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PETROLEUM RESOURCES
WITHIN THE USSR

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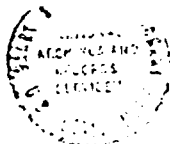
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PETROLEUM RESOURCES WITHIN THE USSR

SUMMARY

General.

The extent of fulfillment of the current Soviet Five-Year Plan for petroleum cannot be accurately predicted, since it depends not only upon capabilities inherent in the petroleum industry itself but also upon the progress achieved in other industries and, more importantly, upon expediencies dictated by Communist Party strategy. The implementation of Party strategy is readily effected through Government control of economic activities enabling Soviet administrators to revise industrial priorities to the extent feasible to meet a changing situation.

Organizational Control.

Since the governmental reorganization of 4 March 1946, the exploitation of petroleum resources, formerly under Geographic Combines supervised by a central Commissariat for Petroleum, has been the responsibility of two separate ministries: Petroleum Ministry, South and West, and Petroleum Ministry, East. The former has jurisdiction over the Caucasus, Ukraine and other areas of Western Russia; the latter over the Volga-Urals, Central Asia and the Far East. Pechora (Ukhta field and refinery) is reported to be under the direct control of the Ministry of Internal Affairs.

Under the present organization, control is centralized in each Ministry on a functional basis, thus eliminating the pre-1945 practice of vesting the control of exploration, drilling, production and refining in the Geographic Combines which in turn required each operating branch to clear through the head of the Combine before discussing even purely technical problems with an opposite number in the Central Moscow Commissariat. These organizational changes are indicative of (1) a willingness to modify existing concepts of industrial organization if increased operating efficiency is likely to result, and (2) the administrative implementation of a policy to build up oil output in the eastern fields.

Reserves (see Enclosure A).

While little is known regarding Russia's potential store of oil, in view of the existence of vast areas favorable to the accumulation of petroleum, it is possible that total reserves are at least as large as those of any world power. Proven reserves, however, the measure of oil



reasonably certain of being produced by current practices with equipment now available, are much smaller. Estimates of proven reserves vary from 300 million to 1 billion metric tons. The latter figure, which is the official Soviet estimate for 1938, is about 1/10 of proven world reserves and about 1/3 of like reserves in the United States.

Production (see Enclosure B).

The Fourth Five-Year Plan calls for a progressive annual increase in crude oil output from 19.4 million metric tons in 1945 to 35.4 million metric tons in 1950. If viewed as a five-year goal beginning with 22.6 million metric tons in 1946, this rate of increase in production is greater than that set in any previous Five-Year Plan. However, if the 1940 crude oil output of 31.2 million metric tons is used as a reference, the goal appears realizable without undue strain elsewhere in the Soviet system of economy. This is at once apparent from the table below showing planned percentage increases in output of selected industries between 1940-1950 and 1945-1950:

Industry	Unit of Measurement	Percentage Increase	
		1940-1950	1945-1950
Crude Oil	Million Metric Tons	13.8	82.5
Pig Iron	" " "	30.0	116.7
Steel	" " "	38.8	84.1
Coal	" " "	50.6	70.1
Electric Power Capacity	" Kilowatts	103.6	109.3
Aluminum	Thousand Metric Tons	186.7	100.0
Machine Tools	" Units	49.4	64.3
Gross Industrial Output	Billions 1926-27 Rubles	49.1	61.4

The bulk of Russia's petroleum comes from the Caucasus. The Volga-Urals and Central Asia, areas referred to as the Eastern Fields, rank next in importance. Sakhalin, Old Polish Galicia and Ukhta, though minor producing areas by comparison, are important by reason of geographic location. The extent to which the annual crude oil production quotas will be met during the next five years is dependent, in large measure, on the following considerations:

- a. The extent to which production at Baku can be revived.
- b. The rapidity with which the devastated oil fields of Maikop-Krasnodar and West Grozny in the Caucasus can be rehabilitated.
- c. The measure of success attained in increasing the annual rate of drilling hole from the 1945 figure, which was well under the 1.9 million meters drilled in 1940, to approximately 4. million meters in 1950. Fulfillment of this drilling

program in turn is predicated upon a rise of 20% in commercial drilling and 30% in exploratory drilling per rig per month; a substantial increase over 1945 in the number of working rigs; development of improved equipment to obtain greater drilling depths; more extensive use of geophysical prospecting; and increased output of drilling machinery, pipe, and supplies.

d. Repair of pipelines and railroads in the Caucasus to pre-war operating capacity; the building of several moderate length pipelines and railroads connecting oil fields with refineries in the Eastern oil areas; and the replacement, to required capacity, of tankers on the Black and Caspian Seas and barges on the Volga River.

