stroy. In the latter half of 1954, 12 tankers left the Black Sea for Vladivostok or other ports in Region XII, carrying a total of approximately 120,000 tons of petroleum products. 59/ Some of this cargo was scheduled to be shipped to Communist China by rail from Vladivostok. 60/ Except for these few tanker shipments,

* Estimates of origins of products are based on data accounting for approximately 40 percent of civilian consumption in Primorskiy Kray in 1949 and approximately 17 percent in 1953. Data concerning shipments in other years have also been considered in estimating the pattern of shipments.

all products consumed in Primorskiy Kray or the areas which it supplies are shipped in by rail.

b. Flow of Products within the Kray.

Distribution of petroleum products within Primorskiy Kray is under the supervision of the Chief Directorate of Oil Sales at Vladivostok. The Ministry of Defense has its own petroleum distribution points at Ugol'naya and Guberovo, 61/ and the Ministry of the Merchant Fleet has an oil base at Nakhodka. 62/ Many of the small towns along the Primorskiy coast which cannot be reached overland receive petroleum products by tanker from Vladivostok. 63/

There are other more distant areas that are supplied by tanker from Vladivostok, including Sakhalin Island, Kamchatka, Dal'stroy, and the Chukotsk Peninsula. Sakhalin had its own Oil Sales Directorate, at Yuzhno-Sakhalinsk, 64/ until the fall of 1953, when it was put under the jurisdiction of the Primorskiy Oil Sales Directorate. 65/ Kamchatka, which is part of Khabarovskiy Kray, was subordinate to the Khabarovsk Oil Sales Directorate until the fall of 1953, when it was also brought under the Primorskiy Directorate. 66/ The Dal'stroy organization, although located in the northern part of Khabarovskiy Kray, receives most of its petroleum supplies by tanker from Vladivostok. 67/ Most of the petroleum shipped from Vladivostok to the Chukotsk Peninsula is destined for military units or for the Chief Directorate of the Northern Sea Route. There are military representatives and representatives of the Northern Sea Route in Vladivostok to look after these shipments. 68/ During 1952, approximately 475,000 tons of petroleum products were delivered by tanker from Vladivostok to these northern areas, for both military and civil consumers, and during 1953, approximately 525,000 tons were delivered. 69/

V. Civil Consumption. *

Estimates of civil consumption of petroleum products in Regions XI and XII are based principally on reports of deliveries to consumers by

* For details of consumption in each region, see Appendix B.

the individual Oil Sales Directorates. These reports reflect deliveries of products by quarterly periods or parts of quarterly periods. In addition, available information on the receipt of petroleum products by the Oil Sales Directorates and by individual consumers has been considered. Because there is insufficient information to establish consumption estimates of those products, the estimates in this section exclude all deliveries of aviation gasoline and all lubricants, with the exception of avtel. It is estimated that these products would increase estimated civil consumption by not more than 3.5 percent. *

The total estimated civil consumption of petroleum products in the 3 regions in 1954, amounting to about 4.2 million tons, represents 8.7 percent of the civil consumption in the entire USSR in 1954, which is estimated at about 48 million tons. 71/ The total estimated annual civil consumption of petroleum products in Regions IX, XI, and XII in 1949, 1950, and 1954 is shown in Table 2.

Table 2

Total Estimated Annual Civil Consumption of Petroleum Products in Economic Regions IX, XI, and XII of the USSR
1949, 1950, and 1954

Thousand Metric Tons

Year	Region IX	Region XI	Region XII	Total
1949	N.A.	437	753	N.A.
1950	1,720	510	941 a/	3,171
1954	2,200	807	1,183	4,190

a. The 1950 estimate is derived by applying the observed percentage increase for 1950 over 1949 in Primorskiy Kray to the 1949 estimate for the whole of Region XII.

* This estimate is based on total observed shipments to Dal'stroy during 1953, which is the only concrete information available. 70/ Civilian deliveries of aviation gasoline and miscellaneous lubricants to other parts of Regions IX, XI, and XII may be less than the 3.5 percent observed in shipments to Dal'stroy.

VI. Intra-Sino-Soviet Bloc Trade.

As a result of the Western embargo, 72/ Communist China has been dependent upon the Soviet Bloc for most of its petroleum requirements since July 1950. North Korea and Outer Mongolia also receive petroleum from the USSR. Most of the petroleum exported to these areas either originates in or passes through Regions IX, XI, and XII, thus becoming of strategic importance in the over-all regional supply and distribution pattern.

A. Communist China.

Under a Sino-Soviet trade agreement signed in April 1950, the USSR contracted to supply petroleum as well as other products to Communist China.

[redacted] using an estimated average price of 190 rubles per ton for all products,* petroleum shipments to Communist China are estimated at 152,500 tons in the second, third, and fourth quarters of 1950. Although there were some shipments in the first quarter of 1950, they are believed to be small, and the total shipments of petroleum from the USSR to Communist China probably did not exceed 175,000 tons for the year. It is estimated that during 1951 approximately 750,000 tons of petroleum were shipped to Communist China and that in the first half of 1952 approximately 465,000 tons were shipped. 78/ In July 1952 the system of payments was changed, thereby eliminating that basis for estimating total petroleum shipments to Communist China. Petroleum is shipped to Communist China from the USSR by ocean-going tanker, by river barge, and by rail.

* Based on the following prices of products shipped to Communist China by rail: aviation gasoline B-95, 306 rubles per ton 73/; aviation gasoline B-78, 283 rubles per ton 74/; motor gasoline, 203 rubles per ton 75/; kerosine, 177 rubles per ton 76/; and Ekhabi crude oil, 149 rubles per ton. 77/ Diesel fuel is estimated at 168 rubles per ton, on the basis of the above prices.

1. Ocean Tanker.

Before the outbreak of the Korean War, tanker shipments from Vladivostok to Communist China consisted mainly of crude oil. In 1949, about 30,000 tons and in 1950 about 22,500 tons 79/ were delivered to the Dairen Refinery. In addition, small amounts of petroleum products were delivered. 80/ In 1951, total petroleum shipments to Communist China increased tremendously, and sizable deliveries of products, totaling about 75,000 tons, 81/ were made by tanker from Vladivostok. In 1952, tanker shipments to Communist China decreased to about 37,000 tons, 82/ and in 1953 they rose again to approximately 110,000 tons. 83/ In 1954, about 50,000 tons of products are believed to have been delivered by tanker to Communist China from Vladivostok. 84/

2. River Barge.

Barge shipments of petroleum up the Amur and Sungari Rivers to Chiamussu in Manchuria were first observed in June 1951. About 60,000 tons of petroleum are estimated to have been delivered by barge during the shipping season, from June through October. 85/ At least 27,000 tons of this total were crude oil. During the 1953 shipping season, 101,000 tons of crude oil 86/ and an estimated 25,000 tons of motor gasoline 87/ were shipped by barge. No information is available regarding barge shipments to Communist China during 1952. As the 1953 shipments are estimated to be more than double the amount shipped in 1951, however, it is believed that at least 80,000 tons of petroleum were shipped by barge during 1952. Barge shipments, principally crude oil, during the 1954 season are estimated at a minimum of 150,000 tons. 88/

3. Rail.

Rail shipments from the USSR cross into Communist China at two points, Otpor in Chita Oblast and Grodekovo in Primorskiy Kray. In 1953 and 1954 the refineries in Economic Region XII, Plant No. 409 and Plant No. 419, shipped an estimated 75,000 tons of aviation fuel and 35,000 tons of motor gasoline* to Communist China by rail via

* Based on an average shipment of 5,000 tons of motor gasoline per month during the 7 months in which barge shipments via the Amur River are not possible.

