

Royal Commission on Energy

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Second Report

July 1959

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Royal Commission
on Energy

Second Report

July 1959

Second Report

To His Excellency the Governor General in Council,

MAY IT PLEASE YOUR EXCELLENCY,

We, Commissioners appointed by Orders in Council dated 15th October, 1957 and 13th January, 1958, to enquire into and make recommendations concerning the matters more specifically set forth in the Order in Council dated 15th October, 1957:

BEG TO SUBMIT TO YOUR EXCELLENCY THE FOLLOWING
SECOND REPORT.

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Foreword

This Second Report deals with the policies which the Commission believes will best serve the national interest in relation to the export of crude oil and the marketing of crude oil within Canada itself. The First Report of the Commission dealt with most of the specific matters mentioned in the Order in Council under which it was established (see Appendix A), with certain important exceptions. These exceptions related to the section in the Order in Council which requires the Commission to enquire into and make recommendations concerning "the policies which will best serve the national interest in relation to the export of energy and sources of energy from Canada". The First Report dealt with this section of the Order in Council only in terms of natural gas. This report deals with export problems and policies concerning crude oil.

The extension of the field of enquiry in this report to include an appraisal of some of the problems relating to domestic as well as to export markets was necessary because the export and domestic markets for Canadian crude oil are inter-related. A review of export markets alone would not therefore have been sufficient. The significance of the domestic market to Canada is illustrated by the fact that petroleum is the source of 54 per cent of all the energy used in Canada at the present time. Strong representations were made to the Commission during its public hearings in 1958 concerning the possibility of Canadian crude oil being used by the Montreal refineries in substitution, in whole or in part, for overseas crudes. In view of the importance of this matter to Canada and to its oil industry and because of its close connection with the problem of export markets, this report has attempted to explore the possibility and the implications of the Montreal market proposal and to make recommendations accordingly.

The Commission recognizes that the problems arising out of the marketing of crude oil inevitably raise other issues concerning conservation, exploration, production, transportation, refining and retail marketing and taxation, but it did not consider that it was required to investigate and report upon all aspects of the oil industry. We have thought it pertinent to our terms of reference, however, to review in some detail the situation concerning the reserves of crude oil in Canada and to appraise the recent course and future prospects of export and domestic markets. In Appendix E we have assembled an historical series of Canadian petroleum statistics.

The task of the Commission has been made especially difficult by reason of the fact that the North American and international oil markets are passing through a period of rapid and perhaps fundamental change. This condition had not become obvious in the early part of 1958 but since the Commission finished its public hearings in the fall of that year the world

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oil economy has been marked by the appearance of surpluses of crude oil and products, by more intense international competition for markets and by declining prices. The policy of the United States in restricting imports of petroleum was intensified during this period but has taken a new and a more encouraging turn, insofar as Canada is concerned, by the exemption from such restrictions of Canadian crude oil transported by pipe line. These changes in international and United States market conditions are already being felt by the Canadian oil industry. However, the full implications for Canada of the changing international situation concerning petroleum may not be apparent for some time to come. The fact that these changes are so recent and that they are still continuing to take place, made it difficult for the Commission to determine how far certain problems facing the oil industry could be regarded as temporary.

The Commission was fortunate in the co-operation which was extended to it by Provincial Governments, oil and pipe line companies, the Oil and Gas Conservation Board of Alberta, the Canadian Petroleum Association, Canadian Bechtel Limited, Mr. W. J. Levy and many other individuals and groups. We received valuable written and oral submissions and supplementary information from these sources. The Commission wishes to thank all those concerned for their submissions and for the other forms of assistance which they so generously gave to the Commission.

We wish to make special mention of the services rendered by all members of the Commission staff, by our Counsel, Advisers, Secretary and Research Assistants. Mr. Arthur S. Pattillo, Q.C., of Toronto and Mr. M. H. Patterson of Calgary, as Counsel and Assistant Counsel respectively rendered outstanding service to the Commission. Dr. R. L. Hearn as consulting engineer, Mr. R. Bruce West as financial consultant, both of Toronto, and Mr. J. C. Sproule and his associates of Calgary as technical advisers, all gave unstintingly of their time, experience and abilities to the work of the Commission. We are greatly indebted to the Department of Finance for the loan of Mr. J. F. Parkinson, our Secretary, and Mr. M. F. Bélanger. Major N. A. Lafrance came to us through the kindness of the Department of National Defence as Assistant Secretary and was of great assistance in our travels across Canada and in the administration of the Commission. We are grateful to the Department of Mines and Technical Surveys for the services of Mr. Ralph B. Toombs, without whose knowledge of the oil and gas industries the task of the Commission would have been even more difficult than it was. We are also grateful to the Department of Trade and Commerce for the loan of Mr. G. W. Green for a substantial period. To all of these men and to all members of the staff of the Commission we express our thanks and gratitude for their loyalty as well as their willingness at all times to give themselves unsparingly to the work of the Commission.

Crude Oil Reserves

General Prospects

Although there are a number of areas throughout Canada which are geologically favourable to the occurrence of oil, the Western Canada Sedimentary Basin is by far the most important one. It is the source of oil and gas production in the Provinces of British Columbia, Alberta, Saskatchewan, Manitoba and in the Northwest Territories. Some areas outside the Western Canada Sedimentary Basin have produced oil for local use for many decades; others have not yet been drilled or have failed so far to yield oil in commercial quantities.

From the standpoint of oil and gas possibilities the most important of the Eastern Canada sedimentary basins comprises that part of southern Ontario which lies to the southwest of the boundary of the Canadian Shield, from the northern part of Manitoulin Island easterly to the vicinity of Kingston. This sedimentary basin represents a northern extension of the Ohio and Michigan basins of the United States. The Ontario portion covers an area of at least 25,000 square miles. Although oil has been produced in southwestern Ontario since the early 1860's, gas production is now of more importance, particularly in view of the recent successful drilling in Lake Erie.

The St. Lawrence Lowlands basin of Eastern Canada has some geological characteristics in Palaeozoic strata favourable to the accumulation of oil and gas in limited amounts but no commercial deposits of either oil or gas have been found to date. This basin may be described, generally, as having a west-east axis that is occupied by the valley of the St. Lawrence and the upper portion of the Gulf of St. Lawrence.

Another sedimentary area in Ontario borders James Bay on the south and west and extends along Hudson Bay to the Churchill River in Manitoba. This plain, the Hudson Bay Lowland, is underlain by strata, chiefly of Palaeozoic Age, and covers an area of about 125,000 square miles. The sediments are relatively thin and as yet there is insufficient evidence to suggest that this region will yield oil or gas in commercial quantities.

Sedimentary basins also occur in the Appalachian region, another of the principal physiographic and geological regions of Canada, which comprises Nova Scotia, New Brunswick, Prince Edward Island, the Island

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of Newfoundland and that part of Quebec lying generally to the east of Quebec City and south of the St. Lawrence River. This region is underlain chiefly by Palaeozoic rocks. Marine sediments favourable to oil occurrences are known to exist in areas bordering the Gulf of St. Lawrence extending from the Gaspé peninsula to Newfoundland. While numerous oil seepages have been noted over the past century in the eastern part of the Gaspé peninsula, intermittent drilling since the 1880's has failed to establish any commercial accumulations of oil in the area. However, some authorities consider that the Gaspé peninsula has favourable geological indications and that oil may eventually be found.

The only production in the Maritimes comes from the small Stony Creek field discovered in 1909 near Moncton. In this area a certain amount of exploratory work has been carried out over a period of years with indifferent success. Drilling operations carried on elsewhere in the Maritimes include one well drilled to a depth of 14,696 feet near Hillsborough Bay, Prince Edward Island, in 1945. These and subsequent efforts to locate oil have been unsuccessful but the search continues in the Atlantic region, including Newfoundland.

The mountainous belt known as the Cordilleran Region, which borders the Pacific Ocean and extends 500 miles eastward to the Interior Plains, contains along its eastern flank, within the Canadian Rocky Mountains, extensive territory favourable for oil and gas exploration. There are a number of sedimentary localities throughout the Cordilleran Region in which some oil and gas exploratory work has been done but as yet there have been no positive indications of oil in commercial quantities, except, of course, in the eastern zone of the Rocky Mountains, which can be considered as part of the Western Canada Sedimentary Basin.

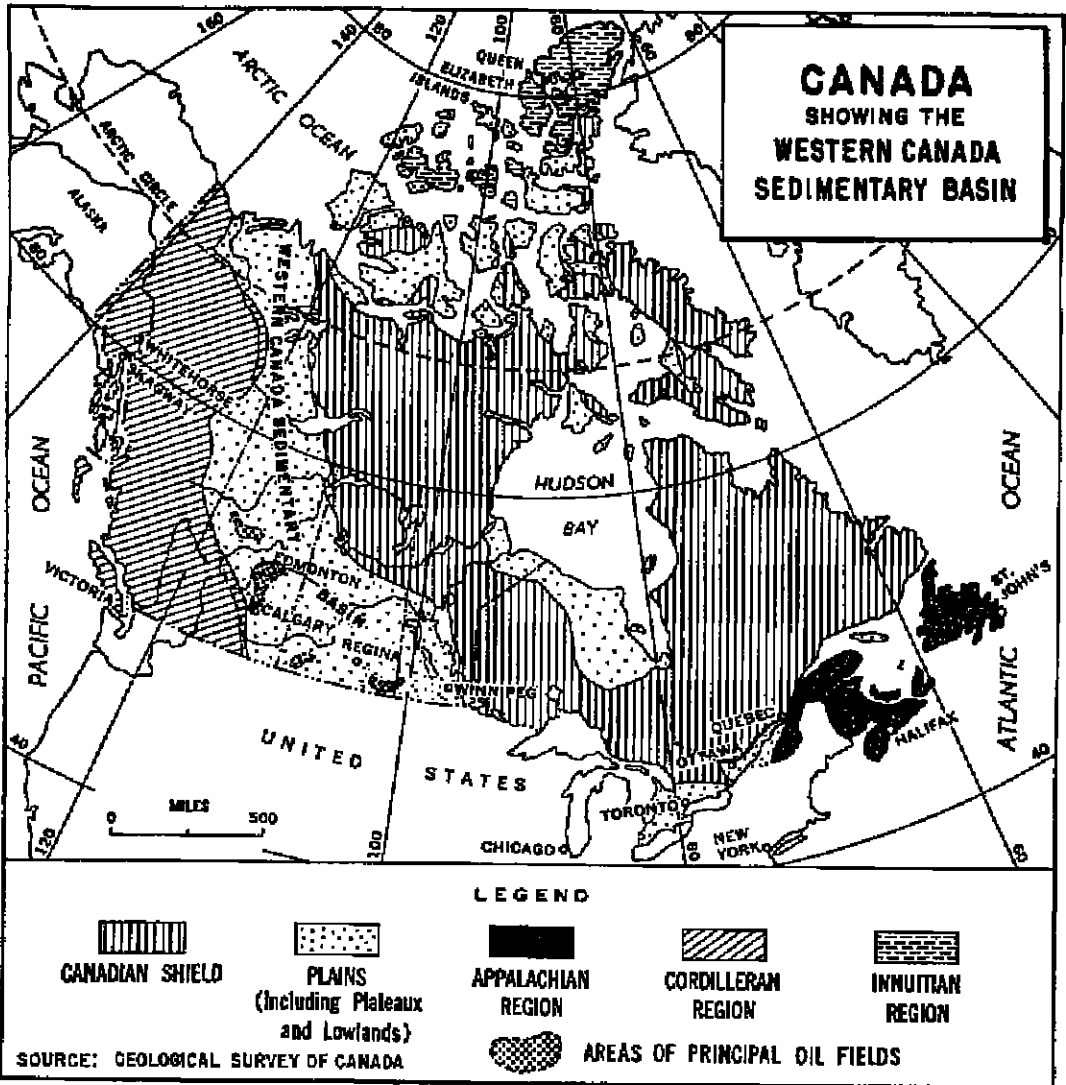
Authorities agree that there are no oil and gas possibilities in the great region of Precambrian rocks known as the Canadian Shield.

Western Canada Sedimentary Basin

Lying between the Cordilleran Region and the Canadian Shield are the Interior Plains, a northward extension of the Interior Plains of the United States. These Plains begin at the Gulf of Mexico and extend northward through Canada to the Arctic Ocean. For the purposes of this analysis we are describing the Interior Plains in Canada and the transitional zone on the west which passes into the Cordilleran Region as the "Western Canada Sedimentary Basin". Chart 1 shows the location and extent of the Western Canada Sedimentary Basin.

Crude Oil Reserves

CHART 1



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Geology

The continental section of the Western Canada Sedimentary Basin extends from the International Boundary 1,500 miles northward to the Arctic Ocean over large areas of the Prairie Provinces and northeastern British Columbia, the Yukon and Northwest Territories. At the International Boundary the Basin has a width of 800 miles; near the Arctic Coast it narrows to 300 miles. Geologically, it is the northern portion of the great interior continental basin. It is bounded on the east by the Precambrian Shield and on the west by the Cordilleran Region. The Arctic Ocean forms the northern boundary of the continental portion of the Basin, although the sedimentary basin proper would include the Arctic Islands west and north of the Canadian Shield. The continental portion of the Basin encompasses an area of approximately 750,000 square miles of potential oil and gas producing territory. If the Arctic Islands* are included in this territory, the total area of the Basin would be increased by possibly 230,000 square miles. The Continental Shelf underlying the Arctic Ocean itself may offer possibilities of oil occurrences. Thus, the area of the Basin may prove to be even more extensive.

Diverse geologic conditions have existed in the past with the result that within the Basin there are a number of smaller basins owing their origin to arch-like features extending westward and southward from the Canadian Shield. From south to north these smaller depositional and structural units include the Williston basin, the Alberta basin, a basin in the vicinity of the Peace and Liard rivers and the Mackenzie delta basin. The intervening zones also contain sediments but most discoveries to date have been made in and along the margins of the several basin areas. Great importance is attached by the industry in its search for oil and gas to the structural and stratigraphic features associated with these basins. Within and to the west of the Rocky Mountains there are other basins which have not as yet been completely delineated.