Refining (see Enclosure C).

Much of the Soviet refining plant is operated at considerably below rated capacity due to obsolescence, lax maintenance, inefficient supervision, and too few experienced personnel. Nevertheless, the petroleum refineries of the USSR can process, with capacity to spare, all crude oil scheduled to be produced in that country under the Fourth Five-Year Plan. Soviet difficulties as regards the refining of petroleum are qualitative rather than quantitative. Much gasoline and lubricating oil is of inferior grade. In general, oil products are produced in accordance with a few basic specifications satisfactory for common uses but unsuited to many specialized requirements.

Transportation (see Enclosure D).

Although petroleum transportation facilities were considerably reduced by war damage, temporary reconstruction measures have progressed sufficiently to permit the handling of all crude oil production. Plans for permanent reconstruction of facilities are phased in with scheduled increases in crude output.

Because of primary dependence on rail transport, the distribution of refined products will in all probability present a more serious transportation problem than getting the crude to the refineries. It is estimated that 40% of the investment in rail facilities, concentrated largely in Western Russia, was lost during the war and that rehabilitation is far from complete. Throughout the USSR there is a general lack of rolling stock, a deterioration of rail facilities, and frequent loading of trains beyond capacity.

Availability of Refined Products (see Enclosure E).

It is not feasible to make an estimate of the total oil product requirements based on the needs of principal consumers. Demand would

certainly exceed supply if requirements for propellants, lubricants and other products of petroleum were met in accordance with American concepts of adequacy. While some deficiencies of high grade lubricants are in prospect, in general it can be assumed that Soviet administrators will succeed in avoiding oil shortages serious enough to interfere with essential industry, agriculture and transportation over prolonged periods or greatly impair the effectiveness of the armed forces. This will be accomplished by absolute control of distribution, a tight system of priorities, and use of inferior products where high grade products are indicated.

Under the circumstances, it seems more useful to ascertain the probable total availability of finished oil products. If the annual crude oil production schedules established for the Fourth Five-Year Plan are met; if combined losses in refining, in transportation and for evaporation do not exceed 10 percent; and, finally, if Russia receives annually from 2. to 3. million metric tons of refined oil products from the satellite countries, apparent supplies will approximate:

	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
Million Metric Tons	22.8	25.8	28.6	31.5	34.4

No information is available regarding storage facilities or oil in storage, but because of wartime heavy demand and reduced production, sufficient time has hardly elapsed to enable the accumulation of substantial stocks.

Future Technological Developments (see Enclosure F).

Notable contributions to the progress of petroleum technology, particularly in the fields of exploration and production, can be expected in the years ahead from the USSR. The turbo system of drilling and the geo-chemical system of prospecting were both developed in the USSR. Although neither have been exploited to any considerable extent elsewhere, some American oil experts are of the opinion that these techniques are not inferior to methods developed for the same purposes now employed in the United States. Based on the record to date, contributions of equal significance to the technology of petroleum refining and transportation cannot be anticipated in the near future.

A map, showing the principal oil fields, crude oil transportation routes, and refineries (throughput and cracking capacity) within the USSR, is attached at the end of this report.

ENCLOSURE A

RESERVES

Immense reserves of petroleum are believed to exist in the USSR. In addition to areas being developed, tested and partially explored, formations favorable for prospecting under-lie vast sections of the country.

Reproduced in the table below is the latest available official estimate of the petroleum reserves for the USSR:

PETROLEUM RESERVES - USSR
(Million Metric Tons)

AREA	Official Russian Estimate 1938		
	Proved & Semi-Proved (A ₁ , A ₂ , & B)	Probable & Possible (C ₁ & C ₂)	Total
<u>Caucasus</u>			
Azerbaidzhan (including Baku)	585.0	1,980.1	2,565.1
Georgia	37.8	139.0	176.8
Dagestan and Grozny	121.6	533.4	655.0
Krasnodar-Maikop and Crimea	22.6	214.1	236.7
<u>Ukhta (Pechora)</u>	1.1	48.5	49.6
<u>Volge-Urals</u>	154.6	2,549.6	2,704.2
<u>Kazakh (Emba)</u>	13.0	1,158.5	1,171.5
<u>Central Asia</u> (Uzbek, Tadzhik, Kirgiz and Turkmen)	19.2	793.0	812.2
<u>Far East (Sakhalin)</u>	22.2	296.1	318.3
<u>TOTAL</u>	977.1	7,712.3	8,689.4

Petroleum reserves can only be approximated at best and figures representing them have little meaning unless fully explained. The Russians define petroleum reserves as follows:

A₁ - Deposits from which petroleum can be extracted by means of existing wells drilled in producing horizons.