Grodekovo. In addition, 95,000 tons of Ekhabi crude oil were shipped by rail via Grodekovo in 1953. Virtually all other rail shipments to Communist China are transported across the Trans-Siberian Railroad. Although most of these rail shipments cross the border at Otpor, some continue on to Grodekovo, in spite of the added distance, because of limited transshipping facilities at Otpor and at Manchouli, on the Chinese Communist side of the border.

Total rail shipments to Communist China are estimated at approximately 142,500 tons in 1950 and 615,000 tons in 1951. This estimate is based on total estimated shipments to Communist China, minus the amounts shipped by tanker and barge. In the first half of 1952, about 408,000 tons of petroleum are estimated to have been shipped by rail. Rail shipments after this time can be estimated only roughly.

On the basis of rail shipments in the first half of 1952 and planned and known shipments in the second half of 1953, rail shipments are estimated to have been maintained at a rate of 200,000 tons a quarter during 1952 and 1953.

Rail shipments in the first 6 months of 1954 are believed to have been reduced as a result of the great increase in tanker shipments from the Black Sea area. In the third and fourth quarters, rail shipments probably would have increased, following the disruption of the tanker program, again reaching the 1953 level of 200,000 tons a quarter. A change in the pattern of rail shipments to Communist China was observed in December 1954, when lamp kerosine, which arrived at Vladivostok by tanker from the Black Sea, was shipped to Communist China by rail from Vladivostok. 91/ Rail shipments for 1954 are estimated at 350,000 tons in the first half and 410,000 tons in the second half.

Estimated petroleum shipments to Communist China through Regions IX, XI, and XII in 1949-54 are shown in Table 3.

Table 3

Estimated Petroleum Shipments to Communist China through Economic Regions IX, XI, and XII of the USSR 1949-54

Metric Tons

Type of Shipment	1949	1950	1951	1952	1953	1954
Tanker	38,500	32,500	75,000	37,000	110,000	50,000
Barge	0	0	60,000	80,000	126,000	150,000
Rail	N.A.	142,500	615,000	800,000	800,000	760,000
Total	N.A.	175,000	750,000	917,000	1,036,000	960,000

B. North Korea.

Approximately 20,000 tons of crude oil were delivered by tanker from Vladivostok to North Korea in 1949, 92/ and 14,850 tons were delivered in the first half of 1950. 93/ The Wonsan Refinery was bombed in July 1950, and there were no further shipments of crude oil. After the Korean War began, petroleum was sent to North Korea only by rail. 94/

The total amount of petroleum shipped from the USSR to North Korea can be estimated only roughly.

Total petroleum shipments from the USSR to North Korea in 1950, including the crude oil shipped by tanker, might be estimated at a minimum of 75,000 tons and in 1952 at a minimum of 100,000 tons.

C. Outer Mongolia.

In 1950, Outer Mongolia imported from the USSR approximately 33,600 tons of petroleum products. 101/ Of this total, 20,000 tons were shipped from Ulan-Ude to Ulan-Bator for north-central Mongolia, 12,100 tons were shipped from Borzya to Choy Balsan for eastern Mongolia, and northwestern Mongolia received 1,000 tons at Turta and 500 tons at Tsagaan Nuur. Since 1951 there have been no indications of petroleum products being shipped to Choy Balsan, except for some lubricants. It is probable that Mongolneft' (Mongolian Oil Trust), with headquarters at Sayn Shanda, probably has a topping plant which would supply the requirements of eastern Mongolia, except for lubricants. Shipments to other areas of Mongolia are continuing but are not believed to have increased. Total shipments of petroleum products from the USSR to Mongolia in 1954 are estimated at 22,000 tons.

VII. Supply-Demand Balance.

A. Crude Oil.

The supply-demand balance for crude oil in this report applies only to Region XII because there are neither exploited sources of crude oil nor natural crude oil refineries in Regions IX and XI. The estimated production of crude oil on Sakhalin Island in 1954 about equalled

* Based on the following prices of products shipped to Communist China: aviation gasoline B-95, 306 rubles per ton 97/; aviation gasoline B-78, 283 rubles per ton 98/; motor gasoline, 203 rubles per ton 99/; and lamp kerosine, 177 rubles per ton. 100/

the estimated total amount of all crude oil charged to the refineries at Khabarovsk and Komsomol'sk. Some of the crude oil produced on Sakhalin, however, was exported to Communist China, some was consumed on Sakhalin,* and some was delivered to Dal'stroy. As a result of this diversion, the charge to the two refineries exceeded the available crude oil, and a deficit of about 345,000 to 465,000 tons of crude oil existed. The deficit was overcome by importing a corresponding amount of crude oil from the Ural-Volga area to be processed in the Khabarovsk refinery.

The production and distribution of crude oil in Economic Regions IX, XI, and XII of the USSR in 1954 are shown in Table 4.**

B. Petroleum Products.

Regions IX, XI, and XII represent a large deficit area with respect to petroleum products. In 1954 the only major sources of petroleum products located within these regions were the two refineries at Khabarovsk and Komsomol'sk.*** Of the total estimated production of these refineries, approximately 430,000 tons were supplied by rail to military consumers and for export. The remainder was available for civil consumption within Regions IX, XI, and XII. Only 80,000 tons of this was shipped to Regions IX and XI. The net deficit for civil consumption in the 3 regions amounted to about 3.8 million tons in 1954, necessitating the shipment of this amount of petroleum products into the 3 regions from other areas. Region IX probably received most of its requirements from the Ural-Volga area because of its proximity. The Ural-Volga area was also the principal source of supply for Region XI. Region XII, in addition to consuming most of the available output of the local refineries, received almost 70 percent of its requirements from the west, principally from the Ural-Volga area.

* This includes that portion of the production that is consumed in the topping plant at Okha as well as losses incurred in production and distribution and fuel burned in the field.

** Table 4 follows on p. 25.

*** The synthetic liquid fuels plant at Kitoy (Combine 16), which began production in June 1954, produced a minimum of 50,000 tons during 1954. Production of other synthetic refineries in the three regions is believed to have been insignificant.

Table 4

Production and Distribution of Crude Oil
in Economic Regions IX, XI, and XII of the USSR
1954

Thousand Metric Tons

	Amount
Production a/	1,100
Consumption	
Exports to Communist China	200
Shipments to Dal'stroy	35
Consumed on Sakhalin Island	127
Refinery charges at Plant No. 409 and Plant No. 419	1,030 to 1,150
Transportation loss	53
Total consumption	1,445 to 1,565
Net deficit	345 to 465

a. All production is on Sakhalin Island.