The Williston basin occupies a large part of southern Saskatchewan and, although centred in the United States, has sediments in excess of 12,000

* The Arctic Islands, or the Arctic Archipelago, lie north of the Canadian mainland. The land area of this region exceeds half a million square miles, almost one-seventh of the land area of Canada. Geologically, the Islands are the northward extension of the North American Continent and thus consist, in part, of an extension of the Canadian Shield and, in part, of flat-lying sedimentary strata of Palaeozoic Age which form the Arctic Lowlands and Plateaux and which constitute an extension of the Interior Plains. To the north and west of these strata there are belts of variously folded sedimentary rocks, which make up the Inuitian Region, and on the extreme west the Arctic Islands are bounded by a coastal plain. The Western Canada Sedimentary Basin thus in effect extends north of the Arctic Coast to take in a large portion of the Arctic Islands, outside of the Canadian Shield. It is of interest to note that since the end of 1958 many applications have been made to the Federal Government for exploratory rights covering millions of acres in the Arctic Islands.

Crude Oil Reserves

feet in thickness in the Canadian portion. The Alberta and the Peace-Liard basins, separated by the Peace River Arch, contain sedimentary sequences of more than 15,000 feet in thickness. Throughout these and the other basins, formations of practically every geologic age are represented and many of these have already been found productive of oil and gas. It has become apparent from exploration that the structural features throughout the Western Canada Sedimentary Basin have created many favourable conditions for the accumulation of oil and gas.

Structural and stratigraphic evidence, based on geological mapping, geophysical surveys and the examination of cores from hundreds of wells, indicates the possibility of large additions to present estimates of proved reserves. The continental portion of the Basin, with its area of some 750,000 square miles and thicknesses ranging from 1,000 to 2,000 feet near the Precambrian outcrop on the east to about 15,000 feet along the western edge of the Interior Plains and even greater thicknesses in the Foothills and adjacent Rocky Mountains, contains almost one million cubic miles of sediments. The dimensions of the Western Canada Sedimentary Basin thus suggest that the volume of ultimate oil reserves will be substantial.

In the search for oil only about one-half of the continental section of the Basin has been subjected to preliminary exploration, including some drilling. Exploration has been concentrated in and around basins in the more populated and easily accessible parts of the Prairie region. Seismic and other geophysical methods have been extensively used but little more than one-tenth of the entire region has been investigated by drilling. Even within these relatively restricted areas of intense exploration, comparatively few wells have been drilled to maximum depths of the Basin. In fact, of the total of 22,500 wells drilled in Western Canada to the end of 1958, not more than 400 have been drilled to the underlying Precambrian basement rocks. Consequently, large portions of the Basin remain to be thoroughly tested before its ultimate reserve potential can be accurately established. The south-central portion of Alberta, east of the Foothills, has so far attracted the most attention and contains over half of the producing wells in Canada. Recently, exploratory work has been extended into more northerly regions and important discoveries have been made in the area mid-way between Edmonton and the Peace River region and in north-eastern British Columbia. The main activity in Saskatchewan has been from Lloydminster south to the International Boundary along the Alberta border and in the southeast corner of the Province. Exploration and development in Manitoba have been limited to the southwest corner of the Province. Activity in British Columbia has been concentrated in the Peace River District. In the Northwest Territories it has been centred in the Mackenzie River Valley.

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Reserves

Drilling and operating experience in the Western Canada Sedimentary Basin has proceeded far enough to provide the basis for what we believe to be reasonably sound estimates of the oil resources of the continental section of the Basin. In the estimates shown in Table I the term "oil" includes all economically recoverable liquid hydrocarbons, i.e., crude oil and natural

TABLE I—ESTIMATED CRUDE OIL AND NATURAL GAS LIQUID RESERVES
DECEMBER, 1957
(in thousands of barrels)

<i>Authority</i>	<i>Proved reserves (a)</i>	<i>Probable reserves (b)</i>
<i>Alberta</i>		
Alberta Oil and Gas Conservation Board	3,366,000 (c)	.....
Canadian Petroleum Association	2,721,587	816,771
<i>Saskatchewan</i>		
Government of Saskatchewan	675,000 (d)	916,000 (d)
Canadian Petroleum Association	420,954	172,074
<i>Manitoba</i>		
Government of Manitoba	34,258	5,065
Canadian Petroleum Association	34,258	5,065
<i>British Columbia</i>		
Government of British Columbia	21,266 (d)	.....
Canadian Petroleum Association	25,602	44,153
<i>Northwest Territories</i>		
Canadian Petroleum Association	52,858	58,500
TOTAL WESTERN CANADA SEDIMENTARY BASIN		
Canadian Petroleum Association	3,255,259	1,096,563
The British American Oil Company Limited	4,295,000	.....

(a) Proved reserves consist of remaining reserves of oil estimated to be recoverable under existing economic and operating conditions including both drilled and undrilled reserves, as defined by the Committee on Petroleum Reserves of the American Petroleum Institute.

(b) Probable reserves consist of remaining reserves of oil estimated to be recoverable taking into consideration advances in operating techniques and extensions of proved areas based on reliable geological and engineering data.

(c) The reserve computation method of the Oil and Gas Conservation Board of Alberta provides for the inclusion of some probable reserves; hence the estimate is in general agreement with the Canadian Petroleum Association estimate of proved and probable reserves.

(d) Crude oil only. In conformity with the specifications of the American Petroleum Institute's Committee on Petroleum Reserves, crude oil estimates include all condensate which comes out of the separator with the crude oil and is run as part of the crude oil stream. All other condensate is included in the estimates of natural gas liquids. Regarding the differences in the two estimates of the proved and probable reserves for Saskatchewan, the Canadian Petroleum Association noted that some of the discoveries in Saskatchewan are relatively new and very limited production experience on certain pools is available. The Association stated to the Commission that: "Both the Department of Mineral Resources and the Canadian Petroleum Association are satisfied that they have made the best estimates possible from the data available to them and while both understand the reasons for the differences, neither would feel justified in changing its estimates at the present time."

Source: Submissions to the Commission.

Crude Oil Reserves

gas liquids. Consequently, such estimates do not include the Athabasca oil sands, because they have not yet been proven to be economically recoverable. However, it should not be overlooked that very substantial sums are being invested at the present time in the experimental development of these oil sands and real efforts are being made to find ways and means of making them economically recoverable. It may well be that, in the reasonably near future, these oil sands will have a far greater significance than can be attributed to them at the present time.

The estimates of proved and probable reserves appearing in Table I are made on the basis of detailed drilling and operating experience. It was the consensus of those giving testimony on the subject to the Commission that these reserves form only a small part of the oil which will be recovered eventually from this section of the Basin.

The ultimate oil recovery from any basin must be conjectural due to uncertainties as to geological factors, technological developments, future costs and economic prospects in general. Estimates of the ultimate "possible" reserves in the continental section of the Western Canada Sedimentary Basin appear in Table II. It should be realized that the methods used in arriving at the estimates in Table II are subject to comparatively wide margins of error, both with respect to an estimate of volume of sediments and to the selection of appropriate accumulation factors.

**TABLE II—POSSIBLE RECOVERABLE RESERVES OF CRUDE OIL
AND NATURAL GAS LIQUIDS IN THE WESTERN CANADA
SEDIMENTARY BASIN ***

<i>Authority</i>	<i>Volume of sediments in cubic miles</i>	<i>Accumulation factor in barrels</i>	<i>Total possible reserves (thousands of barrels)</i>
Canadian Petroleum Association	956,738	50,000	50,000,000
Shell Oil Company of Canada Limited	1,060,000	47,000	50,000,000
The British American Oil Company Limited	789,166	69,380	54,700,000

* Excluding the Arctic Islands.

Source: Submissions to the Commission.

Available information does not permit an accurate estimate of the distribution by provinces or regions of the possible reserves in the Basin. However, in view of the fact that Alberta is estimated to have about two-fifths of the volume of sediments in the continental section of the Basin, it may reasonably be assumed that this province will be the most important source of oil in Canada for many years.

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In estimating possible reserves in Table II a "volumetric method" has been used. Under this method an estimate is made, based on available geological data, of the volume of sedimentary rocks likely to contain crude oil and natural gas liquids. This volume, expressed in cubic miles, is multiplied by an "accumulation factor" which is an estimate of the number of barrels of recoverable oil thought to exist per cubic mile. The accumulation factors used are derived from the experience obtained from similar basins in an advanced stage of development.

A pioneer in this method of estimating possible reserves, L. G. Weeks, arrived at an accumulation factor of 50,000 barrels of liquid hydrocarbons per cubic mile, based on studies of producing basins in the United States. The similarity in geological characteristics of the Western Canada Sedimentary Basin and the large producing basins in the United States, together with a comparison of the exploratory records in both countries, suggest that Weeks' accumulation factor may be applicable in Canada.

The Canadian Petroleum Association, in its analysis, used the accumulation factor determined by Weeks. The British American Oil Company Limited used an accumulation factor of 69,380 barrels per cubic mile. This factor was arrived at from a study of the records of oil discoveries in the Mid-Continent producing fields in the United States. The company's estimate of 54.7 billion barrels for the possible reserves in the Western Canada Sedimentary Basin is made up of an estimated 48.4 billion barrels of crude oil and 6.3 billion barrels of natural gas liquids.

Shell Oil Company of Canada Limited, in its analysis, used an accumulation factor of 47,000 barrels per cubic mile. This factor was arrived at by dividing proved recoverable reserves in the United States, as published in 1957 by the American Petroleum Institute, plus cumulative production to that year, by the estimated total volume of sediments in the United States, namely, two million cubic miles.

Shell Oil Company also made a study of the total oil generating capacity of the Western Canada Sedimentary Basin. The conclusion reached was that the volume of oil originally generated in the Western Canada Sedimentary Basin was of the order of 4,600 billion barrels. This estimate, of course, cannot be compared with the estimates of possible reserves given in Table II. These latter estimates measure the present and future availability of the oil which was originally generated. The results of the two analyses made by Shell Oil Company suggest that the estimates in Table II may be on the conservative side.

None of these estimates of possible reserves includes reserves in the Athabasca oil sands in Alberta. The estimates of these reserves have ranged from 100 to 300 billion barrels of heavy crude oil.

Crude Oil Reserves

It will be seen from Table I that the Province of Alberta contains the largest proportion of the established reserves of the Western Canada Sedimentary Basin. This, in part, arises from the fact that exploration and development in that province have been in progress for a longer period. Because of the relatively short history of exploration throughout the Basin, Table I tends to understate the potential oil production outside of Alberta, particularly in British Columbia and the Northwest Territories.

The proved reserves of oil in the Basin have grown within the period of a decade to over three billion barrels by 1957, after allowing for the production of 835 million barrels. Since 1952 the average annual increase in gross reserves of crude oil and natural gas liquids in the Basin has been 435 million barrels.

Clearly, Canada's oil resources in the Western Canada Sedimentary Basin are very substantial although, as indicated in Table III, present proved reserves are small in relation to total proved world reserves, representing less

TABLE III—WORLD OIL RESERVES AS AT END 1957
(in millions of barrels)

<i>Western Hemisphere</i>	<i>1957</i>	<i>Eastern Hemisphere</i>	<i>1957</i>
U.S.A.		MIDDLE EAST	
Crude oil	30,300	Iran	32,000
Natural gas liquids	5,688	Iraq	25,000
Total	35,988	Kuwait	60,000
CARIBBEAN		Neutral Zone	5,000
Venezuela	16,000	Qatar	1,750
Colombia	650	Saudi Arabia	45,000
Trinidad	300	Southern Arabia	500
Total	16,950	Other Middle East	251
CANADA		Total	169,501
Crude Oil	2,874		
Natural gas liquids	395	AFRICA	814
Total	3,269	WESTERN EUROPE	1,369
MEXICO	2,750	EAST INDIES	8,085
ARGENTINA	750	OTHER FAR EAST	493
PERU	275	U.S.S.R. and associated countries	24,500
OTHERS	280	EASTERN EUROPE	900
TOTAL WESTERN HEMISPHERE	60,262	CHINA	800
		TOTAL EASTERN HEMISPHERE	206,462
		TOTAL WORLD 1957 — 266,724	

Source: Compiled by BP Canada Limited from published sources.

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than two per cent of the world total. However this proportion would be increased dramatically if Canada's potential oil resources in the Athabasca oil sands proved to be economically recoverable.

The present proved reserves of oil in the Basin are sufficient to provide for 18 years of operation at the 1957 level of production or 12 years on the basis of the 1957 Canadian consumption of petroleum products. These estimates greatly understate the country's oil reserve position however, inasmuch as proved reserves represent only a small fraction of the possible reserves which it is reasonable to expect may eventually be recovered.

On the basis of quality, the proved oil reserves of the Basin have so far consisted largely of high gravity crudes and it is expected that future discoveries will follow the pattern of the past. In that event, the crude oils discovered in the Basin will be predominantly light crudes with a gravity range between 30° and 40° A.P.I.* Some 90 per cent of the proved reserves of the Basin are in this range. Medium gravity crudes comprise some seven per cent of proved reserves. These crudes, ranging in gravity from about 20° to 29° A.P.I., have occurred in the shallower parts of the Basin located principally in western Saskatchewan. The remaining three per cent of the proved reserves of the Basin have been the heavy crudes of 8° to 19° A.P.I., occurring between Kindersley and Lloydminster in western Saskatchewan, and in eastern Alberta, to the north of the medium crude occurrences.

The high A.P.I. gravity of western Canadian crudes facilitates transportation over long distances by pipe line. If heavy crudes are to be moved economically by pipe line they require some processing, or mixing with lighter crudes, to reduce their viscosity. Furthermore, under normal refinery practice in North America, lighter gravity crudes have a higher yield of gasoline and of light fuel oil than heavier crudes. As a result, where the balance of the demand for heavier fuels can be met from other sources, well-head prices for the lighter crudes reflect these premium uses. Technological advance in refinery practice and changing market requirements may, of course, reduce the price differential between light and heavier crudes.