A₂ - Surveyed and delimited reserves, or reserves in a producing field ready to be tapped by additional wells efficiently spaced.

B - Reserves in horizons which contain oil as indicated by several existing wells, but not delimited or completely surveyed. Also, in producing fields, "B" reserves may be estimates for lower untapped horizons which are oil producers in adjacent fields.

C₁ - In producing areas this represents reserves in horizons the existence of which is not yet established but is assumed on the basis of the geological structure and location. In areas in which the presence of oil in economic quantities is not yet established, "C" represents reserves assumed to be present in known and, in places, already partly surveyed favorable structures.

C₂ - Reserves in possible favorable structures, the presence and extent of which is assumed from the regional geology.

Few countries aside from the Soviet Union compile probable and possible oil reserves. Such figures are generally considered to have little or no connection with proven reserves. Proven reserves, though not susceptible of accurate measurement, do constitute a uniform concept of the probable existence of oil accepted by oil men in most countries.

American geologists who attended the 17th International Geological Congress in Moscow in 1937 are reported to have estimated total Russian proven oil reserves at approximately one billion metric tons, which compares very well with the official Russian figure for 1938. This figure, however, exceeds other unofficial estimates by about three to one.* Though many specific claims have been made regarding prospects for the extension of old oil fields - discoveries of deeper oil horizons and exploration of favorable geological structures since 1938, no official new estimates of proven reserves are known to have been released.

Annual Report on the Soviet Oil Industry in 1938, Wasselleff, N. K.,
April 1939, 272.4 million of metric tons;
Annual Report on the Soviet Oil Industry in 1939, May 1940, Wasselleff,
N. K., 305.3 million of metric tons;
Petroleum Resources of the USSR (1940) PAW et al 1944, 310.6 million
of metric tons.

ENCLOSURE B

PRODUCTION AND EXPLORATION

Although Russian production of petroleum still is concentrated largely in the Caucasus, a continuation of pre-war efforts is strenuously being made to reduce dependence on this area by building up production in the Eastern fields. It was realized that even a region as prolific as Baku could not be expected indefinitely to sustain a high rate of oil production and that in the event of hostilities the Caucasus area might be difficult of defense. Moreover, the principal fields in the Volga-Urals area are more accessible than Caucasian oil to the new eastern industrial centers. The eastward trend of petroleum production was accelerated during the war when the Caucasus was largely isolated from Western Russia and it is heavily accentuated in the Fourth Five-Year Plan. Important oil-producing areas are individually discussed in subsequent paragraphs.

PETROLEUM PRODUCTION - USSR
(Thousand Metric Tons)

	1940		1945		1950	
	Actual	Per- cent	Esti- mated	Per- cent	Planned	Per- cent
<u>Caucasus</u>	26,900	86.4	13,535	69.8	21,950	62.0
Baku	22,000		11,600		17,000	
Maikop-Krasnodar)						
Grozny)	4,900		1,900		4,840	
Dagestan)						
Georgia	Negligible		35		110	
<u>Ukhta (Pechora)</u>	Unknown		100	.5	300	.8
<u>Ukraine</u>	400	1.3	200	1.0	325	.9
<u>Volga-Urals</u>	1,850	5.9	2,650	13.7	7,315	20.7
Kuibyshev-Volga	250		1,250		3,000	
Bashkiria	1,500		1,300		4,000	
Molotov	100		100		315	
<u>Central Asia</u>	1,537	4.9	1,915	9.9	3,510	9.9
Uzbek	200		515		1,066	
Tadzhik	30		45		60	
Kirgiz	30		55		80	
Kazakh	697		700		1,200	
Turkmen	580		600		1,104	
<u>Far East (Sakhalin)</u>	460	1.5	1,000	5.1	2,000	5.7
TOTAL	31,147	100.0	19,200	100.0	35,400	100.0

Caucasus. Baku was not invaded or seriously bombed during the war, but production had to be shut down for long periods due to the inadequacy of storage and the diversion of men, materials and equipment to other areas during the German invasion. Such enforced shutdowns, together with periods of over-production in the past, have probably impaired permanently the useful life of many fields in the Baku region.

Several measures are scheduled to be undertaken under the Fourth Five-Year Plan to recover and sustain output at Baku. By 1950, the rate of drilling is to exceed the 1940 figure of 960 thousand meters by 25 percent. Additional wells are to be drilled off shore in the Caspian Sea where substantial production is in prospect. Likely oil-bearing areas throughout the Aspheran Peninsula are to be intensively explored and deeper wells are to be drilled all over the Baku region to tap oil horizons as yet little exploited.