The production and distribution of petroleum products in Economic Regions IX, XI, and XII of the USSR in 1954 are shown in Table 5.*

VIII. Capabilities, Vulnerabilities, and Intentions.

A. Capabilities.

Regions IX, XI, and XII are unable to produce sufficient petroleum to meet the needs of the area. The area is deficient both

* Table 5 follows on p. 26.

Table 5

Production and Distribution of Petroleum Products in Economic Regions IX, XI, and XII of the USSR 1954

	Thousand Metric Tons
Production by local refineries	906 to 1,012
Rail shipments to military consumers and for export	430
Net available for civil consumers from local refineries	476 to 582
Civil distribution	
Region IX	2,200
Region XI	807
Region XII	1,183
Additional 3.5 percent for lubricating oils and aviation gasoline	146
Total civil requirements	4,336
Net deficit of petroleum products	3,754 to 3,860

in crude oil resources and in refining capacity. Because the geologic structures of the oilfields are not conducive to any significant or rapid increase in production, it is unlikely that any attempt will be made to expand the capacity of the refineries in the Far East.

Although the synthetic liquid fuel plant at Kitoy (Combine 16) does not appear to be producing any of the refined products for which

it was designed, the plant produced quantities of motor gasoline, kerosine, and diesel fuel oil in 1954. Should this production continue to increase, the distribution pattern will be modified, and the degree of dependence upon other regions for petroleum products will be reduced.

The transportation facilities serving Siberia and the Soviet Far East, although limited in certain areas during the winter season, appear capable of distributing the present petroleum needs of the area. Continuing extension of the product pipeline from the Urals to Novosibirsk will lighten the burden of petroleum shipments on the Trans-Siberian Railroad.

B. Vulnerabilities.

The petroleum industry of Economic Regions IX, XI, and XII is largely dependent upon the oilfields on Sakhalin Island, the refineries at Komsomol'sk and Khabarovsk, and the Trans-Siberian Railroad. The loss of these three facilities would seriously cripple the supply of petroleum to Communist China and North Korea as well as to the regions themselves.

C. Intentions.

Activities in the petroleum industry in Regions IX, XI, and XII are designed primarily to lessen the degree of dependence upon other areas for the supply of petroleum. Important among these current activities are the construction of a second unit at Combine 16, the planned construction of a petroleum refinery near Irkutsk, and the eastward extension of the product pipeline from the Urals.

The activity at Combine 16 warrants close scrutiny as an indicator of intentions. A switchover to the production of aviation gasoline, as originally planned, in lieu of the present production of motor gasoline, kerosine, and diesel fuel, would indicate a stress on the

production of military products. An increase in production of jet fuel at Plant No. 409 in Komsomol'sk at the expense of other products could also be an indication of military intentions.

Any evidence of the delivery to the area of petroleum in quantities greatly in excess of the presently estimated demand might suggest a program of stockpiling.

APPENDIX A

REFINING AND PROCESSING FACILITIES FOR PETROLEUM PRODUCTS IN ECONOMIC REGIONS IX, XI, AND XII OF THE USSR

I. Natural Crude Oil Refineries.

A. Refinery Facilities.

1. Plant No. 419, Khabarovsk (Economic Region XII).

Plant No. 419 is located at 48°30' N - 134°30' E, approximately one-half mile northwest of the principal railroad station in the city of Khabarovsk. It was placed in operation for the first time in August 1935 and was described as the first combined straight-run and cracking unit in the USSR. 102/ It was originally designed to process approximately 650 tons of crude oil per day, from which topped crude representing 80 percent of the crude charge was to be processed in the thermal cracking unit of the refinery. 103/ On this basis the plant was probably designed to process approximately 250,000 tons of crude oil per year.

By 1954 the plant probably had more than doubled its capacity. On 6 May 1954, 1,647 tons of crude oil were charged, from which 1,317 tons of cracking stock were processed. 104/ Thus the ratio of cracking stock to crude oil remained the same as that originally designed. The refinery is estimated to operate at 85-percent capacity, allowing for repair and maintenance time, or for 310 operating days per year. Thus the annual throughput capacity is estimated at about 550,000 tons.

Plant No. 419 does not produce a very wide variety of products, and it appears to be capable of manufacturing only those products which are produced as a direct result of combined atmospheric distillation and thermal cracking operations.

2. Plant No. 409, Komsomol'sk (Economic Region XII).

Plant No. 409 is located at 50°33' N - 137°0' E, approximately 8-1/2 miles northwest of the center of the city of Komsomol'sk. Newer and larger than Plant No. 419, it presumably was put in operation in 1942. 105/ There is no information about the original design or capacity of this plant or of any subsequent construction. Information about operations during the period 1948-54 indicates that it conducts only primary distillation or topping operations. It operates largely on Ekhabi crude oil, 106/ which contains 60 percent of components that boil at temperatures normal in a primary distillation operation. Thus cracking operations would offer little advantage. In August 1949, Plant No. 409 shipped mazut to Plant No. 419 for feed stock for the cracking unit at the latter plant, 107/ which supports the conclusion that Plant No. 409 has no cracking facilities.

, the production in July 1949 is estimated to have been 61,530 tons of products. 108/ Assuming this product yield to represent 85 percent of crude charge, the crude charge would be on the order of 2,300 tons per day. As Plant No. 409 does not have cracking facilities, thus reducing the interruptions for maintenance, it is estimated to operate at 90-percent capacity, which amounts to 330 days per year. The annual throughput capacity in 1949 is estimated to have been between 750,000 and 800,000 tons.

B. Types of Crude Oil Processed.

Crude oil from Sakhalin Island and from the oilfields of the Ural-Volga area is processed in the refineries in Region XII. Plant No. 419 is known to have processed Ekhabi, Katangli, and Okha crude from Sakhalin 109/ and Tuymazy and Bugul'ma crude from the Ural-Volga area. 110/ It appears that this plant is charging progressively smaller quantities of Sakhalin crude and, since early 1950, increasingly larger quantities of Ural-Volga crude. Some of the crude oil from the Ural-Volga area that is shipped to Plant No. 419 is similar in distillation characteristics to the crude oil from the Okha field on Sakhalin. Thus Plant No. 419 could process Ural-Volga or Okha crude with equal facility.