The magnitude and quality of the resource base of the oil industry in Canada would not appear to give rise to special problems. The oils are predominantly of good grade and the reserves are clearly sufficient to support a large and expanding industry.

* The A.P.I. gravity is an arbitrary scale adopted by the American Petroleum Institute for expressing the specific gravity of oils. The lighter the oil, the higher is its A.P.I. gravity. Relation to specific gravity is as follows:

$$^{\circ} \text{A.P.I.} = \frac{141.5}{\text{Specific Gravity at } 60^{\circ} \text{ F}} - 131.5$$

Production and Marketing of Canadian Oil

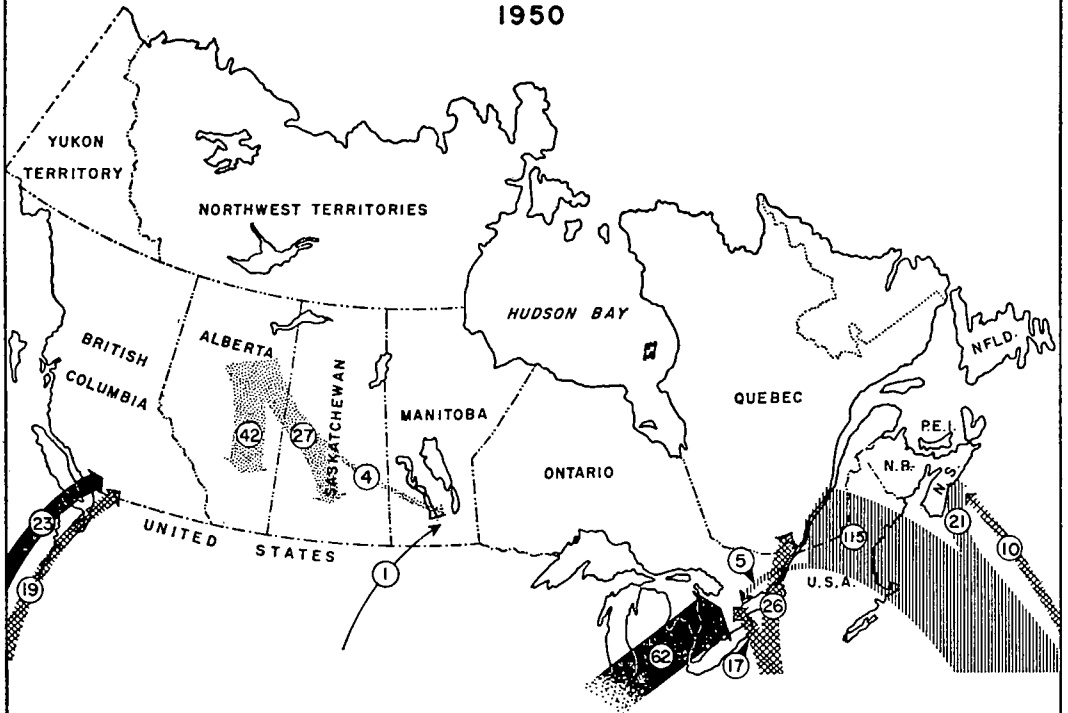
The oil producing industry in Canada has grown rapidly since the discovery of the Leduc field in Alberta in 1947. In 1946 Canada produced 7,586,000 barrels of crude oil. In 1957 the output reached approximately 181,848,000 barrels. Drilling operations in Western Canada increased from less than 150 wells drilled in 1946 to a peak of some 3,300 wells in 1956. During the period the industry invested over three billion dollars in exploration, development and production of oil and gas in Western Canada. Between 1947 and 1957 the revenues of the Governments of Alberta, Saskatchewan and Manitoba were augmented by sales of mineral rights, rentals and production royalties by some \$781 million.* The quick succession of oil discoveries in Western Canada, subsequent to the Leduc discovery, and the rapid expansion of production changed the whole Canadian oil supply picture. Indigenous production supplied less than 10 per cent of Canada's requirements of petroleum products in 1947 as compared with 47 per cent in 1957. The real proportions of this increase are apparent from the fact that the demand for all oils, domestic and imported, which amounted to 267,000 barrels per day in 1947 rose to 742,000 barrels per day in 1957. In 1947 there were no exports of crude oil from Canada. In 1957 exports were at the average rate of 152,000 barrels per day, with an approximate annual value of \$141 million and accounted for some 30 per cent of total production. In the peak month of the year the proportion was approximately 40 per cent. Taking into account exports of crude from Canada and imports and exports of refined products, Canada was, on balance, 67 per cent self-sufficient in petroleum by 1957. This large volume of exports reflected, of course, the greater demands occasioned by the Suez crisis of that year. By 1957 productive capacity in Canadian oil fields had reached a point where it could have supplied more than the total Canadian demand.

The dramatic nature of the change in petroleum production and supply which has occurred in Canada in recent years is illustrated by Chart 2, "Supply of Crude Oil and Petroleum Products in Canada 1950 and 1957".

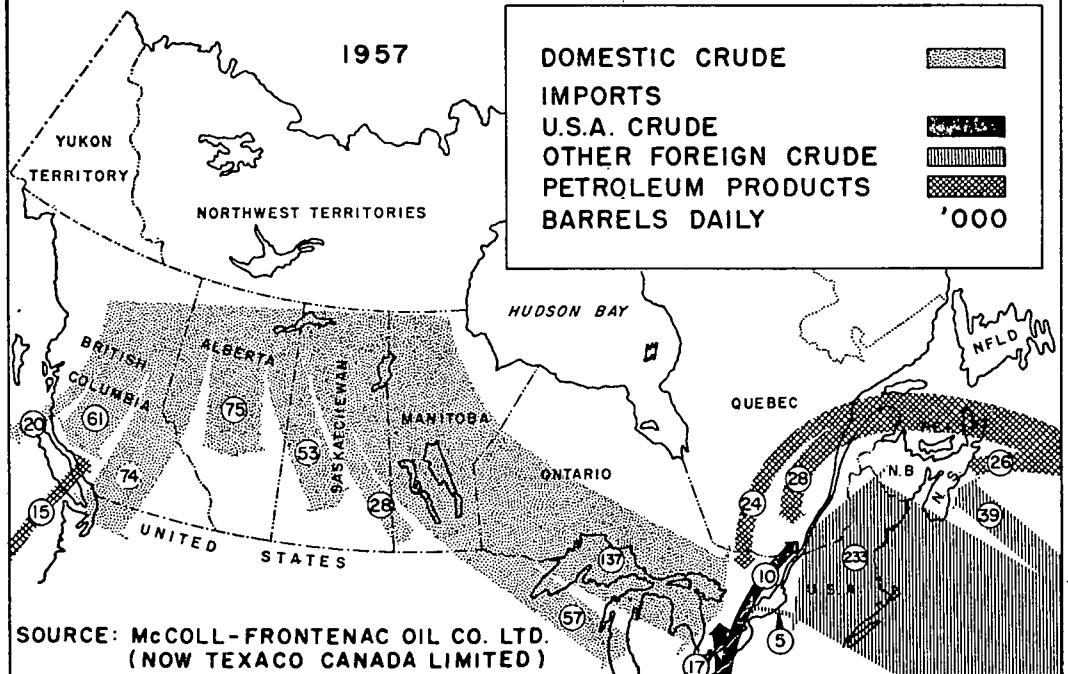
* Of the total revenue of \$781 million, the Government of Alberta received \$724 million, the Government of Saskatchewan \$54 million and the Government of Manitoba \$3 million.

SUPPLY OF CRUDE OIL AND PETROLEUM PRODUCTS IN CANADA 1950 AND 1957

1950



1957



DOMESTIC CRUDE	
IMPORTS	
U.S.A. CRUDE	
OTHER FOREIGN CRUDE	
PETROLEUM PRODUCTS	
BARRELS DAILY	'000

SOURCE: McCOLL-FRONTENAC OIL CO. LTD.
(NOW TEXACO CANADA LIMITED)

Production and Marketing of Canadian Oil

Expansion in production and development of new resources and markets continued without interruption until 1957 as Canadian oil was successively delivered to more distant markets. After 1957, as discussed later, a number of events combined to interrupt the rapid expansion which had occurred during the preceding decade.

Stages of Expansion

Eastward Expansion from Alberta

The initial expansion of production after the Leduc discovery led to a progressive capture of practically the entire prairie regional market for petroleum products, except specialty products. Before this discovery the Prairie Provinces largely relied on the importation of crudes and products from the United States and for this reason had long been a high cost area for such commodities because of remoteness from foreign sources of supply. Within a brief period existing refineries were converted to the use of Canadian crude. At the same time, in order to meet the growing demand for petroleum products, the refinery capacity of the region was expanded, first in Alberta and then in Saskatchewan. As a result the demand for petroleum products was met increasingly from domestic production. Initially the crude oil was delivered to the refineries by rail and road rather than by pipe line.

By 1949 reserves had been established in Alberta capable of producing, under accepted conservation principles, at rates in excess of the total demand of the Prairie Provinces. In 1950, at the request of the industry and following public hearings as to the most desirable procedures, a plan of prorating production to market demand was introduced in Alberta to meet the problem of surplus supply. Under this plan the Petroleum and Natural Gas Conservation Board of Alberta (now the Oil and Gas Conservation Board) receives from refining companies statements of their crude oil requirements for the succeeding months. On the basis of these "nominations" and other evidence, the total production permitted by the Province is allocated among the different pools or wells in the province. The first basis of allocation is one designed to provide an "economic allowance" or a floor for each producing well. The second provides for a sharing of the residual demand, after provision for the "economic allowance", in proportion to the maximum permissive rate of production of the different pools or wells as determined by the Board. The plan established by the Board in 1950 is still in use with only minor modifications. More fundamental changes are due to come into operation on January 1, 1960, the effect of which will tend to secure a

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larger output from the more productive wells or pools in the Province. Similar control of production is not as yet practised in the other Canadian producing provinces.

The first step in the transportation of Canadian crudes by large diameter pipe line, a feature of the industry destined to become of major significance in its future expansion, was taken when the Interprovincial Pipe Line Company was incorporated in 1949. Initially the plan was to build and operate a crude oil pipe line, extending from Edmonton to Regina, in order to secure the benefit of the economies in transportation cost which can be obtained through pipe line facilities, as distinct from road and rail transport. This plan was quickly revised to enable Canadian crude to reach more distant markets in Eastern Canada.

The rapid saturation of markets in the prairie region and the discovery of other fields, such as Redwater near Edmonton in 1948, made it desirable to secure additional markets. To the west, the nearest Canadian market was the Vancouver area. To the east, the nearest large Canadian markets were in Ontario. These markets offered prospects of growing requirements for crude oils but the task of supplying them presented difficult transportation problems. They could be reached economically only with large diameter pipe lines. The construction of a large diameter pipe line could not be undertaken until oil reserves and trends in discovery were sufficient to sustain the throughput of a line for the period of years required to amortize the investment. However, these conditions were rapidly fulfilled by the producing industry.

The extension of the market had implications for well-head or field prices. Until 1948 the well-head prices of Alberta crudes were determined by the competition of crudes reaching Regina from the United States so that the well-head prices in Alberta, after allowance for transportation costs to Regina, were equal to the well-head prices of competitive imported crudes, plus their transportation costs to Regina, with any necessary adjustment for foreign exchange. An extension of the market to Eastern Canada involved increased transportation costs and, for this reason, was likely to result in a reduction in well-head prices. It was anticipated that an additional reduction might be necessary to meet the competition of United States crude oils in that eastern Canadian market area and that there would be an overall benefit only if the increased net revenues from the larger volume of oil production more than offset the effect of any reduction in well-head prices.

In late 1950 the Interprovincial Pipe Line Company completed the construction of its pipe line to Superior, Wisconsin. The construction of dock facilities at Superior enabled Canadian crude to be shipped from this point to Sarnia by lake tanker. Investment in large storage capacity at

Production and Marketing of Canadian Oil

Superior provided for a continuous pumping schedule of oil from Alberta during the closed navigation season. The extension also enabled other refineries within the prairie region and in the Mid-Western area of the United States to be supplied by spur lines. When shipments of Alberta crudes first reached Ontario refineries in 1951, well-head prices of these crudes dropped as much as 44 cents per barrel. Sarnia, the most distant point at which Alberta crudes met United States competition, then became what is commonly referred to in the industry as the "basing point" for well-head prices in Western Canada.

In order to take advantage of the economy of transmission by pipe line, as opposed to lake tanker and associated winter storage, and to meet the increasing Ontario demand for crude oil, the Interprovincial Pipe Line Company in 1953 extended its pipe line from Superior to Sarnia. A further extension of the line to refineries in the Toronto area was made in 1957. This latter extension did not result in any reduction in well-head prices because Western Canada crude could be laid down competitively with United States crudes in Toronto, even after payment of the additional pipe line transportation cost from Sarnia to Toronto.

The initial construction and each subsequent stage of expansion of the Interprovincial pipe line system were based on the assumption by the major oil companies that the competitive position of Canadian crudes in the new market would not deteriorate. Financial risk was involved and guarantees, were required to ensure financing. Accordingly, in the original financing of the Interprovincial Pipe Line Company, Imperial Oil Limited undertook sufficient throughput obligations to service the funded debt of the pipe line company. Imperial Oil also made commitments to certain refining companies for delivery of Canadian crude at prices competitive with those of United States crudes, thus enabling these companies to proceed with refinery construction programmes based upon the use of Canadian crude.

Westward Expansion from Alberta

British Columbia's refining capacity in 1950 was approximately 28,000 barrels daily. The refineries, all in the Vancouver area, obtained their principal supplies of crude oil from California by tanker. More than half of the total demand for petroleum products in the Province was met by imports, principally from the United States. An expansion of refining capacity in British Columbia and the use of Canadian, rather than imported, crude offered the prospects of a substantial outlet for Canadian crude, which, however, was not adequate to support a pipe line from Alberta.