It is significant that even accomplishment of the foregoing program is not expected to enable Baku to produce as much oil in 1950 as was produced in 1940.

Although Grozny produced two-thirds as much petroleum as Baku in 1932 (about 8. million metric tons), subsequent exhaustion of the more prolific oil fields had reduced output to slightly under 2.9 million metric tons by 1938, and not until 1941 was the decline partially arrested by finding oil in deeper formations. Although only the West Grozny fields were occupied by the Germans, since re-occupying the fields in 1943, the Russians have had to replace many facilities, restore equipment and replenish stores of all kinds. Production by 1950 is expected to exceed 1945 output by almost 50 percent if exploitation of deep horizons located 80 to 140 kilometers distant from the City of Grozny proceeds as expected.

Before the war, the Maikop-Krasnodar region was considered one of the most promising oil developments in the entire Soviet Union. Production had risen from 531 thousand metric tons in 1931 to 2.3 million metric tons in 1938 and further increases appeared certain. Though completely devastated during the German invasion, an extensive program of rehabilitation already under way is counted on to increase output from approximately 500 thousand metric tons in 1945 to 3. million metric tons in 1950. This is a reasonable goal provided men and equipment are made available, as proved deposits should be productive for many years without the establishment of new reserves.

Production of petroleum in Dagestan and Georgia did not begin until after the war commenced. Prospects appear favorable for a substantial output of oil for these regions, particularly Dagestan, but a large production of petroleum is not anticipated during the next few years. Dagestan output in 1950 is expected barely to exceed 1945 and though a rise in production is planned in Georgia, operations in that area during the next five years apparently will be primarily exploratory.

Ukraine (Old Polish Galicia). It is not surprising that Soviet planners have scheduled no large increase in output for the old Polish fields located mainly in the vicinity of Drogobych and Borislav. Production had declined steadily for years before the war owing to the onerous conditions imposed by the former Polish Government on foreign oil companies operating in that country and the inefficient production methods practiced by the Polish oil industry. Presumably, Soviet officials feel that the production effort necessary to raise output can be more advantageously employed in other areas inside the USSR easier of defense.

Volga-Urals ("Second Baku"). The Fourth Five-Year Plan calls for five times as much drilling in the Eastern fields in 1950 as took place in 1940, and the bulk of this effort is to be concentrated in the Volga-Urals area which includes the important oil-producing regions of Bashkiria and Kuibyshev-Volga. Prior to 1940, most of Bashkiria's production centered at the fields around Ishimbai. Exhaustion of these fields, together with Soviet inability to locate new reserves during the war years, caused a heavy decline in output only partly arrested by the discovery of oil in the deep rocks of the Devonian Age. This fall in production at Ishimbai will probably be more than offset by developments at Tuimazy where output has increased substantially since 1944. High initial production and low rate of decline characterizes the wells which tap Devonian formations in this region.

The Kuibyshev-Volga region which includes all of the oil production in the Kuibyshev Oblast, as well as that of the Buguruslan field in Chkalov Oblast, was the most favored of Soviet oil developments during the war. Production was greatly expanded and operations here received top priority in men and equipment at the time the Caucasus was isolated and output in the Bashkiria region failed to reach expected levels. Like other oil-bearing regions in the Middle Volga, Kuibyshev-Volga is dependent upon oil from deep Devonian rocks to sustain its high rate of production. Typical of these new fields are those at Zhiguli hills in the Samara Bend, said to compare favorably with the best fields at Maikop and Grozny.

The status of oil operations in Molotov Oblast is not clear. Production effort there is being shifted from the field around Krasnokamsk to Severokamsk. This is a logical development, as the Devonian formations at Severokamsk are more prolific than the shallow deposits at Krasnokamsk. Intensive exploitation of the region is scheduled to increase output by 300 percent between 1945 and 1950.

Pechora (Ukhta). Operations at the Ukhta fields in Pechora near the Arctic Circle are believed to be under the Ministry of Internal Affairs as penal labor is largely employed. It is reported that a large modern refinery capable of processing many times the 1950 planned output of 300 thousand metric tons was erected in 1944, permitting the inference that actual production might be higher than that scheduled in the Fourth Five-Year Plan. Although seemingly isolated, the Ukhta fields are accessible by rail.