Plant No. 409 is known to process both Ekhabi and Katangli crude. 111/ General identification of the residual fuels from Plant No. 409 as "sweet" (low sulfur content) and those from Plant No. 419 as "sour" (high sulfur content) indicates that the former does not process the high-sulfur types of crude oil from the Ural-Volga area. 112/

C. Refinery Operations.

Before 1951 the operation of the two refineries in Region XII was seriously limited by the availability of crude oil on Sakhalin Island and by the limits of the shipping season for transporting crude oil from Sakhalin to the mainland. Plant No. 409 probably ceased operations during the last calendar quarter of 1949 and did not operate during the first calendar quarter of 1950. 113/ The total crude oil available from Sakhalin to the refineries in 1949 is estimated to be on the order of a half million tons,* considerably less than the estimated throughput capacity of the two plants. The completion of a pipeline from Sakhalin to Komsomol'sk in the latter part of 1951 has enabled Plant No. 409 to operate on a year-round basis since that time. The increasing amounts of Ural-Volga crude oil being shipped to Plant No. 419 in 1954 114/ indicate that Sakhalin still does not produce sufficient crude oil to employ fully the capacity of the two mainland refineries.

Other factors limiting the operations of the two Far East refineries include the corrosive effects on plant equipment of the sulfurous types of crude oil from the Ural-Volga area, 115/ a lack of sufficient storage facilities when shipments of finished products from the refineries are delayed, and the extreme low temperatures during the winter season.

Estimated crude oil charges to refineries in Region XII of the USSR during the 1948-54 period are shown in Table 6.**

* See Table 6, p. 32, below.

** Table 6 follows on p. 32.

Table 6

Estimated Crude Oil Charges to Refineries
in Economic Region XII of the USSR
1948-54

Year	Source	Amount (Thousand Metric Tons) Plant No. 409	Plant No. 419	Total	Estimated Margin of Error (Percent)
1948	Sakhalin	225 to 250	200 to 225	425 to 475	±10
1949	Sakhalin				
	Ekhabi	230 to 245	200 to 220	430 to 465	
	Katangli		15	15	
	Okha		10	10	
	Total	230 to 245	225 to 245	455 to 490	±10
1950	Sakhalin				
	Ekhabi	450		450	
	Katangli/Okha		25	25	
	Ural-Volga		225	225	
	Total	450	250	700	±15
1951	Sakhalin				
	Ekhabi	450 to 500		450 to 500	
	Katangli/Okha	15	70	85	
	Ural-Volga		350 to 400	350 to 400	
	Total	465 to 515	420 to 470	885 to 985	±15

Table 6

Estimated Crude Oil Charges to Refineries
in Economic Region XII of the USSR
1948-54
(Continued)

Year	Source	Amount (Thousand Metric Tons)			Estimated Margin of Error (Percent)
		Plant No. 409	Plant No. 419	Total	
1952	Sakhalin				
	Ekhabi	450 to 525		450 to 525	
	Katangli/Okha	20	85	105	
	Ural-Volga		380 to 420	380 to 420	
	Total	470 to 545	465 to 505	935 to 1,050	±15
1953	Sakhalin				
	Ekhabi	450 to 550		450 to 550	
	Katangli/Okha	25	100	125	
	Ural-Volga		420 to 440	420 to 440	
	Total	475 to 575	520 to 540	995 to 1,115	±15
1954	Sakhalin				
	Ekhabi	450 to 550		450 to 550	
	Katangli/Okha	30	120	150	
	Ural-Volga		430 to 450	430 to 450	
	Total	480 to 580	550 to 570	1,030 to 1,150	±15

D. Refinery Output.

Total refined product output of Plant No. 409 and Plant No. 419 is estimated at between 85 and 90 percent of the crude oil charge, 906,000 to 1,012,000 tons of products in 1954. There is no information available on which to base a realistic estimate of the pattern of product yield. The following products are believed to be produced currently at the two Far East refineries.

1. Aircraft Engine Fuels.

Except for grade B-70, which is a high-octane, straight-run gasoline, and grade B-89, which is grade B-70 modified only by the addition of tetraethyl lead, neither plant is believed to produce reciprocating engine aircraft fuel from local resources. Grades B-93, 116/ B-95/115, 117/ and B-95/130 118/ are produced by blending locally produced base stocks with components shipped to the refineries from sources elsewhere in the USSR. The components used in blending at Plant No. 409 include iso-octane, 119/ alkyl benzol, 120/ and toluene, 121/ and at Plant No. 419, iso-octane 122/ and pyrobenzol. 123/

Of the two Far East refineries, only Plant No. 409 is known to produce jet-engine aircraft fuel T-1.* The manufacture of T-1 at Plant No. 409 is estimated to have begun in 1950. 124/ The analyses of Ekhabi crude oils indicate that the content of distillate suitable for the production of jet fuel is sufficiently high to enable a maximum production of 35 percent of fuel which would meet the 1954 Soviet jet fuel specification. 125/ An attempt to produce this maximum, however, would preclude the production of any kerosine or ligroine** and would reduce substantially the gasoline and diesel fuel yield. It is estimated that between 20 and 25 percent of Soviet jet fuel T-1 could be produced from a unit weight of Ekhabi crude oil and permit concurrent production of gasoline, kerosine, and related products.

* T-1 is a kerosine-type fuel, similar to US grade JP-1, for use in jet-engine aircraft.

** Ligroine is a light distillate product used as a fuel for tractors.

2. Nonaircraft Distillate-Type Fuels.

Motor gasoline, ligroine, tractor kerosine, and diesel fuel appear to have been produced by both refineries during the period under consideration. 126/ Although Plant No. 419 continues to manufacture motor gasoline, 127/ there is no evidence to indicate that since 1948 Plant No. 409 has produced any sizable quantities of finished motor gasoline. It has been observed to ship motor gasoline base stock to Plant No. 419. 128/ The high-quality gasoline fractions from Ekhabi crude oil which Plant No. 409 has processed in recent years may be conserved for use in the production of aviation gasolines. It is also conceivable that a portion of the materials that might be used in motor gasoline is being diverted to the manufacture of jet fuel T-1.

Illuminating kerosine is not believed to be produced in either refinery in Region XII. Both plants manufacture some grades of diesel fuel for use in high-speed engines. 129/ Plant No. 409 is also capable of producing the "special-grade" diesel fuel which is considered suitable for use in diesel-propelled submarines. 130/

3. Lubricating Oils.

No lubricating oils are produced in either refinery in Region XII. Lubricants in the form of nigrol (transmission oil) and axle oil, both of which are essentially residual products similar to mazut, were reported as having been produced at Plant No. 419 during 1954. 131/

4. Residual-Type Products.

Both Plant No. 409 and Plant No. 419 produce heating mazut and bunker fuel. 132/ Plant No. 419 produces various grades of bitumen (asphalt). 133/ Another unidentified product, probably in a category between boiler fuel oil and bitumen, is known to have been produced at Plant No. 419 134/ in small quantities.

II. Synthetic Refineries.

A. Combine 16, near Irkutsk (Economic Region XI).

Based on plans developed by a German firm, Combine 16 was to have been designed in two sections to process annually a total of approximately 9.5 million tons of bituminous coal to yield the following 135/:

	Metric Tons per Year
Aviation gasoline	800,000
Iso-octane	212,000
Lubricating oils	84,000
Sulfur	17,000
Liquefied petroleum gases	232,000
Phenol	68,000

The design also provided for the alternative production of motor gasoline, diesel fuel, and nitration-grade toluene at the sacrifice of the aviation gasoline yield.