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There were further prospects in the Puget Sound area. The States of Washington and Oregon, which afforded substantial markets for petroleum products, had little refining capacity at the time, although refinery construction was under consideration. For defence reasons the United States Government was concerned that such refineries should obtain their crude oil from a source which did not involve ocean transportation. The demand for petroleum products in California was also rapidly increasing and, with the levelling off of production, less California crude oil was available to supply other States.

These factors, together with the continued development of oil reserves in Alberta and the success of the Canadian oil industry in obtaining financial

TABLE IV — CHANGES IN POSTED FIELD PRICES FOR REDWATER CRUDE OIL 1948-1959

<i>Year</i>	<i>Dates</i>	<i>Posted price dollars per barrel</i>	<i>Major reason for changes in well-head price</i>
1948	Jan–Nov	3.20	
	Dec	2.68	To make Alberta crude competitive at Winnipeg
1949	Sep 24	2.88	Devaluation of the Canadian dollar
1950	Oct 16	2.73	Alteration of exchange rate (Freeing of Canadian dollar)
1951	Apr 24	2.44	To make Alberta crude competitive with Illinois crude at Sarnia
	Jun 1	2.46	Reduction in local pipe line tariff
1952	Apr 23	2.315	Alteration of exchange rate and meeting competition at Sarnia
	Oct 15	2.325	A reduction in Interprovincial pipe line tariff to the Lakehead, offset by currency adjustment
1953	Mar 19	2.385	Alteration of exchange rate and meeting competition at Sarnia
	Jul 21	2.645	Increase in world crude prices reflected at Sarnia and an alteration of exchange rate
1954	Oct 15	2.555	Alteration of exchange rate
1955	Jan 7	2.485	Price change in Illinois crude and some adjustment for alteration of exchange rate
	Feb 1	2.49	Adjustment to local Alberta pipe line tariff change
1957	Jan 16	2.67	General world price increase reflected at Sarnia
	Aug 30	2.63	Alteration of exchange rate
1958	Apr 12	2.56	Alteration of exchange rate and change in Illinois prices
1959	Mar 24	2.42	Reductions in world posted prices and their impact on crude and product prices in Canadian markets.

Source: Alberta Oil and Gas Conservation Board.

Production and Marketing of Canadian Oil

support from various oil companies in the United States interested in refining Alberta crude oils in the Puget Sound area, led to the incorporation of Trans Mountain Oil Pipe Line Company in the spring of 1951. The principal pipe line facilities of that company were completed by 1953 thus enabling crude oil from the Edmonton area to be transported through them to the refineries of the lower mainland of British Columbia and, by means of a spur line, to the Puget Sound area. In expanding into this market no reduction in well-head prices in Alberta was involved. With well-head prices continuing to be based on competition at Sarnia, Canadian crude had a price advantage in Vancouver and also in the Puget Sound area, even after paying the United States import tariff of 10½ cents per barrel.

Table IV sets out the changes in posted prices for Redwater crude oil that have taken place since 1948, together with the effective dates and the reasons for these changes. The price changes made in March, 1959, represent a major point of departure in the pricing of Canadian crude oils. As explained later in this report these changes represent essentially an abandonment of the Sarnia basing point and an adjustment of Canadian prices to new competitive forces.

Developments in Other Provinces

Success in Alberta led to increased activity in the search for oil throughout the Western Canada Sedimentary Basin and, particularly, in the Province of Saskatchewan. Until 1953, the heavy black oil found near Lloydminster formed the greater part of the output of that province. It was chiefly used by refineries in Alberta designed to yield primarily bunker C fuel oil and asphalt products. Light crude oil was discovered in south-eastern Saskatchewan in 1954. This crude, after the construction of the Westspur pipe line in 1956, found an increasing outlet in Ontario and the Middle West area of the United States, along the route of the Interprovincial Pipe Line Company.

The discoveries of high sulphur, medium gravity crudes in western Saskatchewan in the early 1950's presented a special marketing problem. These crudes were not particularly suitable for use in the accessible refineries of Ontario and the United States. This situation led to the development of an integrated production, transportation and refining operation for the specific purpose of serving a market in the St. Paul area of Minnesota, and involved the construction of a refinery in that area designed to handle these particular crudes.

Production commenced on a small scale in the Virden area of Manitoba in 1951. This area was then linked with the Interprovincial Pipe Line Company's system and the oil transported eastward to market.

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Production of crude oil in British Columbia started in 1956. This production, as yet, is relatively small and until now has been refined and marketed locally in the Peace River district of Alberta and British Columbia.

Achievements of the Industry

Although for decades the oil industry in Canada has been a major one, it had achieved by 1958 the status of one of Canada's most important industries. Large and imaginative investments had been made throughout Canada in the preceding decade in exploration and development, in expanding refinery capacity, in building and expanding oil pipe lines and in providing marketing facilities. These investments, which amounted to some \$4.6 billion, had given the industry a broad operating base offering prospects for continued expansion. Crude oil production had grown steadily and was now occurring in all of the western provinces, with Alberta accounting for some 75 per cent of the total. Production potential had increased even more rapidly. Chart 3, "Crude Oil Supply in Canada 1958", illustrates the principal supply and distribution components of the industry as developed by that year.

Supply and Demand Trends in Canada

The achievements of the industry are particularly apparent in the change in the source of supply of crude oil used by refiners in Canada. Over the period Canada's oil requirements increased substantially. Canadian refineries in 1947 used 76.8 million barrels of crude oil of which 7.3 million barrels, or 9½ per cent, were obtained from Canadian oil fields. By 1957 Canadian refinery receipts had reached 238.6 million barrels, of which 126.9 million barrels, or 53 per cent, came from Canadian oil fields. Moreover, in the latter year Canadian crude oil exports amounted to 55.3 million barrels. Consequently, in 1957 Canadian fields produced the equivalent of 76 per cent of the requirements for crude oil at Canadian refineries. In addition, these requirements, during the period 1947-57 had registered a threefold increase. Chart 4, "Supply and Demand of all Oils in Canada 1950-1958", illustrates the growth in the principal components of supply and demand that has taken place in recent years.

Table V shows that total imports of crude oil into Canada also increased during the period 1950-57 and that these are now largely concentrated in Quebec and in the Maritime Provinces. There has been a progressive decline in imports into all other provinces. The decline in Ontario imports is of particular significance for the Canadian oil industry.

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TABLE V—USE OF FOREIGN AND DOMESTIC CRUDES*, BY REGIONS
1950-1958
(in thousands of barrels daily)

Year	British Columbia		Prairies		Ontario		Quebec and Maritimes		CANADA	
	Im-ports	Total crude supply	Im-ports	Total crude supply	Im-ports	Total crude supply	Im-ports	Total crude supply	Total Imports	Total crude supply
1950	21	21	1	80	69	70	133	133	224	304
1951	22	22	....	93	44	82	162	162	228	359
1952	20	21	....	109	37	93	168	168	225	391
1953	16	23	....	145	30	95	177	177	223	440
1954	5	42	....	126	24	119	181	181	210	468
1955	....	53	....	151	28	139	210	210	238	553
1956	....	60	....	163	25	159	266	267	291	649
1957	....	61	....	153	22	163	284	284	306	661
1958	....	58	....	154	4	160	277	277	281	649

* Includes crude oil and natural gas liquids.

Sources: Dominion Bureau of Statistics and Provincial Government Publications.

An analysis of the regional supply and demand position in Canada, as appearing in Table VI, shows that in 1957 Canadian crudes had become the sole source of crude oil supply in British Columbia and the Prairie Provinces and the major source in Ontario.

TABLE VI—SUPPLY AND DEMAND OF ALL OILS, 1957
(in thousands of barrels daily)

	British Columbia	Prairies	Ontario	Quebec and Maritimes	Total Canada
Supply					
Production (a)	1	504	2	....	507
Imports					
Crude oil	....	....	22	284	306
Products	16	3	24	54	97
Transfers between areas					
Crude oil	61	-196	135	....	....
Products	7	-5	68	-70	....
New supply	85	306	251	268	910
Stocks decrease	-1	....	+5	-11	-7
Total supply	84	306	256	257	903
Demand					
Exports					
Crude oil	....	152	....	....	152
Products	5	....	2	2	9
Domestic demand	79	154	254	255	742(b)
Total demand	84	306	256	257	903

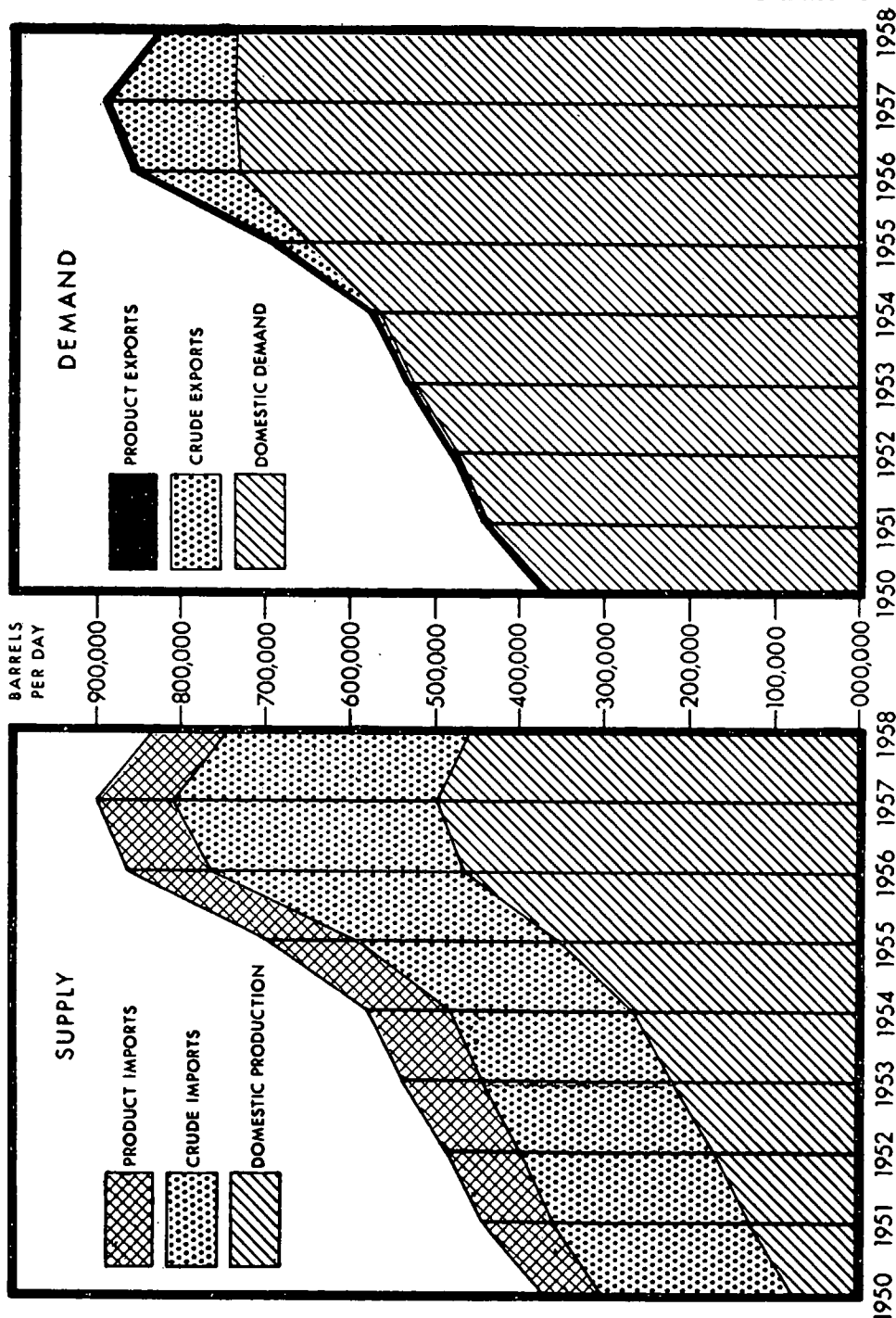
(a) Includes production of crude oil, natural gasoline, L.P.G.'s and other blending materials.

(b) Domestic demand increased by 3 per cent in 1958 to some 765,000 barrels a day.
Source: Alberta Oil and Gas Conservation Board.

Production and Marketing of Canadian Oil

CHART 4

SUPPLY AND DEMAND OF ALL OILS IN CANADA 1950-1958



PREPARED BY COMMISSION STAFF

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Growth of Crude Oil Exports

By 1957 exports had risen to an average daily rate of some 152,000 barrels, amounting to a total of 55.3 million barrels for that year. However, in 1958 exports declined to 31.7 million barrels. It should be noted in examining Table VII that the high level of production shown for 1956 and 1957 reflects the abnormally high demand for Canadian oil during the Suez crisis. The decline in production during 1958 was due, to a certain extent, to the loss of export markets which had been temporarily available during the Suez crisis.

TABLE VII—CRUDE OIL EXPORTS AS RELATED TO TOTAL DOMESTIC PRODUCTION

Year	Exports (millions of barrels)	Total production (millions of barrels)	Exports as a percentage of production
1950 .....	.....	29.0	.....
1951 .....	.3	47.6	0.6
1952	1.4	61.2	2.3
1953	2.5	80.9	3.1
1954	2.3	96.1	2.4
1955	14.8	129.4	11.5
1956	42.9	172.0	25.0
1957	55.7	181.8	30.6
1958	31.7	166.5	19.0

Source: Dominion Bureau of Statistics.

Alberta has been the main source of these exports. Approximately 30 per cent of its total production, i.e., 43.4 million barrels, was exported from Canada in 1957. Saskatchewan exported a further 11.8 million barrels in that year, or 32 per cent of its production. As indicated in Table VII, the decline in exports from Canada in 1958 was the major cause of the first reversal in the steady growth of production experienced by the industry since 1947. The impact of this decline in exports and the resultant curtailment of production was confined to Alberta.