Central Asia. Loosely grouped as the Central Asia area are the widely scattered oil developments of Uzbek, including the very minor production of Kirgiz and Tadzhik, of Turkmen and Kazakh. Uzbek oil comes almost entirely from the southern part of the Fergana Valley, mostly in the vicinity of Palvantosh and Andizhan, though exploration is planned in areas favorable to prospecting in the northern part of the Valley. Production in Kazakh is concentrated in the Emba District. Prospecting, so far unsuccessful, aimed at extending the field northward, is being done along the pipeline to Orsk and extending as far as the Southern Urals. The Nebit Dag field near Krasnovodsk is the source of all petroleum produced in Turkmen. Oil-bearing areas are believed to extend from the Balkhanski Mountains to the Iranian border and from the Caspian Sea to Kopet Dag. The output of all three regions increased substantially during the war when it was feasible to employ many men and much equipment normally at work in the Caucasus, and future prospects are said to be favorable. It is questionable if planned output for the next five years will be met, since the required drilling rigs and men could probably be used elsewhere to produce oil more accessible to the principal centers of consumption.

Far East. Commercial development of petroleum in the Soviet Far East is confined to Sakhalin where, until 1944, production was shared with the Japanese. It is reported that production in Northern Sakhalin, coming from a narrow belt along the East Coast roughly between the Okha and Noglik Rivers, rose from 460 thousand to 1. million metric tons between 1940 and 1945, and that Russian control of the entire island will probably enable the 1945 output to be doubled by 1950. This latter increase in production is in part predicated upon exploitation of new horizons not yet fully developed. Efforts will undoubtedly be made to exploit fully this region, where every ton of oil produced avoids the long rail haul on the Trans-Siberian line or procurement from foreign sources.

Synthetic Liquid Fuels.

The Russians are familiar with the basic processes for coal liquefaction; they have developed further than anyone else the production of gas by burning coal in mines; for years they have made limited use of producer gas and similar propellants for automobiles, tractors, etc., and it is reported that sapropelite coals in several places in Siberia, where natural petroleum is unavailable, are being processed for liquid fuels.

The Fourth Five-Year Plan calls for an annual output of 900 thousand metric tons of synthetic liquid fuels in 1950. Meeting this goal would seem to depend largely on the extent to which the Russians are able to move equipment from plants like Leuna in Germany to the USSR and make use of German technicians to operate them. It is doubtful if similar equipment of required capacity could be produced during the next five years in the USSR, or sufficient know-how acquired for its efficient operation.

ENCLOSURE D

REFINING

Petroleum refining capacity in the USSR was less adversely affected during the war than production of crude oil. The Germans resorted to little strategic bombing of Russian industrial targets, and several refineries, particularly those in the Black Sea area, were dismantled before German occupation and set up elsewhere in the Soviet Union. Acquisition of petroleum production was the principal objective of the German drive into the Caucasus.

Refining capacity in the USSR now appears substantially in excess of crude production and is likely to continue so for several years. Crude throughput capacity, cracking capacity and rated aviation gasoline capacity are shown in the table below:

PRINCIPAL PETROLEUM REFINERIES
(Thousands of Metric Tons)

<u>Location</u>	<u>Crude Throughput</u>	<u>Cracking</u>	<u>Aviation Gasoline</u>
<u>Caucasus and Southern Ukraine</u>			
Baku	14,440	1,715	---
Batumi	3,055	802	---
Grozny	6,460	2,355	300
Krasnodar	951	---	---
Makhach-Kala	919	---	---
Tuapse	1,488	311	---
Other	38	---	---
Sub-Total	27,351	5,183	300
<u>Moscow-Volga-Urals</u>			
Astrakhan	150	---	---
Buguruslan	500	---	---
Chkalov	---	---	---
Gorki	---	1,000	250
Gurev (Lend-Lease 560)	601	---	---
Ishimbai	610	1,005	187
Constantinovka	485	---	---
Kuibyshev (Lend-Lease 460)	475	87	---
Molotov	485	998	169
Moskva	200	---	---
Orsk (Lend-Lease 515 - Cracking)	---	388	---
Saratov	910	678	194
Sterlitamak	---	2,011	250
Syzran	960	---	---
	1,100	694	---

(continued on page 12)