Although Combine 16 was scheduled for construction in 1946, 136/ lack of materials and funds for the project delayed construction, and it had not been completed at the end of 1951. 137/ It is possible that deficiencies in the electrical system and shortages of coal delayed operations on a commercial scale until sometime after 1953. 138/

Except for the reported production of tar and semicoke in the spring of 1954, 139/ there were no indications that the plant had attained commercial production of liquid fuels prior to June 1954, when motor gasoline was shipped from Combine 16. 140/ Significant quantities of motor gasoline, illuminating kerosine, and diesel fuel oil were produced during the last half of 1954. 141/ The total of these products, which represents shipments on about 20 days of the 7-month period, is approximately 25,000 to 30,000 tons. On the basis of this coverage, the total shipped during the 7-month period is estimated at not less than 50,000 tons. There is insufficient evidence available at the present time on which to base a quantitative estimate of the capabilities of this plant.

The absence of any reference to the production of petroleum products for which the plant was primarily designed indicates either that construction of all elements of the plant had not been completed or that the operation has been modified to produce products other than those originally planned. Therefore, the construction of facilities which would be used in the production of high-quality aviation gasoline or blending components may have been deferred and emphasis placed on the development and/or operation of those less complicated facilities which could be used to produce, among other things, kerosine-type jet fuel.

Although there is no positive evidence to support such a conclusion, it is possible that the plant is using natural crude oil as raw material instead of coal, for which the plant was originally designed.

B. Others.

The following installations, which are described as synthetic fuel plants, are actually low-temperature carbonization plants and are, therefore, relatively unimportant to the petroleum industry.

a. Synthetic Liquid Fuel Plant No. 1, Leninsk-Kuznetskiy (54°38' N - 86°10' E), Region IX
b. Synthetic Liquid Fuel Plant No. 4, Cheremkhovo (53°09' N - 103°04' E), Region XI
c. Synthetic Liquid Fuel Plant No. 22, Gornozavodsk (46°23' N - 141°51' E), Region XII
d. Synthetic Liquid Fuel Plant No. 23, Uglezavodsk (47°26' N - 142°27' E), Region XII

Plant No. 1 and Plant No. 4 produce small amounts of semi-coke, tar, bitumen, casting binder, carburizing agents, antiseptic, and phenols. 142/ Plant No. 22 and Plant No. 23, which were transferred to the Ministry of the Coal Industry in June 1954, 143/ produce small amounts of liquid fuel and tar paper. 144/

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APPENDIX B

CIVIL CONSUMPTION OF PETROLEUM PRODUCTS IN ECONOMIC REGIONS IX, XI, AND XII OF THE USSR

I. Economic Region IX.

Civil consumption of petroleum products in Region IX is estimated to have increased from about 1.7 million tons in 1950 145/ to about 2.2 million tons in 1954.* Available information does not permit a breakdown of this total by product or by consuming sector.

II. Economic Region XI.

A. Over-All Level of Civil Consumption.

Petroleum consumption within Region XI is estimated at approximately 437,000 tons in 1949 and 510,000 tons in 1950. By 1954 it had risen to approximately 807,000 tons, an increase of 58 percent.

The product breakdown of petroleum consumed remained substantially the same in 1950 as in 1949, the greatest change being a decrease of 2 percent in the consumption of ligroine. The product breakdown for 1950, however, is based only on consumption within Irkutsk Oblast, Chita Oblast, and the Buryat-Mongol ASSR, which accounts for approximately three-fifths of the total products consumed in the region in 1950. Estimated consumption of petroleum products in Economic Region XI of the USSR in 1949 and 1950 is shown in Table 7.** There are no available data on which to base estimates of product breakdowns for years later than 1950.

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* The 1954 figure is estimated by applying the observed percentage increase for 1954 over 1950 in Primorskiy Kray (see Table 8, p. 46, below) to the 1950 estimate for Region IX.

** Table 7 follows on p. 40.

Table 7

Estimated Consumption of Petroleum Products
in Economic Region XI of the USSR
1949-50

Product	1949 (Percent)	1950 (Percent)
Motor gasoline	38	39
Kerosine	27	28
Diesel fuel	10	11
Ligroine	8	6
Mazut	7	7
Avtol	5	5
Motor fuel	4	3
Other	1	1

B. Consumption within the Administrative Subdivisions.

In 1950, Krasnoyarskiy Kray and Irkutsk Oblast accounted for more than 65 percent of the total civil consumption of petroleum products in Region XI. Estimated consumption in the six administrative subdivisions in 1950 is as follows:

	Metric Tons
Krasnoyarskiy Kray	182,600
Irkutsk Oblast	153,000
Chita Oblast	90,500
Buryat-Mongol ASSR	60,200
Yakutsk ASSR	15,000
Tuva Autonomous Oblast	Less than 10,000

The estimated consumption in Yakutsk ASSR is not believed to include deliveries to the Northern Sea Route or to units of Dal'stroy within Yakutsk ASSR. There may have been additional deliveries on direct shipment* to other consumers in remote areas of Yakutsk ASSR. The plan for cargo shipments in 1955 on the Lena River, which is virtually the only means of transport north of Yakutsk, included 106,000 tons of petroleum products. 146/ In addition to deliveries to civil consumers through the Oil Sales Directorate, this would include deliveries to military consumers, to the Northern Sea Route, to Dal'stroy, and to any other civil consumers receiving direct shipments.

C. Principal Consumers.

In Region XI as a whole, agricultural activities and enterprises of the MVD were the largest consumers of petroleum products in 1949. Agriculture consumed almost 75 percent of the kerosine and ligroine in the region 147/ as well as substantial amounts of motor gasoline 148/ and diesel fuel. 149/ The MVD consumed a large share of the diesel fuel 150/ and motor gasoline 151/ in the region. The coal industry was also an important consumer of diesel fuel 152/ and motor gasoline, 153/ and the Procurement Ministry consumed sizable amounts of motor gasoline. 154/

In Chita Oblast and the Buryat-Mongol ASSR, metallurgical enterprises were important consumers of motor gasoline, 155/ and in Chita Oblast the electric power industry also consumed motor gasoline. 156/ In Krasnoyarskiy Kray the river fleet was a major consumer of diesel fuel. 157/ The timber industry and agricultural enterprises were the principal consumers of all petroleum products in Yakutsk ASSR. 158/

* Not delivered by the local Oil Sales Directorate

III. Economic Region XII.

Total civil consumption of petroleum in Region XII, which includes the entire eastern coast area of Siberia from Vladivostok to the Chukotsk Peninsula, was approximately 753,000 tons in 1949. By 1954 it had increased more than 50 percent to about 1.2 million tons.

A. Khabarovskiy Kray.

In Khabarovskiy Kray the civil consumption of petroleum products, amounted to about 278,000 tons in 1949. By 1954 it had increased more than 50 percent to approximately 428,000 tons. The figure for 1949 includes consumption for Kamchatka, which accounted for a very small part of the total, but does not include those shipments from Vladivostok to Dal'stroy, which are included in the consumption in Primorskiy Kray.