The Present Position

Table VIII lists Canadian exports of crude oil by province of origin and illustrates the extent to which total exports have declined during the three years 1956-58. It also shows that the curtailment of production has been confined to Alberta and that exports from Saskatchewan have continued to grow. These marketing trends are further illustrated in Chart 5, "Disposition of Alberta and Saskatchewan Crude Oil 1956-58".

Production and Marketing of Canadian Oil

**TABLE VIII—CANADIAN CRUDE OIL DISPOSITION BY PROVINCE
OF ORIGIN**

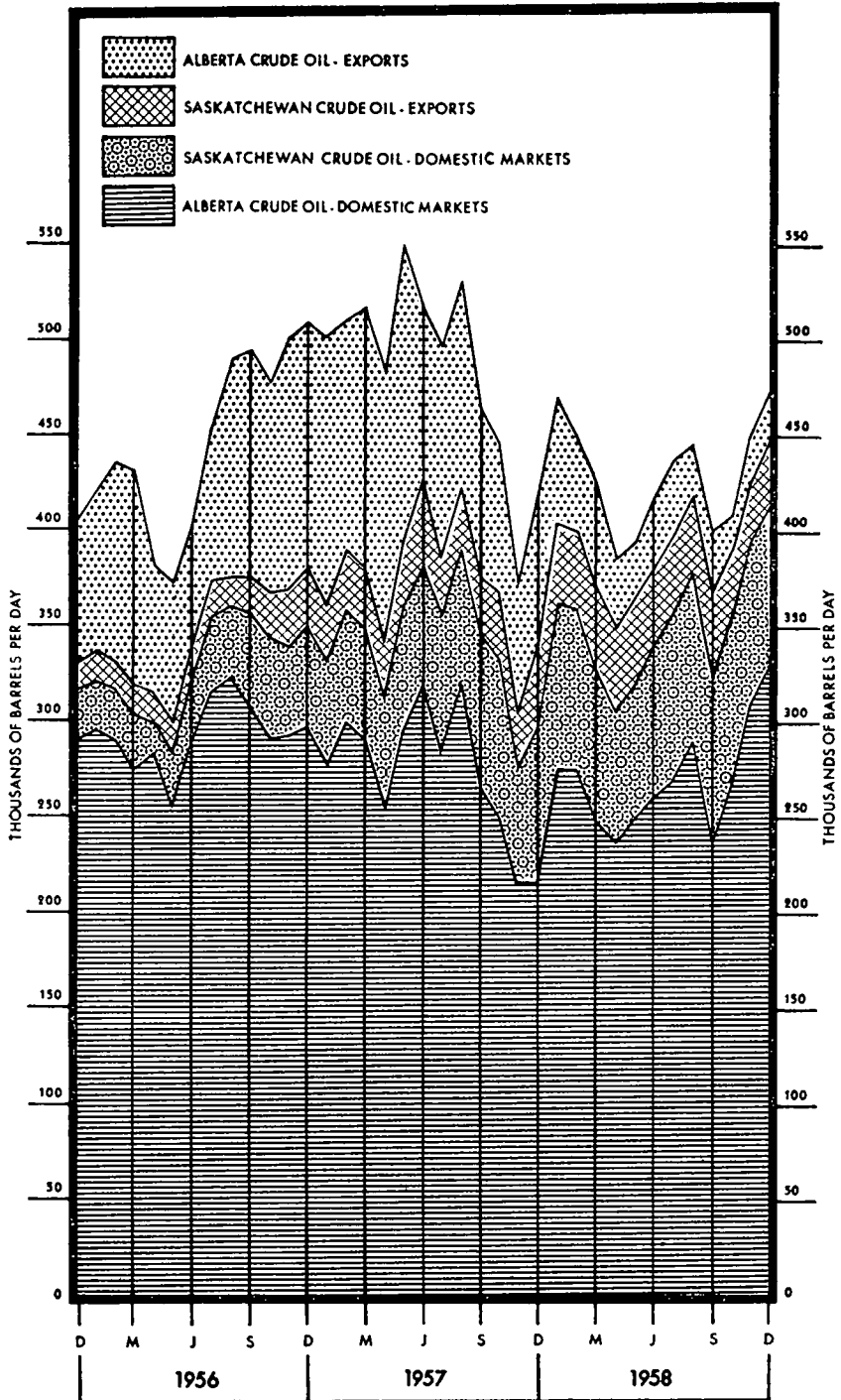
(in thousands of barrels per day)

	<i>Alberta</i>		<i>Saskatchewan</i>		<i>Manitoba</i>	
	<i>Domestic</i>		<i>Domestic</i>		<i>Domestic</i>	
	<i>Exports</i>	<i>sales</i>	<i>Exports</i>	<i>sales</i>	<i>Exports</i>	<i>sales</i>
1956						
January	85.1	294.4	15.7	25.7	.....	13.7
February	105.2	289.1	14.2	26.8	.....	14.6
March	113.1	275.1	16.2	26.8	.....	15.5
April	66.3	282.6	16.0	15.2	.....	13.5
May	74.4	254.5	15.7	27.7	.....	15.0
June	63.5	289.0	17.8	32.7	.....	14.8
July	82.6	315.2	18.6	38.7	.....	20.2
August	114.9	321.6	14.9	37.6	.....	25.0
September	120.4	305.8	17.2	49.9	.....	15.6
October	109.6	290.7	23.5	52.7	.....	16.8
November	133.2	292.5	29.5	45.9	.....	16.7
December	129.9	296.0	29.1	53.8	7.4	3.0
1956 Average	98.8	292.2	19.0	36.1	0.6	15.4
1957						
January	141.3	277.0	29.4	53.5	8.0	7.9
February	119.7	299.1	30.7	60.2	16.9	0.4
March	137.1	290.0	31.5	58.5	10.2	10.2
April	142.6	253.0	30.5	46.9	9.4	1.5
May	155.0	295.2	33.7	65.6	7.6	.....
June	90.4	318.9	34.8	63.0	7.8	17.7
July	111.7	282.8	29.4	72.9	7.1	18.7
August	107.9	319.2	31.2	73.0	7.3	.....
September	88.7	265.9	30.2	78.7	5.8	9.1
October	77.7	250.6	35.7	81.8	6.4	.....
November	70.0	214.2	27.0	61.9	8.3	17.1
December	83.2	213.7	40.4	83.2	9.0	14.6
1957 Average	110.4	273.3	32.0	66.6	8.6	8.1
1958						
January	66.2	276.2	42.5	85.5	15.8	1.0
February	48.6	275.4	42.6	83.4	12.1	4.7
March	57.2	247.7	43.1	79.2	11.0	5.8
April	35.8	237.2	46.7	66.5	5.3	10.5
May	29.3	249.9	46.6	68.1	5.8	10.8
June	38.1	260.9	40.4	78.7	5.7	11.0
July	40.1	270.0	40.0	87.6	5.2	11.4
August	26.9	288.6	40.0	89.5	4.5	11.3
September	35.2	237.5	40.3	88.0	3.0	12.4
October	17.9	266.9	35.4	88.1	5.9	9.3
November	24.9	308.9	32.4	86.0	12.5	2.4
December	23.7	329.1	36.8	84.0	9.3	5.0
1958 Average	37.0	270.7	40.6	82.1	8.0	8.0

Source: Prepared by Commission staff from provincial government sources.

CHART 5

DISPOSITION OF ALBERTA AND SASKATCHEWAN CRUDE OIL
1956-1958



PREPARED BY COMMISSION STAFF

Production and Marketing of Canadian Oil

Table VIII also shows that, in contrast to the export record, no comparable decline in sales to the domestic market has occurred. Such domestic sales, however, showed no appreciable increase in 1958 due largely to the fact that demand for petroleum products increased by only three per cent in Canada compared with an average annual increase of 12 per cent since 1947. There was also some liquidation of inventories. In 1958, Saskatchewan's sales increased whereas those of Alberta declined. During the past few years Saskatchewan has secured an increasing share of the Canadian market as well as of the export market. This province's share of total domestic production of crude oil rose from 3 to 27 per cent in the period 1952-58. Canada's self-sufficiency in oil, after taking account of exports and imports, declined from 67 per cent in 1957 to 60 per cent in 1958, due to the decline in crude oil exports.

New discoveries in Western Canada and the decline in the export market caused a substantial decrease in 1958 in the ratio of production to the industry's capacity to produce. This was particularly true for the Province of Alberta.

TABLE IX—ACTUAL PRODUCTION AS A PERCENTAGE OF POTENTIAL PRODUCTION—1956-1958, ALBERTA AND SASKATCHEWAN (a)
(in thousands of barrels daily average)

Year	Alberta			Saskatchewan		
	Production	Potential	Percentage	Production	Potential	Percentage
1956	393	684	58.7	58	68	85
1957	377	756	50.7	101	125	81
1958	310	793	39.2	125	175	79

(a) The combined production of Manitoba and British Columbia accounts for only 3 per cent of Western Canada output and is not considered in this table.

Source: Submission by Oil and Gas Conservation Board of Alberta.

In the latter part of 1957 and during 1958 there was a substantial decline in exploration and development expenditures in the producing sector of the industry. An early 1959 estimate of the Canadian Petroleum Association indicates that development expenditures declined from \$242 million in 1957 to \$150 million in 1958, while exploration expenditures declined from \$305 million to \$290 million. The drop in expenditures reflected, in part, a reduction in the cost of drilling, which in itself was related to the lower level of exploration and development. The number of wells drilled in all categories, however, declined from approximately 3,000 in 1957 to just over 2,500 in 1958. The decline in expenditures for development was

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greater than that for exploration. This arose in part from the completion of several field development programmes. Exploratory drilling declined from 1,058 wells in 1957 to 849 in 1958.

The reduction in the expenditures on oil drilling as such has been greater than the figures would suggest as they include increased expenditures made in an accelerated search for natural gas. The decline in oil drilling might have been greater but for the fact that the long-term nature of exploratory programmes tended to lessen the influence of adverse market conditions on oil exploration. In addition the necessity on the part of the industry to fulfil certain drilling obligations and certain regulations under provincial Statutes assisted in maintaining expenditures on both exploration and development.

The decrease in the industry's expenditures generally in 1958 resulted, *inter alia*, from the combination of a decline in export markets, a general slackening in business activity and a lower than anticipated Canadian demand for petroleum products. The decline in actual and prospective export markets appears to have been the most significant factor. The tapering off in field activity has led to the incorporation of fewer companies and to an increase in the number of company mergers.

It is clear, from testimony given to the Commission, that the loss of export markets for oil is a matter of great concern to the industry and to government authorities. Consequently we have considered it advisable to examine the industry's experience in these export markets and to endeavour to assess the extent to which these or other markets may become available to Canada in the future.

Export of Canadian Oil

Exports of Canadian crude oil have had a short history and, with a few negligible exceptions, have been limited to the United States of America. The first export was from Alberta in 1951 and was incidental to the movement of crude oil into Ontario markets. The facilities of the Inter-provincial Pipe Line Company, passing through the States of Minnesota and Wisconsin en route to the head of Lake Superior, were linked to two relatively small refineries in the United States. Similarly, when the line was extended to Sarnia, through the northern part of the State of Michigan, other United States' refiners became purchasers of relatively minor quantities of Canadian crude oil.

The Pacific Northwest Market

The first project deliberately designed to carry crude oil into export markets was that of the Trans Mountain Oil Pipe Line Company Limited. In the spring of 1951 Alberta crude production had reached 126,000 barrels daily or 60 per cent of its then potential output. On the basis of new discoveries which had taken place, it was estimated that the potential output in Alberta would be 325,000 barrels per day by 1953. This would have been more than enough to sustain the anticipated increase in the requirements of the Ontario market, which was already being served, in part, by Alberta crudes. West of the Rocky Mountains a marketing area existed in which it appeared that a large volume of Alberta crude oil might be sold. The British Columbia demand for crude oil and petroleum products, amounting to 46,000 barrels daily in 1950, was being met by imports of some 23,000 barrels a day of California crude oil and a similar quantity of products. A small volume of products was also received from Alberta. The projected expansion of refining capacity in Vancouver was a contributing factor in the decision to construct a pipe line from Edmonton to transport western Canadian crudes to the Pacific Coast.

The Pacific Northwest area, i.e., the States of Washington, Oregon and Idaho, was another prospective market. The refining capacity in that area was only 12,000 barrels per day and there was a demand for approximately 200,000 barrels daily of petroleum products. The building of additional refineries in the area was therefore under consideration. There was no

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local production of crude oil and the demand for both crude and products was met from California. The refining capacity of California was adequate to meet all civilian and military requirements of the area west of the Rocky Mountains. However, the United States Petroleum Administration for Defense, in an appraisal of the situation in 1951, concluded that the growth of reserves in California was not keeping pace with the growth in demand. This meant that, unless additional reserves could be established in California, an alternative source of crude oil for the proposed refineries in the Puget Sound area would be needed.

Although imports could be secured from a number of foreign sources, strategic factors favoured the development of a source of supply in Canada. In assessing the supply and demand situation in the Pacific Northwest the Petroleum Administration for Defense in a report, published in December, 1951, found that the foreseeable local supplies of crude oil for District V, which included the Pacific Coast States, would not be adequate to meet anticipated demands, unless certain special oil reserves held by the United States Navy were made available. There were six alternative supply possibilities. These included imports by tanker from the Eastern Hemisphere, from the Caribbean area and from the United States Gulf Coast, shipments by pipe line from the West Texas-New Mexico area and from the Rocky Mountain area, or imports by pipe line from Canada. An appraisal of these alternatives indicated that imports of crude oil by pipe line from Canada, to supplement the supplies of District V, was definitely advantageous in terms of defence requirements. One of the main advantages was that Canadian crude oil could be moved overland to the Pacific Northwest whereas supplies from foreign areas would have to be transported by the more vulnerable ocean routes. Accordingly the Petroleum Administration for Defense concluded that:

"It is impossible to evaluate all eventualities bearing on this problem. Most of them are secondary to the major consideration of the defense needs of the Pacific Northwest and the desirability of making available to a market as much producible crude oil in the Western Hemisphere as possible. No practical means of accomplishing these desired defense considerations other than an Alberta-Puget Sound pipeline is apparent. The crude oil pipeline from Alberta to the Puget Sound area is recommended therefore, with the construction of increased refining capacity. The Petroleum Administration for Defense should assist in acquisition of steel to this end."