Location	Crude Throughput	Cracking	Aviation Gasoline
<u>Moscow - Volga-Urals (Cont'd)</u>			
Tuimazy	500	---	---
Ufa	1,489	356	50
Ukhta	240	---	---
Yaroslavl	300	---	---
Other	74	66	---
Sub-Total	9,079	7,283	1,100
<u>Central Asia</u>			
Chimion	127	---	---
Kim	400	---	---
Krasnovodsk (Lend-Lease)	500	1,042	184
Melnikovo	400	---	---
Nebit Dag	317	109	---
Vanovskaya	300	---	---
Alma Ata (150 Lube Oil Only)			
Sub-Total	2,044	1,151	184
<u>Soviet Far East</u>			
Khabarovsk	190	135	---
Aleksandrovsk	100	---	---
Other	52	---	---
Sub-Total	342	135	---
<u>TERRITORIES INCORPORATED SINCE 1938</u>			
<u>Poland</u>			
Drogobych	348	50	---
Other	96	---	---
Poland - Total	444	50	---
<u>Czechoslovakia - Total</u>	35	---	---
<u>Latvia - Total</u>	15	---	---
Sub-Total	494	50	---
GRAND TOTAL - USSR and Incorporated Areas	39,310	13,802	1,584

SHALE OIL PLANTS
(Thousands of Metric Tons)

Location	Crude Throughput	Cracking	Aviation Gasoline
<u>USSR</u>			
Gdov	100	---	---
Other	100	---	---
USSR - Total	200	---	---

(continued on page 13)

Location	Crude Throughput	Cracking	Aviation Gasoline
ESTONIA			
Kohtla/Tarne	90	10	---
Other	110	---	---
ESTONIA - Total	200	10	---
GRAND TOTAL	400	10	---

The capacities shown in the table above are based in part on translations of German intelligence reports which are often difficult to evaluate. These figures may be too high, as they substantially exceed other estimates. For instance Krasnodar, though reported being rebuilt, was said to have been destroyed by the Germans, and Grozny Tuapse may have suffered some damage while the existence of certain plants such as Chimion, Kim and Alma Ata is based primarily on German sources.* The aggregate amount of rated crude throughput capacity in the USSR is less significant than the qualifying factors: output and quality of refined products.

Although flexibility of modern refining processes, lack of precise data on the characteristics of crude oil processed from refinery to refinery, and unavailability of information as to the output of various refined products, make it impractical to attempt a comparison of the relative efficiency of Russian and American petroleum refinery operations, some useful observations can be made. Between 1930 and 1942, thirty-eight units of American petroleum refining plant, including units for topping, thermal cracking, processing of lubricating oil, polymerization and hydrogenation, went to the USSR. Three complete modern refineries, an aviation lubricating oil plant and two desalting and dehydrating units were furnished to the USSR under lend-lease. Even so, much of the Soviet petroleum refining plant is obsolete; maintenance is lax and operating personnel below supervisory grade is poorly trained and insufficient in number; gasoline is often of inferior quality and lubricating oils are generally produced in too few grades to meet many of the specialized requirements of industry and transportation. It is doubtful if the aggregate output of petroleum refineries exceeds 75 percent of rated capacity and may be even less.

* ORI No. 3604, State Department, June 7, 1946: The total annual crude refining capacity of the USSR ranged from 26,405,000 to 34,954,000 metric tons in 1945; the probable figure was about 30,780,000 metric tons.

ENCLOSURE D

TRANSPORTATION

Petroleum produced in the Caucasus is generally accessible to refinery by pipeline and water transport. Though some use is made of the railways to move crude oil, so far as petroleum is concerned they are used primarily to carry refined products to ports on the Black and Caspian Seas and to the rail center at Rostov-on-Don. Caspian Sea tankers connect with Astrakhan, which provides access to the interior by rail and river; Black Sea tankers unload oil at various ports in the Crimea and Ukraine for rail trans-shipment north and west; and Rostov-on-Don, as yet not fully rehabilitated from the ravages of war, normally connects with all sections of the USSR by rail.

Elsewhere in the USSR, except the Far East where Sakhalin oil reaches refinery by river and pipeline, railways are still relied on to move substantial quantities of crude oil. Short pipelines connect some oil fields in the Volga-Urals area with refineries, and longer lines such as that between Tuimazy and Ufa are under construction or projected. These pipelines, however, still need to be supplemented by rail facilities. The Gurev-Orsk pipeline carries Emba oil to Orsk for refining and short lines in other parts of Central Asia connect some of the widely scattered fields with refineries. Much of this petroleum, however, reaches refinery by rail.

In contrast with crude oil, the bulk of which moves by pipeline and water transport, most refined products reach Russian consumers by rail. There are noteworthy exceptions: a pipeline from Grozny to Trudovaya delivers kerosene to the Donbass; tankers unload refined oils at many cities along the coasts of the Black and Caspian seas; and oil barges on the Volga, and to a less extent on other inland waterways, carry finished products to many parts of the USSR.