In 1949 the principal products consumed in Khabarovskiy Kray were heating mazut (about 30 percent of the total) and motor gasoline (about 27 percent of the total). The principal consumers of heating mazut were the Amur River Steamship Agency and various industries -- in particular, the metallurgical plant at Komsomol'sk. Consumption in Amur Oblast (Blagoveshchensk) differed from that of the kray as a whole. Amur Oblast consumed sizable amounts of both ligroine and kerosine, most of which were delivered to the Ministry of Agriculture. 159/ In 1954, motor gasoline and heating mazut remained the principal products consumed in Khabarovskiy Kray. Consumption of motor gasoline had increased significantly since 1949 and comprised about 45 percent of the estimated total. Heating mazut increased only slightly over the 1949 level and in 1954 accounted for about 25 percent of the total consumption. Diesel

fuel consumption increased from about 44,000 tons (16 percent of the total) in 1949 to about 73,000 tons (17 percent of the total) in 1954, and the consumption of both kerosine and ligroine decreased. The decrease in ligroine consumption was quite significant -- from about 23,000 tons in 1949 to about 7,000 tons in 1954.

In addition to the consumption figures given above, Plant No. 126 of the Ministry of the Aviation Industry located at Komsomol'sk has received direct shipments of jet fuel from other directorates. The first such shipment was observed in 1950, 160/ and in 1953 regular shipments from Ufa occurred in each of the months from August through November. 161/ These shipments varied from 280 to 440 tons per month. It is believed that shipments of jet fuel to this plant would continue on a regular basis and would amount to about 4,000 tons in a year. No other regular recipients of direct shipments have been observed, except for those plants that receive heating mazut and have been accounted for in the estimated consumption of heating mazut in the kray.

B. Primorskiy Kray.*

Total civil consumption of petroleum products in Primorskiy Kray is estimated to have been approximately 425,000 tons in 1949. By 1953 it had increased about 50 percent to approximately 650,000 tons. This includes products shipped from Vladivostok to Dal'stroy, which is not actually in Primorskiy Kray.

* See Table 8, p. 46, below.

Because distribution in Kamchatka Oblast was transferred to the jurisdiction of the Primorskiy Oil Sales Directorate in the latter part of 1953, the total consumption of Primorskiy Kray in 1954 includes the consumption in Kamchatka, which is estimated roughly at 30,000 tons.* Thus the civil consumption in Primorskiy Kray, including Kamchatka Oblast, is estimated at 680,000 tons in 1954.

Primorskiy Kray is not important as an agricultural economy, nor does it have any large industrial enterprises. The fishing industry and merchant shipping are the major industries, and the petroleum consumed reflects their requirements for petroleum products. In 1949, 42 percent of the petroleum consumed was mazut, 20 percent was diesel fuel, and 18 percent was motor gasoline. By 1953, diesel fuel, which had increased tremendously in importance throughout the USSR, 166/ comprised 35 percent of the petroleum consumed in the area; mazut, 31 percent; and motor gasoline, 25 percent.

Approximately 87 percent of the mazut was consumed by the Ministry of the Maritime and River Fleet in 1952 and 1953, and the fish industry accounted for an additional 7 percent. 167/ Dal'stroy was the largest consumer of diesel fuel during the period covered in this report, accounting for 48 percent of the total in 1952. The fish industry consumed 25 percent, and the merchant fleet consumed 18 percent. 168/ These were also the principal consumers of diesel fuel in 1949. 169/ Dal'stroy was also the largest consumer of motor gasoline, its deliveries amounting to approximately 56,000 tons 170/ (70 percent of the total consumption) in 1949, and approximately 90,000 tons (55 percent of the total) in 1953.

The total petroleum products shipped to Dal'stroy from Vladivostok in 1953 amounted to approximately 193,200 tons. The diesel fuel and mazut delivered to the Ministry of the Maritime and River Fleet amounted to approximately 216,650 tons, and deliveries of diesel fuel and mazut to the fish industry amounted to approximately 70,500 tons. After deducting these amounts from the estimated total production consumed, there remained approximately 168,000 tons of petroleum products for all other consumers throughout Primorskiy Kray in 1953.

In addition to products delivered from Vladivostok, Dal'stroy received an occasional tanker cargo direct from the Black Sea or from Sakhalin Island. In 1953, approximately 12,000 tons of gasoline were shipped from Rumania 171/ and 17,000 tons of crude oil from Sakhalin. 172/ The crude oil presumably is used as fuel oil. Thus the total petroleum delivered to Dal'stroy in 1953 amounted to 222,200 tons. In 1954, Dal'stroy received approximately the same amount of crude oil from Sakhalin 173/ and approximately 30,000 tons of diesel fuel from Batumi. 174/

C. Sakhalin Island.

The consumption of petroleum products on Sakhalin Island, was approximately 50,000 tons in 1949. Deliveries from the Sakhalin Oil Sales Directorate, however, do not represent total civil consumption on Sakhalin. The Far East Oil Association (Dal'neft') on North Sakhalin has its own topping plant which supplies its requirements for motor gasoline, kerosine, and mazut. 175/ It also supplies some products to other consumers. 176/ In addition, Dal'neft' is believed to receive direct shipments of diesel fuel

Thus the bulk of the petroleum consumed by Dal'neft', which probably is the largest consumer of petroleum products on Sakhalin, is not included in the 1949 consumption estimate of approximately 50,000 tons.

There is very little available information regarding petroleum consumption on Sakhalin after 1949. On the basis of the observed increase in consumption in Primorskiy Kray of 50 percent in 1954 over 1949, therefore, the petroleum consumption on Sakhalin, exclusive of Dal'neft', is estimated to have been approximately 75,000 tons in 1954.

Sakhalin was brought under the jurisdiction of the Primorskiy Oil Sales Directorate for the supply of petroleum products in the latter part of 1953. The Sakhalin consumption in 1954, however, has not been included with the consumption in Primorskiy Kray,

The estimated civil consumption of petroleum products in Primorskiy Kray in Economic Region XII of the USSR during the 1949-54 period is shown in Table 8.

Table 8

Estimated Civil Consumption of Petroleum Products in Primorskiy Kray in Economic Region XII of the USSR
1949-54

Metric Tons

Product	1949	1950	1951	1952	1953	1954
Motor gasoline	78,800	112,800	117,400	135,000	163,000	N.A.
Ligroine	7,400	6,800	6,300	5,700	1,000	N.A.
Tractor kerosine	22,300	19,300	18,300	17,200	17,200	N.A.
Lamp kerosine		3,700	3,700	3,700	3,600	N.A.
Diesel fuel	85,100	160,000	131,800	232,200	225,200	N.A.
Engine fuel	41,200	43,800	14,500	18,400	16,500	N.A.
Mazut	180,000	173,800	191,500	190,500	202,500	N.A.
Avtol	8,900	8,400	15,800	17,500	19,000	N.A.
Total	423,700	528,600	499,300	620,200	648,000	680,000 a/

a. Estimated to be approximately the same as 1953, plus an estimated 30,000 tons consumed in Kamchatka Oblast.