The Government of Canada in a note to the Government of the United States, dated March 8, 1955, referred to the defence considerations which had entered into the planning of the Trans Mountain pipe line:

"It will be remembered that the United States Navy on strategic grounds gave support to the construction of the Trans Mountain pipe line and for the construction of additional refining capacity in the State of Washington."

Export of Canadian Oil

This approach to the problems of continental defence was in harmony with an earlier agreement between Canada and the United States on the principles of economic co-operation on defence matters as set out in an exchange of notes in 1950. In a note of October 26, 1950, the Secretary of State for the United States declared:

"The United States and Canada have achieved a high degree of cooperation in the field of industrial mobilization during and since World War II through the operation of the principles embodied in the Hyde Park Agreement of 1941, through the extension of its concepts in the post-war period and more recently through the work of the Joint Industrial Mobilization Planning Committee. In the interests of mutual security and to assist both governments to discharge their obligations under the United Nations Charter and the North Atlantic Treaty, it is believed that this field of common action should be further extended. It is agreed, therefore, that our two governments shall cooperate in all respects practicable, and to the extent of their respective executive powers, to the end that the economic efforts of the two countries be coordinated for the common defense and that the production and resources of both countries be used for the best combined results."

"The following principles are established for the purpose of facilitating these objectives:

1. In order to achieve an optimum production of goods essential for the common defense, the two countries shall develop a coordinated program of requirements, production and procurement.

2. To this end, the two countries shall, as it becomes necessary, institute coordinated controls over the distribution of scarce raw materials and supplies.

3. Such United States and Canadian emergency controls shall be mutually consistent in their objectives, and shall be so designed and administered as to achieve comparable effects in each country. To the extent possible, there shall be consultation to this end prior to the institution of any system of controls in either country which affects the other.

4. In order to facilitate essential production, the technical knowledge and productive skills involved in such production within both countries shall, where feasible, be freely exchanged.

5. Barriers which impede the flow between Canada and the United States of goods essential for the common defense effort should be removed as far as possible.

6. The two governments, through their appropriate agencies, will consult concerning any financial or foreign exchange problems which may arise as a result of the implementation of this agreement."

Following the outbreak of the Korean War in 1950, the United States Petroleum Administration for Defense took action, on occasion, to assist in the maintenance of a high level of oil exploration and development in Western Canada. For example, it helped to obtain priority in the allocation of steel and other scarce materials produced in the United States.

The Canadian oil industry had been studying, since 1950, the possibilities of new markets on the Pacific Coast. The possibility of using Canadian crudes in the refineries of British Columbia and the favourable

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competitive position of Alberta crudes in the Pacific Northwest markets, when compared to California and overseas oils, were considered to justify the building of a pipe line from Alberta to the Pacific Coast. The outbreak of the Korean War and defence considerations hastened the decision to build the pipe line. Trans Mountain Oil Pipe Line Company commenced construction of this second major venture in oil pipe lines in Canada in 1952. This involved the construction of a pipe line from Edmonton to Vancouver and the Puget Sound area. In view of its importance in terms of continental defence, steel was allocated to the project from United States sources.

Six oil companies with refining capacity on the West Coast supported the Trans Mountain pipe line project by becoming shareholders in the Company and by entering into deficiency agreements to ensure payment of the interest on and amortization of the first mortgage bonds. The interest held by these companies, at the time of the initial financing and in March, 1958, is shown in Table X.

TABLE X — SUMMARY OF TRANS MOUNTAIN SHAREHOLDINGS

Company	Number of Shares	
	Original issue 1951	March 27, 1958
Deficiency agreement guarantors		
Imperial Oil Limited	130,000	130,000
Shell Oil Company of Canada Limited	130,000	130,000
Standard Oil Company of British Columbia Limited	130,000	130,000
Canadian Gulf Oil Company (now The British American Oil Company Ltd.)	130,000	130,000
Union Oil Company of California	100,000	.....
Richfield Oil Corporation	50,000	50,000
Other oil companies	250,000	53,025
Total	920,000	623,025
All other shareholders	580,028	881,903
Total shares outstanding	1,500,028	1,504,928

Source: Submission by Trans Mountain Oil Pipe Line Company.

The bulk of the funds for the Trans Mountain oil pipe line was raised by first mortgage bonds. Imperial Oil Limited, through its deficiency agreement, in effect guaranteed 54.2 per cent of the \$65 million initially raised in this way in 1952. The obligations of Canadian Gulf Oil Company (now The British American Oil Company Limited), Shell Oil Company of Canada Limited and Standard Oil Company of British Columbia Limited, under these deficiency agreements, were unconditionally guaranteed by their parent

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companies in the United States, i.e., by Gulf Oil Corporation, Shell Oil Company and Standard Oil Company of California, respectively. Two further deficiency agreements were entered into in 1954 and 1957 by all these companies, except Union Oil Company of California.

The initial capacity planned for the Trans Mountain line was 75,000 barrels daily, involving a 24-inch line with two pumping stations. However, as construction proceeded, certain developments took place which suggested that a larger throughput could be marketed. In 1952 General Petroleum Corporation announced plans for the construction of a refinery, near Ferndale, Washington, with a capacity of 35,000 barrels per day, to be completed in 1954. In 1953, Shell Oil Company commenced construction at Anacortes, Washington, of a refinery with a capacity of 55,000 barrels per day. This refinery was completed in the summer of 1955. These developments resulted in Trans Mountain adding two additional pumping stations before the completion of the line, thereby increasing the capacity to 150,000 barrels per day. A spur line was also built from the main line to serve the new refineries at Ferndale and Anacortes. This spur line is operated by Trans Mountain Oil Pipe Line Corporation, a United States subsidiary of the Canadian Company. Shipments to Vancouver refineries commenced in 1953 and to the Puget Sound area in 1954. During the last half of 1955 the throughput of Trans Mountain rapidly increased as refinery demand rose and by December the line was transporting some 100,000 barrels per day, with about 52,000 barrels daily being shipped across the international border to the two refineries at Ferndale and Anacortes. At this time these two refineries represented approximately 90 per cent of the total refining capacity of the Puget Sound area.

As will be seen from Table XI, exports to the Puget Sound area continued to grow in 1955 and early 1956 and, after some decline in the mid-year, reached a level approaching the refinery capacity of the area during the latter part of 1956, due to the imminence of the closure of the Suez Canal. This position also held throughout the first half of 1957. In early 1957, during the actual Suez crisis, the Trans Mountain line operated at its full capacity of 200,000 barrels daily. The demand for crude oil in the Puget Sound and California areas was such that, had the capacity of the pipe line been greater, more crude could have been marketed on the West Coast of the United States at that time.

As a result of this unexpected increase in demand Trans Mountain further expanded its pipe line facilities. A fifth and sixth pumping station were added in 1956. In 1957 two 51-mile sections of line were looped with 30-inch pipe and one additional permanent and three temporary pumping stations

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were added. Construction was also begun on new wharfage facilities at Vancouver. The total capacity of the line was thus increased to 250,000 barrels daily.

TABLE XI — EXPORTS OF ALBERTA CRUDE FROM CANADA TO THE WEST COAST OF THE UNITED STATES, 1955-1958
(in barrels per day)

Month	1955		1956		1957		1958
	Puget Sound	Puget Sound	Offshore	Puget Sound	Offshore	Puget Sound	
January	13,565	48,940	3,835	84,859	33,369	52,181	
February ..	14,578	69,101	.....	75,219	26,608	35,614
March	27,482	69,898	2,743	68,535	46,368	42,789	
April	25,867	24,409	7,032	83,469	44,485	30,958	
May	27,411	26,096	15,740	76,338	59,324	19,286	
June	23,116	30,957	4,061	58,861	14,071	24,873	
July	27,213	23,915	27,427	94,002	2,778	27,690	
August	34,443	57,040	31,935	86,068	3,898	13,845	
September ..	37,509	61,965	32,812	74,146	4,047	10,705	
October	45,923	73,438	17,732	68,191	.....	10,380
November ..	42,734	75,406	25,143	54,955	.....	13,272
December ..	51,858	69,232	34,690	65,388	.....	10,002
Monthly average	30,975	52,533	16,929	74,169	19,579	24,300	

Source: Alberta Oil and Gas Conservation Board.

Table XI also shows, under the column "Offshore", the commencement of shipments of Alberta crude by tanker to the California market early in 1956. In the latter part of 1955, spot tanker rates, which had been relatively low at the time of the construction of the Trans Mountain pipe line, progressively increased in anticipation of the Suez crisis and the resultant shortage of tankers. These tanker rates rose to as high as USMC plus 125,* i.e., 125 per cent above the ceiling rates enforced by the United States Maritime Commission in World War II for United States Government tanker commitments. These high rates were in contrast to rates as low as USMC minus 30 which had prevailed earlier in 1955. In consequence, Alberta oil,

* The former USMC rates, established for each of the major supply routes, no longer have official significance but they form a standard of reference against which the market level at any given time can be readily measured and expressed. Originally, these rates were equal to those enforced by the U.K. Ministry of Transport. Post-war currency restrictions resulted in the use of two separate scales for quotations of tanker rates. The USMC rates have remained the standard of reference for the dollar market, while the London Market Tanker Nominal Freight Scale plays the same role for the sterling market.

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which had been competitive in California with foreign crudes, became even more attractive in terms of price. The first tanker shipment to San Francisco was loaded at Vancouver on January 1, 1956. Later in that year, with the outbreak of the Suez crisis and the accompanying shortage of ocean tankers, leading to even higher tanker rates, this offshore movement rose substantially with the result that exports to California by tanker in 1956 totalled six million barrels. The competitive position of Canadian crudes was further improved early in 1957 because of relatively greater increases in the posted prices of competing crudes and this offshore movement reached a peak of almost 60,000 barrels per day in 1957. Among the consignees were two of the largest refiners in the San Francisco Bay area, Tidewater Oil Company and Standard Oil of California. Further south, the Richfield Oil Corporation purchased Alberta crude at Los Angeles, while the U.S. Oil and Refining Company at Tacoma, in the Puget Sound region, also made some purchases.

As the Suez crisis waned, Middle East and Far East crudes again began to move into their former world markets, including the United States Pacific Coast. The increased supply of new tankers, in addition to the number of older ones which had been recalled into service, brought about a sharp drop in tanker rates, thereby reducing the price advantage of Canadian crude. The existence of inventories of crude oil and products, which had been built up in West Coast areas of the United States against a possible period of scarcity, contributed to the declining demand for Canadian crude. By October, 1957, shipments to the Puget Sound area had declined considerably and offshore movements had ceased altogether. This decline continued into 1958. Thus, by the time the expansion of the capacity of the Trans Mountain pipe line was completed in 1957, the demand had dropped and by the autumn of 1958, due in part to the introduction of import controls by the United States Government, exports of Canadian crudes to the Pacific Coast had decreased to some 11,000 barrels daily, all of which was moving into the Puget Sound area.

The Middle West Market

Canadian crude oil exports to the Middle West area of the United States experienced a fairly satisfactory growth during the period 1955-58. As noted earlier, the Interprovincial pipe line system runs through an extensive area of United States territory. This enabled Canadian crude to reach certain refineries along its route as early as 1951.

Table XII lists those refineries in the Middle West States which in 1958 obtained a portion of their crude oil requirements from Canada through

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the Interprovincial pipe line system. These refineries are described in terms of their total crude oil refining capacity which does not, of course, indicate the actual purchases of Canadian crude.

TABLE XII—UNITED STATES MIDDLE WEST PURCHASERS OF
CANADIAN CRUDE

As of March, 1958

(refining capacity in barrels per calendar day)

<i>Company</i>	<i>Location</i>	<i>Capacity</i>
Lake Superior Refining Co.	Superior, Wis.	12,000
International Refineries, Inc.	Wrenshall, Minn.	11,000
Great Northern Oil Co.	Pine Bend, Minn.	31,400
Northwestern Refining Co.	St. Paul Park, Minn.	16,000
Northwestern Refining Co.	New Brighton, Minn.	2,500
Bay Refining Corp.	Bay City, Mich.	9,950
West Branch Refineries, Inc.	West Branch, Mich.	5,000
TOTAL		87,850

Source: Oil and Gas Journal, March, 1958.

For the first few years, the Canadian crudes exported to the Middle West markets came from Alberta. During the summer of 1955, however, crude oil began to move out of Saskatchewan to a new market in the St. Paul-Minneapolis area. Soon after the initial discoveries of petroleum in the southwestern corner of that province, it became apparent that markets did not exist for the quantities of medium gravity crude, of high sulphur content, that these fields were capable of producing. There were no refineries in Canada or in the Great Lakes area of the United States designed to process oil of such quality. Certain producing companies, Mobil Oil of Canada, Woodley Canadian Oil Company and Southern Production Company (subsequently purchased by Sinclair Canada Oil Company), took the initiative in providing their own outlet. The first step was the construction of the South Saskatchewan pipe line system, consisting of gathering systems in the fields involved and a trunk line which connected with the Interprovincial pipe line at Regina. In the United States a take-off line, owned by the Minnesota Pipe Line Company, was built from the Lakehead pipe line system at Clearbrook, Minnesota, to the St. Paul area. A modern refinery, specially designed to process these Saskatchewan medium crudes, was constructed at St. Paul by the Great Northern Oil Company, which was controlled by Woodley Petroleum Company and Sinclair Refining Company.