During 1947 some difficulty may be experienced in isolated instances in getting petroleum to refineries, but serious bottlenecks are not likely to develop. Railroads and pipelines in the Northern Caucasus are reported to have been repaired sufficiently to handle current production of crude oil in that area, while the capacity of tankers on the Caspian and Black Seas and barges on the Volga River is believed to be adequate for the present carriage of petroleum. Further replacement of both land and water means of oil transportation in the vicinity of the Caucasus will doubtless keep step with planned output of petroleum. Elsewhere in the USSR, important crude oil carriers were not directly affected by German military action.

On the other hand, because of the predominant reliance on rail transport, distribution of refined products will be seriously hampered for years to come throughout the USSR and at times may be completely tied up in some areas of Western Russia. In this part of the USSR, hundreds of miles

of rail track, a great many bridges and a large number of river craft still need to be replaced before through traffic can be resumed. Both in Western Russia and elsewhere in the USSR there is a lack of rolling stock, poor maintenance of facilities and tendency to load rail cars much beyond capacity.

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ENCLOSURE E

AVAILABILITY OF REFINED PRODUCTS

According to one estimate, by 1950 annual requirements for refined petroleum products will approximate 41. million metric tons. Another source states that requirements may reach 65. million metric tons each year from 1946-1950. Even the lower of these figures is substantially larger than the planned production of 34.5 million metric tons for 1950.

Demand is almost certain to exceed available supplies both quantitatively and qualitatively. It is difficult to visualize enough propellants, lubricants and other petroleum products to go around if existing and projected Soviet industrial, transportation, agricultural and military requirements are estimated in terms of American experience as to grade and quantity. There is the additional consideration that in many applications a greater quantity of refined products must be used because of their inferior quality, harder use to which vehicles and machinery are subjected, and longer time operated before replacement.

Depending upon the Soviet estimate of Russia's position vis-a-vis the Western powers and internal considerations, heavy industry, agriculture and the armed forces may be expected to share top priority for refined products in the near future. The remainder will go to transportation, light industry, consumer goods production and miscellaneous services with the possibility that concessions will be made from time to time to the production of consumer goods to allay unrest and dissatisfaction among the civil population.

In general, it can be assumed that Soviet administrators will avoid oil shortages serious enough to interfere with indispensable industry, agriculture, and transportation over prolonged periods or to impair greatly the effectiveness of the Army, Navy and Air Forces. This will be accomplished through complete control of distribution, absolute enforcement of priorities, utilization of substantial quantities of finished products which would be considered unacceptable for use in the United States, and considerable use of producer gas vehicles and other applications of substitute fuels.

To expect that, in general, sufficient refined oil products will be available to meet urgent needs is not to say that shortages in certain products may not develop. The USSR is not believed to have sufficient equipment for the manufacture of high grade lubricants. While facilities for the production of aviation gasoline are considered adequate if operated at rated capacity, it is doubtful if the Russians could attain the full potential of these plants. However, since the Russians are fully aware of the possibilities of jet propulsion, they doubtless will make extensive use of aero-fuels much inferior to 95-100 octane gasoline. Reliance on either Diesel or jet-powered planes would substantially reduce demand for high grade aviation gasoline.

Under the circumstances, it seems more useful to endeavor to ascertain the probable total availability of finished oil products. If the annual crude oil production schedules established for the Fourth Five-Year Plan are met; if combined losses in refining, in transportation and for evaporation do not exceed 10 percent; and, finally, if Russia receives annually from 2. to 3. million metric tons of refined oil products from the satellite countries, apparent supplies will amount to approximately:

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	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
Million Metric Tons	22.8	25.8	28.6	31.5	34.4

From the foregoing discussion, it is apparent that the USSR could not be expected to have an exportable surplus of petroleum products. Nevertheless, this does not preclude oil shipments abroad from the USSR, Rumania, Austria or Hungary; the USSR may well release petroleum products to obtain foreign exchange or commodities considered more essential notwithstanding an urgent domestic demand within the Soviet Union.

No information is available regarding storage facilities or oil in storage. It is believed that, because of heavy demand and reduced production during the war, sufficient time has not elapsed to enable the accumulation of substantial stocks.