APPENDIX C

PRINCIPAL PETROLEUM STORAGE FACILITIES AND PIPELINES IN ECONOMIC REGIONS IX, XI, AND XII OF THE USSR

1. Crude Oil Storage.

Most of the crude oil storage facilities in Region XII are concentrated on Sakhalin Island. Some storage, however, is available at the refineries and the transshipment terminal at Sofiyskoye.

Estimated crude oil storage capacity on Sakhalin Island in Region XII of the USSR is shown in Table 9. No information is available on storage facilities at Sofiyskoye.

Table 9

Estimated Crude Oil Storage Capacity on Sakhalin Island a/ in Economic Region XII of the USSR

Location	Number of Tanks	Size (Metric Tons)	Total (Metric Tons)
Okha	6	5,000	30,000
	13	10,000	130,000
Kaygan (Zaliv Urkt)	13	10,000	130,000
Subtotal			290,000
Moskalvo	4	5,000	20,000
	7	10,000	70,000
Subtotal			90,000
Katangli (Zaliv Nabilskiy)	6	5,000	30,000
	5	10,000	50,000
Subtotal			80,000
Total			460,000

Crude oil storage at the refineries is assumed to be equal to the quantity of crude oil necessary for 60 days' operation. This represents the expansion of a 45-day level used in some plants in the US where climatic conditions and routes of communication exert less influence on operations than in the Far East. Therefore, the estimated throughput per month and storage capacity for crude oil at Plant No. 409 are 70,000 tons and 140,000 tons, respectively, and the estimated throughput per month and storage capacity for crude oil at Plant No. 419 are 50,000 tons and 100,000 tons, respectively.

2. Refined Product Storage.

Identified facilities for the storage of petroleum products in Regions IX, XI, and XII of the USSR are shown in Table 10.

Table 10

Identified Facilities for the Storage of Petroleum Products in Economic Regions IX, XI, and XII of the USSR 179/

Location	Coordinates	Capacity (Thousand Metric Tons)
Economic Region IX		
Berdsk	54°45' N - 83°00' E a/*	40
Biysk	52°36' N - 85°15' E a/	30
Barnaul	53°21' N - 83°47' E a/	15
Novosibirsk	55°02' N - 82°55' E a/	10 b/
Omsk	54°58' N - 73°25' E a/	10
Other installations (less than 10,000 tons each)		35 c/
Total		140 d/

* Footnotes for Table 10 follow on p. 51.

Table 10

Identified Facilities for the Storage of Petroleum Products in Economic Regions IX, XI, and XII of the USSR 179/
(Continued)

Location	Coordinates	Capacity (Thousand Metric Tons)
Economic Region XI		
Chita	52°03' N - 113°30' E a/	10
Irkutsk	52°16' N - 104°18' E a/	35
Krasnoyarsk	56°02' N - 92°48' E a/	30
Makaryeva	53°07' N - 103°22' E a/	53 e/
Tayshet	55°57' N - 98°02' E a/	20
Ulan-Ude	51°49' N - 107°43' E a/	10
Other installations (less than 10,000 tons each)		90 f/
Total		248 d/
Economic Region XII		
Blagoveshchensk	50°17' N - 127°32' E a/	10
Nevel'sk	46°40' N - 141°52' E a/	10
Khabarovsk -- Refinery	48°30' N - 135°03' E	30 g/
Khabarovsk -- Southwest of city	48°30' N - 135°06' E	50
Khabarovsk-Zayachvy	48°35' N - 135°02' E	11
Komsomol'sk -- Refinery	50°37' N - 137°03' E	70 g/
Komsomol'sk -- Navy	50°33' N - 136°59' E	10

Table 10

Identified Facilities for the Storage of Petroleum Products in Economic Regions IX, XI, and XII of the USSR 179/ (Continued)

Location	Coordinates	Capacity (Thousand Metric Tons)
Economic Region XII (Continued)		
Magadan-Nagayevo	59°34' N - 150°42' E	19
Magadan, North	59°37' N - 150°50' E	14
Uglezavodsk	47°19' N - 142°37' E	20 h/
Gornozavodsk	46°33' N - 141°51' E	10 h/
Nakhodka	42°50' N - 132°53' E	25
Korsakov, West	46°38' N - 142°46' E	50 b/
Korsakov, Northwest	46°38' N - 142°47' E	25
Korsakov, Southeast	46°36' N - 142°48' E	24 b/
Petropavlovsk-Kamchatskiy	53°00' N - 158°41' E	15
Petropavlovsk-Kamchatskiy (Sero)	53°00' N - 158°41' E	10
Provideniya	64°27' N - 173°10' E a/	12
Sovetskaya-Gavan	49°04' N - 140°18' E a/	50 b/
Svobodnyy	51°24' N - 128°08' E a/	10
Uglovaya	43°21' N - 132°06' E a/	15
Varfolomeyevka	44°18' N - 133°27' E a/	40
Vladivostok-Lagernyy	43°09' N - 131°54' E	90
Vladivostok - Pervaya Rechka	43°10' N - 131°55' E	50

Table 10

Identified Facilities for the Storage of Petroleum Products in Economic Regions IX, XI, and XII of the USSR 179/
(Continued)

Location	Coordinates	Capacity (Thousand Metric Tons)
Economic Region XII (Continued)		
Vladivostok - Mys Guldobina	43°06' N - 131°53' E	19 b/
Vladivostok - Bukhta Ulis	43°05' N - 131°55' E	10 b/
Voroshilov	43°48' N - 131°56' E	10
Other installations (less than 10,000 tons each)		223 i/
Total		932 d/
Total for Economic Regions IX, XI, and XII		1,320

a. Approximate coordinates.
b. Underground storage.
c. Representing the total of 20 installations.
d. Rounded to the nearest 1,000.
e. Allied with a synthetic fuels plant.
f. Representing the total of 49 installations.
g. Excluding crude oil storage.
h. Plants allied with these installations are now under the jurisdiction of the Ministry of the Coal Industry.
i. Representing the total of 82 installations.

Table 10 shows storage capacities at each identified installation having a total capacity in excess of 10,000 tons and the aggregate capacities of all installations with a total capacity of less than 10,000 tons. The total estimated capacity of about 1.32 million tons represents about 12 percent of the capacity of 11.1 million tons estimated for the USSR.

3. Pipelines.

a. Crude Oil Pipelines.

Identified crude oil pipelines in Economic Regions IX, XI, and XII of the USSR are shown in Table 11.* The table shows the known characteristics of the pipeline network serving the crude producing areas on Sakhalin Island. The exact date at which the integrated pipeline between Okha (Sakhalin) and the Komsomol'sk refinery on the mainland began operation is unknown. That section between Okha and Sofiyskoye apparently was operating at least by 1949. 180/ The section of the line between Sofiyskoye and Komsomol'sk was apparently still under construction, or at least was not in full operation, during the third quarter of 1952. 181/ suggests that the line was serviceable to Komsomol'sk. On this basis the crude oil line between Okha and Komsomol'sk may have been operating by the end of 1952.