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Another subsidiary of Woodley Petroleum Company and Sinclair Refining Company, the Great Northern Oil Purchasing Company, was formed to purchase Saskatchewan medium crude oils, including those produced by its affiliated companies. To facilitate the financing of these developments several long-term contractual commitments were made with oil producing companies. Thus, through these integrated arrangements, a marketing outlet was developed for an important Canadian source of this medium gravity crude.

The orderly and economic development of the southeastern Saskatchewan oil fields was assisted by the construction of other pipe line facilities connecting oil fields in this part of the Province to the Interprovincial pipe line system at Cromer, Manitoba, thereby making additional Saskatchewan crudes accessible to export markets. These crudes are of light as well as of medium gravity. Some of these crudes have been exported from Saskatchewan to markets in the Middle West area of the United States. The first delivery of southeastern Saskatchewan oil by pipe line to the Interprovincial pipe line system took place in July, 1956, on completion of the Westspur pipe line. This pipe line system was constructed by the Westspur Pipe Line Company, which was incorporated as an interprovincial pipe line company in May, 1955, under the sponsorship of a number of the producing companies operating in southeastern Saskatchewan fields.

As Table XIII shows, exports of light crudes from Alberta into Middle West refineries increased to substantial quantities. Towards the end of 1956 Manitoba crude also began to move into Minnesota, for use by the Northwestern Refinery Company in the St. Paul area, via the newly constructed Trans-Prairie pipe line and the Interprovincial pipe line. The table also suggests that since 1956 the growth of exports from Saskatchewan was achieved partly at the expense of exports from Alberta. The effect of the Suez crisis on the export of Canadian crude to the Middle West was not significant.

Markets in the Middle West States, to which Canadian oil has been exported, constitute only a small portion of the total market in what might be referred to as the Great Lakes area. This area lies to the south and east of Minnesota, where Canadian oil currently has a market, and comprises the States of Illinois, Indiana, Ohio, Michigan and Wisconsin. The refinery capacity of the Great Lakes area, as at January, 1958, was approximately one million barrels per day, after deducting the refinery capacity of the Wood River—St. Louis district, geographically a fringe area in southern Illinois. The demand for petroleum products in the Great Lakes area is considerably greater than this figure would suggest, as refinery capacity

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has only been sufficient to supply approximately two-thirds of the total petroleum product demand. The refineries in this area in 1958 were as follows:

<i>Company</i>	<i>Number of refineries</i>	<i>Crude oil capacity (barrels per day)</i>
Ashland Oil & Refining Co.	3	72,000
Aurora Gasoline Co.	2	59,500
Cities Service Co.	1	53,000
Clark Oil & Refining Corp.	1	30,000
Gulf Oil Corp.	1	42,000
Naph-Sol Refining Co.	1	5,250
Pure Oil Co.	3	103,900
Sinclair Refining	1	111,000
Socony Mobil Oil Co.	3	91,500
Standard Oil Co. (Indiana)	1	209,000
Standard Oil Co. of Ohio	3	122,000
Sun Oil Co.	1	95,000
The Texas Co.	1	65,000
	22	1,059,150

Source: United States Bureau of Mines.

Most, but not all, of these refineries have sources of crude oil in the Mid-Continent and Gulf Coast areas and are served by pipe line facilities which have been developed on a company affiliation basis. Although this refinery market of some one million barrels per day is large and should constitute a good prospect for Canadian crude, there undoubtedly exists a strong preference by the United States refineries concerned to continue using their existing sources of crude and their existing pipe line facilities. Canadian oil has, as yet, made no significant entry into this very large market. However, as present pipe lines supplying this United States market reach capacity operation and new pipe lines become necessary Canadian crude might find an outlet in this area. It should be noted that some of these refiners are owners of proven reserves of Canadian crude.

The importance of the growth of exports to the Puget Sound and Middle West markets in the expansion of the Canadian oil industry is illustrated in Chart 6, "Disposition of Canadian Crude Oil 1947-1958".

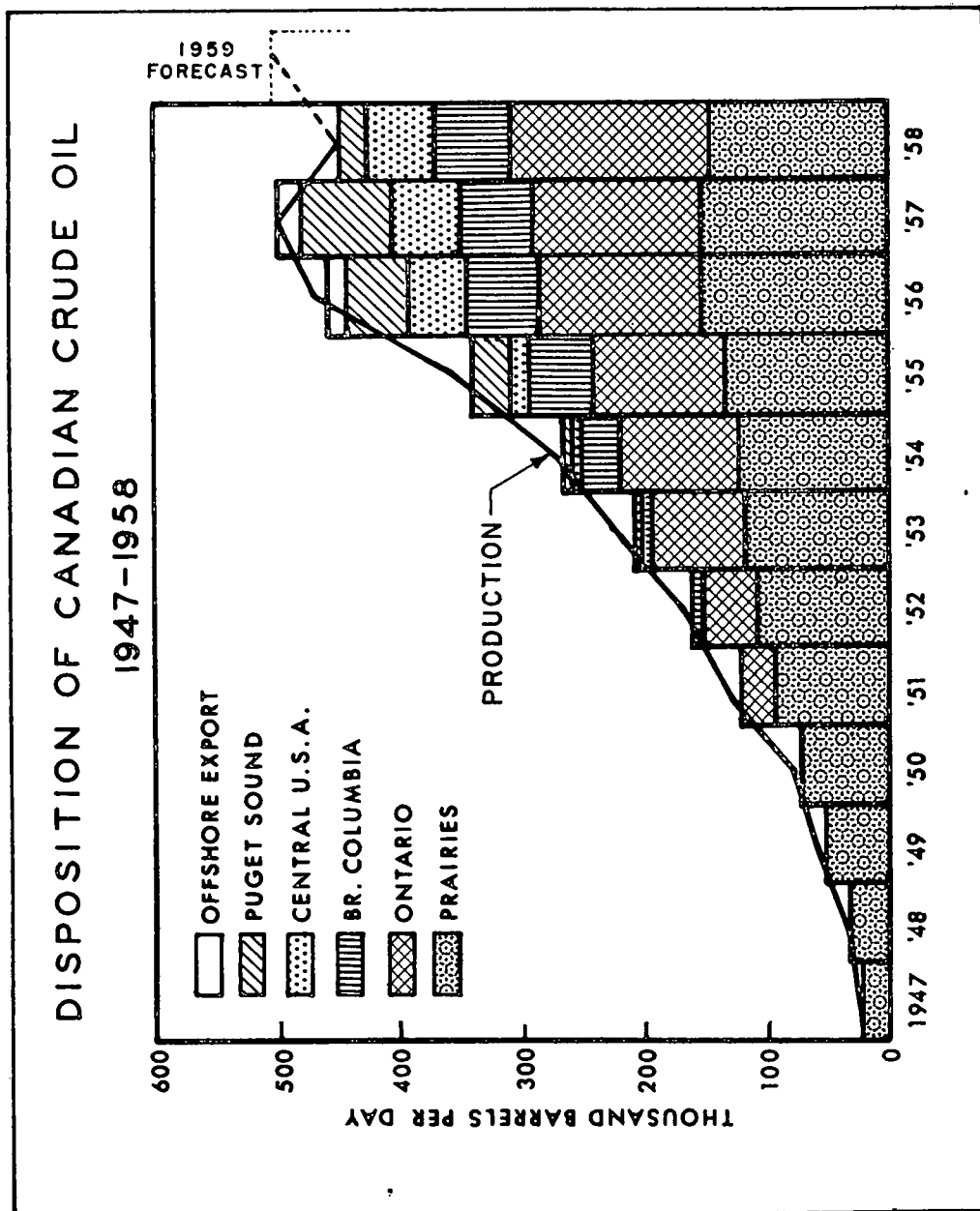
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TABLE XIII — EXPORTS OF CANADIAN CRUDE TO THE MIDDLE WEST OF THE UNITED STATES, 1955-1958
(in thousands of barrels per day)

MONTH	1955			1956			1957			1958				
	Alta.	Sask.	Total	Alta.	Sask.	Total	Alta.	Sask.	Total	Alta.	Sask.	Total		
January	6.7	.....	6.7	32.3	15.7	48.0	23.1	29.4	8.0	60.5	14.0	42.5	15.8	72.3
February	5.1	.....	5.1	36.1	14.2	50.3	17.9	30.7	16.9	65.5	13.0	42.6	12.1	67.7
March	5.8	.....	5.8	40.4	16.2	56.6	22.2	31.5	10.2	63.9	14.4	43.1	11.0	68.5
April	6.2	.....	6.2	34.8	16.0	50.8	14.7	30.5	9.4	54.6	4.7	46.7	5.3	56.7
May	1.5	.....	1.5	32.5	15.7	48.2	19.3	33.7	7.6	60.6	10.0	46.6	5.8	62.4
June	6.0	18.1	24.1	28.4	17.8	46.2	17.5	34.8	7.8	60.1	13.3	40.4	5.7	59.4
July	6.6	9.9	16.5	31.2	18.6	49.8	15.0	29.4	7.1	51.5	12.4	40.0	5.2	57.6
August	9.6	11.0	20.6	26.0	14.9	40.9	17.9	31.2	7.3	56.4	13.0	40.0	4.5	57.5
September	5.5	5.8	11.3	25.6	17.2	42.8	10.5	30.2	5.8	46.5	24.5	40.3	3.0	67.8
October	9.7	12.4	22.1	18.4	23.5	41.9	9.5	35.7	6.4	51.6	7.5	35.4	5.9	48.8
November	21.0	11.5	32.5	32.6	29.5	62.1	15.0	27.0	8.3	50.3	11.6	32.4	12.5	56.5
December	25.4	12.2	37.6	26.0	29.1	62.5	17.8	40.4	9.0	67.2	13.6	36.8	9.3	59.7
Monthly average	9.1	6.7	15.8	30.4	19.0	50.0	16.7	32.0	8.7	57.4	12.7	40.6	8.0	61.3

Source: Provincial governments.

CHART 6



SOURCE: IMPERIAL OIL LIMITED

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United States Import Policy

Agitation by sections of the oil producing industry in the United States against imports of foreign oils is not new. In the 1930's protests led to the imposition of import duties and quotas on imports of crude oils and products. These restrictions were successively modified during World War II. During the decade following World War II, the position of the United States changed from that of a net exporter of oil to that of a net importer. The narrow margin by which the nation had managed to meet essential requirements during World War II had led to widespread concern as to the adequacy of domestic reserves and productive capacity. Thus, in the early postwar period, the policy of the United States favoured the increased importation of foreign oil and a reduction of exports, although by 1946 the question of controlling imports had again become controversial. The abnormally cold winter of 1946-47 caused a temporary lessening of pressure for controls on imports. In 1949 the National Petroleum Council issued a report recommending that imports be permitted to supplement, rather than to supplant, domestic production on the grounds that a constant supply of oil to meet national needs must depend primarily on domestic sources. The Korean War further postponed any action by the United States on the import problem.

In 1952, as the result of the revision of a trade agreement between the United States and Venezuela, the duty on crude and fuel oil imported into the United States was reduced.* This reduction applied, in effect, to crude and fuel oil from any foreign source.

As will be seen from Table XIV the ratio of imports to domestic production in the United States increased steadily between 1946 and 1954. In 1946 imports amounted to five per cent of domestic production whereas in 1954 they had risen to 10.3 per cent.

The ratio of production to productive capacity over the period 1946-54 had fallen from 97 to 77 per cent.† This led to a renewed interest on the part of some sections of the industry in the United States in restricting imports

* For crude and fuel oil of less than 25° A.P.I. gravity the duty became 5½ cents per barrel while for petroleum of higher gravities it was set at 10½ cents per barrel, regardless of the quantities imported. From 1939 to 1943 and 1950 to 1952, the duty had been 10½ cents per barrel up to 5 per cent of the domestic refinery runs of the previous year and 21 cents per barrel on volumes exceeding this quota. From 1943-50, there was a 10½ cent duty per barrel, without limitation as to amount.

† In a statement issued in 1956 on the "Relationship of U.S. Oil Imports to Domestic Oil Production", the Cabinet Advisory Committee on Energy Supplies and Resources Policy described the idle capacity of the United States crude oil producing industry as having grown from 25,000 barrels per day in 1948 to 2,029,000 barrels daily by 1956. American Petroleum Institute estimates placed the 1957 idle capacity at 2,707,000 barrels per day and various industry sources indicated a similar amount of spare productive capacity in 1958, although such estimates do not necessarily imply that transportation facilities exist to enable total productive capacity to be brought to market.

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and resulted in appeals for voluntary import controls. In the summer of 1954, however, the Cabinet Advisory Committee on Energy Supplies and Resources Policy suggested a method of striking a balance between domestic and foreign supplies, so that imports into the United States would "supplement but not supplant" domestic oil. This Committee's recommendation, made in 1955, envisaged a voluntary scheme under which the 1954 ratio of crude and residual fuel oil imports to domestic production would be maintained. The 1955 National Defense Amendment to the Trade Agreements Extension Act authorized the President to adjust oil imports whenever they appeared to him to threaten the national security. Although it was recognized that a continuance of the trend towards increased imports would adversely affect producers, particularly the smaller independent operators, no immediate action was taken under this legislation.

A further increase in imports aggravated the situation, however, and, on August 8, 1955, the Director of the Office of Defense Mobilization called upon the oil companies to curtail their petroleum imports. The United States

TABLE XIV — UNITED STATES CRUDE OIL PRODUCTION AND IMPORTS, 1939-1958
(in thousands of barrels)

<i>Year</i>	<i>Domestic production</i>	<i>Crude oil imports</i>	<i>Product imports</i>	<i>Per cent crude imports/production</i>
1939	1,264,962	33,095	25,965	2.6
1940	1,353,214	42,662	41,089	3.2
1941	1,402,228	50,606	46,536	3.6
1942	1,386,645	12,297	23,669	0.9
1943	1,505,613	13,833	49,579	0.9
1944	1,677,904	44,805	47,506	2.7
1945	1,713,655	74,337	39,282	4.3
1946	1,733,939	86,066	51,610	5.0
1947	1,856,987	97,532	61,857	5.3
1948	2,020,185	129,093	59,051	6.4
1949	1,841,940	153,686	81,873	8.3
1950	1,973,574	177,714	132,547	9.0
1951	2,247,711	179,073	129,121	8.0
1952	2,289,836	209,591	138,916	9.2
1953	2,357,082	236,455	141,044	10.0
1954	2,314,988	239,479	144,476	10.3
1955	2,484,428	285,421	170,143	11.5
1956	2,617,283	341,833	183,758	13.1
1957	2,618,884	363,788	199,900	13.9
1958	2,448,055	350,765	264,260	14.3

Source: United States Bureau of Mines. 1958 figures are preliminary estimates.