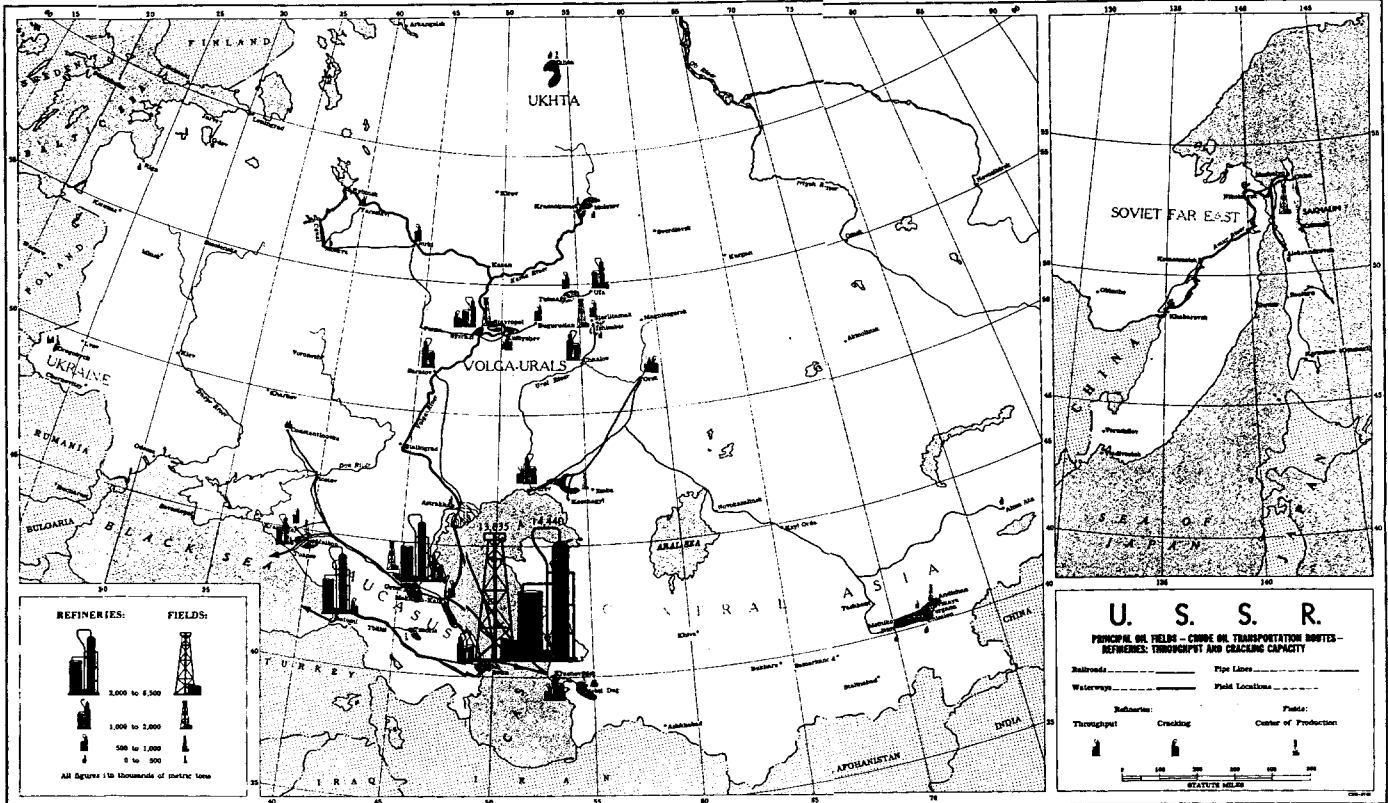
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FUTURE TECHNOLOGICAL DEVELOPMENTS

The production of petroleum in the USSR probably has been retarded by an insufficient number of experienced engineers and geologists, drilling crews less skilled and ingenious than American oil field workers, and inadequate equipment. Use of geophysical prospecting is not yet widespread and secondary recovery techniques such as water-flooding and re-pressuring are little utilized.

Notwithstanding these limitations, the Russians have made substantial contributions to the advancement of petroleum engineering. For instance, turbo-drilling which makes use of a bit driven by a small turbine, in turned propelled by mud fluid, is little employed in the United States, as its use would necessitate extensive changes in practices and equipment now considered efficient and satisfactory. The Russians, less concerned regarding existing equipment, are employing the turbo system to an increasing extent as they claim it is potentially faster than rotary drilling. Geochemical prospecting, first developed in Russia, is perhaps more versatile than the geophysical methods widely employed in the United States. It has not been more extensively utilized in the United States for the reason that geophysical techniques developed first in this country were so well adapted to conditions here.

So far as is known, no American or other foreign oil men have visited the USSR in recent years to advise the Russians regarding petroleum prospecting and production, but American refining engineers almost invariably go to the USSR to supervise the erection of United States refining plant and generally stay until guaranteed performance is obtained. It is believed that the Russians will be heavily dependent upon German technical aid, as well as equipment, for years for much of their production of synthetic liquid fuels. In these circumstances, it is doubtful if Soviet progress in the fields of petroleum refining and synthetic oil production will be particularly noteworthy for some years to come.



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