The crude oil pipeline connecting Okha and the marine terminal at Moskalvo, which was in service at least by 1947, is still in operation. Available information suggests that the pipeline to the mainland represents an extention of this older line from Laguri, which is approximately midway between Okha and Moskalvo. It is possible, however, that the line to the mainland may include a new section paralleling the old line from Okha to Laguri. There is a single reference in 1953 to construction of a crude oil pipeline to serve the Paromay (52°49' N - 143°03' E) area on Sakhalin. 183/

In addition to these crude oil pipelines in the Far East, there was to equipment for use by the Tuymazy-Omsk Oil Pipeline Directorate. 184/ There was, however, no to a pipeline as such. It is possible that such a line, if it exists, may actually be a section of the Urbakh-Novosibirsk product pipeline.

* Table 11 follows on p 53.

Table 11

Identified Crude Oil Pipelines
in Economic Regions IX, XI, and XII of the USSR

Terminals	Length a/ (Kilometers)	Diameter a/ (Centimeters)	Completed
Katangli-Kaygan (Zaliv Nabilskiy) b/	7	15	Pre-World War II
Ekhabi-Okha Line			
South Ekhabi - Okha Section via Kaygan (Zaliv Urkt) b/	25	15	1947
West Ekhabi - Okha Section b/	11	25	Pre-World War II
Okha-Sofiyskoye-Komsomol'sk Line			
Okha-Laguri Section b/	8	15	Pre-World War II
Laguri-Moskalvo Section b/	25	20	Pre-World War II
Laguri-Pogobi Section b/	180	30	1949
Pogobi-Lazarevka Section b/	8	30	1949
Lazarevka-Dekastri Section c/	100	30	1949
Dekastri-Sofiskoye Section d/	75	30	1949
Sofiyskoye-Komsomol'sk Section e/	250	30	1952

a. Approximate.
b. 185/
c. 186/
d. 187/
e. 188/

b. Product Pipelines.

1953 identifies a pipeline serving the general area of Magadan on Nagayevo Bay in Northeast Siberia. It is estimated that this line connecting 3 storage areas in the vicinity of Magadan is about 20 centimeters in diameter and in 1947 extended to the town of Palatka, approximately 65 kilometers due north of the city of Magadan. There were reports that the ultimate terminus of this line would be in the Kolyma gold fields. 189/

An important product pipeline to connect Urbakh (51°14' N - 47°00' E) in Region VI and Novosibirsk in Region IX has been under construction for several years. The approximate route and dates that the sections went into service are shown in the following tabulation:

Urbakh to	Rail Distance (Kilometers)	Date of Operation
Kuybyshev	410	N. A.
Ufa	930	September 1952 190/
Sineglazovo	1,410	January 1953 191/
Kurgan	1,670	October 1953 192/
Petropavlovsk	1,940	September 1954 193/
Omsk	2,210	December 1954 194/
Novosibirsk	2,840	Early 1956 (forecast)

There is a petroleum product line operating in Region VI between Astrakhan' and Saratov. 195/ As Urbakh is only about 50 miles southeast of Saratov, it is conceivable that there is a relationship between this line and the Urbakh-Novosibirsk line.

The diameter of the Urbakh-Novosibirsk line is unknown. In view of the distance involved, it is unlikely that the USSR would have made such an investment in a line less than 8 inches in diameter. The line appears to be used for refined products, and it is unlikely that it would be larger than 12 inches in diameter; for this purpose a larger line might pass the point of diminishing returns. In the US an 8-inch

line would have a throughput capacity of approximately 3,700 tons per day, and a 12-inch line would have a capacity of over 9,000 tons per day. 196/

In addition to the transmission capabilities of the line, it also possesses significant storage potential. A completely filled 8-inch line of this length would contain approximately 70,000 tons of refined products; a 12-inch line would contain about 160,000 tons. *

* Based on a rule-of-thumb estimate that the square of the diameter in inches is equal to the number of barrels (42 US gallons) per 1,000 feet. (8.5 barrels are equal to 1 metric ton.)

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APPENDIX D

METHODOLOGY

The major quantitative estimates contained in this report are based on detailed studies which, because of the bulk of the data involved, it would be impracticable to publish as parts of the report. Those studies have been compiled in fully documented appendixes which are available in the files of the responsible branch of ORR.

The estimates of production of petroleum in Economic Regions IX, XI, and XII of the USSR are based largely on percentage increase figures and shipping information. Estimates of the production of petroleum products are based on studies of the individual refineries in the regions. Quantitative estimates of distribution are based on all available data on shipments of petroleum and petroleum products into the regions, within the regions, and out of the regions to Communist China, North Korea, and Outer Mongolia, by rail, river, and sea. Quantitative estimates of consumption are based principally on delivery reports by local Oil Sales Directorates. Estimates of the exports of jet fuel and aviation gasoline from the Komsomol'sk Refinery are based on an analysis of the observed bill of lading numbers.

In addition to the data on crude oil production, refineries, shipments, and consumption, the appendixes on file contain information on the principal oilfields and prospecting areas, selected inputs and cost of production, and the location of State Reserves Storage Depots.

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APPENDIX E

GAPS IN INTELLIGENCE

There are major gaps in available information on all phases of the petroleum industry in Economic Regions IX, XI, and XII of the USSR. The major gaps are considered to be as follows:

1. Production output of Plant No. 409 at Komsomol'sk since 1950.
2. Present production capabilities of Combine 16.
3. The operating status and capabilities of the Omsk Refinery.
4. Capacity of the Urbakh-Novosibirsk products pipeline.
5. Military requirements for petroleum products in all three regions.
6. Civil consumption requirements by product in Region IX.
7. Civil consumption requirements by product in Region XI in 1954.
8. Petroleum exports by product to Communist China.
9. Extent of the stockpiling program.

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APPENDIX F

SOURCE REFERENCES

An attempt has been made to survey all available sources in the preparation of this report.

Of the collateral open-source material used in the preparation of this report, no source evaluated lower than RR 3 has been incorporated. The following types of Soviet open-source materials were screened and used in the synthesis of Sections II and III to the degree indicated:

1. Regional Press.

   The regional press was extensively screened. Coverage varied from a few scattered issues to extensive coverage for years before 1948. A number of useful articles were found in the newspapers Sovetskiy Sakhalin and Tikhookeanskaya zvezda.

2. Central Press.

   The central press was checked on a lead basis and yielded a few useful articles.

3. Technical and Economic Periodicals.

   Technical and economic periodicals were extensively screened. Neftyanoye khozyaystvo and Vnigri trudy yielded a few useful articles.

4. Technical Books.

Technical books were extensively screened. The books by Fedorov, Velikovskiy, and Pavlova were especially useful.

5. General Books.

Regional geographies and the like were checked on a lead basis, but they yielded relatively little.

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

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

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

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