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Government thus sought to achieve the desired balance between imported and domestic crude through voluntary limitations by importing companies. Nevertheless, imports of Canadian and Venezuelan crudes were at this time specifically exempted from such limitations, partly on strategic grounds and partly because the quantities imported, as related to domestic production, appeared unlikely to exceed the 1954 ratio to domestic production. As a deficit area, the West Coast was exempted from these voluntary limitations. In this connection, the Under Secretary of State of the United States, in an address to the Interstate Oil Compact Commission in June, 1956, said:

“... The [Cabinet] Committee recognized the desirability of placing in a separate category crude oil imports from Canada and Venezuela... national defense was one of the basic factors affecting this decision. In the event of a national emergency, oil from Western Hemisphere countries will always be recognized as our safest supplemental source of petroleum. Moreover, in the case of Canada, the United States had encouraged the building of the Trans Mountain Pipeline... Also in the case of Canada an additional factor underlying the Committee's conclusion was the fact that most of Canada's crude oil exports to the United States come to areas where they are needed to supplement domestic sources and where the detrimental effects on the domestic industry are at a minimum. The light Canadian crudes are especially needed on the West Coast...”

In August, 1956, however, as a result of a sharp rise in projected imports, the Independent Petroleum Association of America and others petitioned the United States Government for immediate limitations on oil imports as provided for by the Trade Agreements Extension Act. Projected imports for the second half of the year, it appeared, would exceed the recommended 1954 import-production ratio of 10.34 per cent by approximately 500,000 barrels daily. Of this excess, some 440,000 barrels fell within the “exempt” categories—270,000 barrels on the West Coast from all sources, including Canada, and 170,000 barrels from Canada and Venezuela into the rest of the United States. The remaining 60,000 “non-exempt” barrels were to be imported by new, rather than established, importers. It was the increasing number of importers, as well as the rising volume of imports, which appeared to aggravate the problem.

The Suez crisis in November, 1956, led to the postponement of any immediate action but, in April, 1957, on the basis of new import schedule filings, the Director of the Office of Defense Mobilization found that, under the terms of the relevant legislation, the national security was threatened. In July, 1957, a Special Cabinet Committee issued its recommendations for a voluntary import programme. Crude oil imports into Districts I-IV, i.e., the area east of the Rocky Mountains, were to be limited to approximately 12 per cent of domestic production. Established importers were requested to reduce their imports by an amount equivalent to 10 per cent of their average

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crude oil imports for the years 1954-56. New importers, i.e., those who had not imported more than 20,000 barrels daily in 1954, were to be permitted to import their scheduled amounts, but in no case in excess of their actual 1956 imports, plus 12,000 barrels daily. The preferential position of Canadian and Venezuelan crudes, which had been established in August, 1955 under the procedure of the Office of Defense Mobilization, was not continued. In effect, each company was permitted, within the limits of its quota, to select its own sources of foreign supply.

The only refineries within Districts I-IV which had been taking Canadian crude were those on the western edge of the Great Lakes area. The immediate effect of the new import programme on exports of Canadian crude to these refineries appears to have been negligible, as they fell under the "new importer" classification.

Table XV shows Canadian exports to the Middle West in 1954-56 and the quota existing in 1957. Two small refineries in Michigan not shown in this table have also been customers for Canadian crude oil. Up to the end of February, 1958, Canada was the only source of imports of foreign crude oil into the Middle West area.

TABLE XV — EXPORTS OF CANADIAN CRUDE TO THE MIDDLE WEST AREA OF THE UNITED STATES, 1954-1956 AND IMPORT QUOTAS, 1957
(in thousands of barrels daily)

	1954	1955	1956	Programmed imports last half of 1957	Allowable imports per formula
Great Northern Oil		6.0	21.1	33.0	33.0
International Refineries	2.0	2.0	9.2	10.9	10.9
Lakehead Pipe Line			0.3	0.3	0.3
Lake Superior Refining	2.0	2.0	5.0	5.0	5.0
Northwestern Refining		2.0	6.0	10.0	10.0
Shell Oil		0.5	0.8	7.5	7.5
TOTAL	4.0	12.5	42.4	66.7	66.7

Source: Compiled by Commission staff from data published by the United States Department of the Interior.

Table XVI shows that Canadian exports to the Middle West area failed to reach the assigned quotas. During 1958 several refining companies in the Middle West area cut back their use of Canadian crude and their import quotas were being used on an exchange basis to import Venezuelan crude for the use of other refineries. In effect, therefore, Canadian crude indirectly lost a portion of the Lakehead market to crude oil from Venezuela.

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TABLE XVI — IMPORTS AND QUOTAS IN THE MIDDLE WEST AREA OF THE UNITED STATES, 1957-1959
(in thousands of barrels daily)

	<i>Total import quotas (a)</i>	<i>Imports from Canada</i>	<i>Imports from other foreign countries (b)</i>
1957			
July	66.7 (c)	55.4	.....
August	66.7	50.1	.....
September	66.7	43.9	.....
October	75.1	50.5	.....
November	75.1	51.2	.....
December	75.1	66.2	.....
1958			
January	75.1	73.7	.....
February	75.1	70.9	.....
March	75.1	67.9	13.9
April	68.3	43.9	15.8
May	68.3	49.9	18.9
June	67.9	61.6	14.4
July	66.1	55.6	4.0
August	64.9	59.1	4.0
September	64.1	56.5	4.0
October	64.1	42.7	10.7
November	64.1	58.5	11.4
December	64.1	56.3	32.1
Monthly average .....	.....	58.0	12.9
1959			
January	64.1	63.7	8.0
February	64.1	60.1	9.0
March 1-10 (d)	64.1	60.7	4.0
March 11-31 (e)	67.5	59.6	.....

(a) Figures are sums of quotas, as of the first of the month, assigned to refineries considered to be customers for Canadian crude.

(b) No foreign crude oil, other than Canadian crude oil, actually was imported into the Middle West. "Imports from other foreign countries" represent amounts imported into East Coast areas of the United States by refiners operating in northern areas of the Middle West.

(c) Quotas were made retroactive to July 1, 1957, although the programme was not implemented until July 29, 1957.

(d) End of Voluntary Oil Import Programme.

(e) Beginning of Mandatory System.

Source: Compiled by Commission staff from data supplied by the United States Department of the Interior.

In December, 1957, the Special Cabinet Committee of the United States Government reviewed the supply-demand balance on the United States West Coast, known as District V. During the six months following its earlier report, demand in District V had lessened significantly, reflecting the effects of general economic factors and the impact of increased natural gas sales

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in that District. Moreover, a new pipe line, from the Aneth field of Utah in the "Four Corners area" to the Los Angeles area, was scheduled to begin the shipment of crude oil into California early in 1958 at a rate of 70,000 barrels per day. This line was intended to increase the availability of domestic oil to California. At the same time, importing companies were projecting a substantially increased volume of imports of foreign crudes for subsequent months. The Committee, therefore, recommended that, effective for the first six months of 1958, the programme of voluntary import restrictions should be extended to District V, with crude oil imports being limited to 220,000 barrels daily. This involved a reduction of some 130,000 barrels per day below the scheduled volume. Major importers, i.e., companies which averaged more than 3,000 barrels of imports per day during 1956-57, were requested to reduce imports to a level 15 per cent below their 1956-57 daily average. All companies at that time importing Canadian crude oil fell within this category. Table XVII shows the crude oil quotas thus established, for the first half of 1958, for companies in District V having refining operations in the Puget Sound area.

TABLE XVII — CRUDE OIL QUOTAS ESTABLISHED FOR COMPANIES IN DISTRICT V HAVING REFINING OPERATIONS IN THE PUGET SOUND AREA
(thousands of barrels per day)

<i>Importer</i>	<i>Average imports 1956-57</i>	<i>Scheduled imports first half of 1958</i>	<i>Import quota assigned for first half of 1958</i>
General Petroleum Corporation....	30.0	27.4	25.5
The Texas Company	24.2	28.5	20.6
Shell Oil Company	38.2	35.0	32.5
Total	92.4	90.9	78.6

Source: Compiled by Commission staff from data published by the United States Department of the Interior.

Crude oil imported into District V by the companies shown in Table XVII, during the first half of 1958, did not fall significantly below the quotas set for these companies. However, as indicated by Table XI, Canadian exports to the Puget Sound area dropped very substantially during 1958. Canada exported to the area a peak average of approximately 94,000 barrels per day in July, 1957, but only some 52,000 barrels per day in January, 1958. By the autumn of 1958 these exports had declined to little more than an average of 11,000 barrels per day. The continued export of even this small volume was the result of a special arrangement whereby Imperial Oil Limited

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accepted at Montreal or Halifax 11,500 barrels per day of Venezuelan crude owned by an affiliate of General Petroleum Corporation and the latter Company took crude oil from Western Canada at its Puget Sound refinery. Late in 1958 this arrangement was supplemented by an additional 12,000 barrels per day taken by General Petroleum Corporation for its Puget Sound refinery on a similar exchange basis.

The Shell refinery at Anacortes substituted higher-cost California crude, early in 1958, for the greater part of its Canadian imports. The Company had an inventory surplus of crude and products in the San Francisco and Los Angeles areas. In addition, there were long established relationships with local producers of crude. Rather than shut back the modern refinery at Anacortes and run this crude in California, it was decided to ship the crude north and operate the Anacortes refinery at capacity. The Company also had access to crude oil in British Borneo which could be laid down at competitive prices in the Puget Sound area. Consequently, Shell decided to discontinue its use of Canadian crude at Anacortes throughout the second half of 1958, although in May, 1958, Shell Oil Company of Canada had predicted to the Commission a doubling of the then 10,000 barrels a day receipts of Canadian crude by this refinery for the following month and further increases later.

The Texas Company's Puget Sound refinery at Ferndale commenced operations during the last quarter of 1958. In its testimony before the Commission, McColl-Frontenac Oil Company Limited (now Texaco Canada Limited) reported that it had been informed by its parent company, i.e., The Texas Company, that the new Ferndale refinery was expected to take some 8,000 barrels per day of Canadian crude, amounting to 20 per cent of its capacity. However, as at May, 1959, the Company had used no Canadian crude in its Ferndale refinery, in spite of the fact that its Canadian subsidiary, Texaco Exploration Company, has sizeable oil reserves in Western Canada.

In a "Memorandum for the President" dated February 27, 1959, the Office of Civil and Defense Mobilization advised that the quantities of oil imports and conditions in the industry had not been stabilized and that:

"in the current world over-supply situation, excessive quantities of low-priced oils from offshore sources are seeking a United States market. In such a situation, without control of production in relation to demand by the countries of origin, it is to be expected that there would be substantial economic incentives to increase imports into the United States. The consequences would continue to upset a reasonable balance between imports and domestic production, with deleterious effect upon adequate exploration and the development of additional reserves which can only be generated by a healthy domestic production industry".

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In its Report to the President, dated March 6, 1959, the Special Committee to Investigate Crude Oil Imports found that, although the majority of firms in the oil industry had complied with the Voluntary Programme, certain factors compelled mandatory action. These included:

“the excessive imports by companies who had not complied with the Voluntary Programme a threat to the success of the Voluntary Programme because of increased importation of unfinished oils and products; the likelihood of increased non-compliance among companies now having allocations when they are asked to cut back imports voluntarily in order to provide allocations for newcomers to the Programme; and the impossibility of working out a desirable and legally permissible revision of the Voluntary Programme acceptable to the Committee which will take care of these requirements”.

On March 10, 1959, a Proclamation was issued by the President of the United States establishing a system of mandatory controls, effective March 11, 1959, to replace the voluntary control programme. The basis of the mandatory system, like that of the voluntary programme, was described as “the certified requirements of our national security which make it necessary that we preserve to the greatest extent possible a vigorous, healthy petroleum industry in the United States”.

In announcing the introduction of the new system, the President stated:

“The United States recognizes, of course, that within the larger sphere of free world security, we, in common with Canada and with the other American Republics, have a joint interest in hemisphere defense. Informal conversations with Canada and Venezuela looking toward a coordinated approach to the problem of oil as it relates to this matter of common concern have already begun. The United States is hopeful that in the course of future conversations agreement can be reached which will take fully into account the interests of all oil producing states”.

Under the mandatory system import licences were to be granted for periods of six months, except that the initial licences were to be issued for the period ending June 30, 1959.

The total quota for refineries in the United States which had been using Canadian crude oil was lowered, as is shown in Table XVIII, from the previous quota. This decrease came about largely as a result of a reduction in District V. The net change in Districts I-IV was not appreciable.

Table XVIII sets out the new quotas established under the mandatory control system for refineries in Districts I-IV and District V which had used Canadian crude and compares them with those in force immediately prior to the introduction of mandatory controls. It will be noted that two small refiners—Leonard Refineries, Inc., and West Branch Refineries, Inc., both in Michigan, were authorized as “new importers”.

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TABLE XVIII — CRUDE OIL QUOTAS ESTABLISHED IN MARCH, 1959, UNDER THE UNITED STATES MANDATORY CONTROL SYSTEM FOR COMPANIES WHICH HAD USED CANADIAN CRUDE OIL

<i>Company</i>	<i>New Quota bbl/day</i>	<i>Old Quota bbl/day</i>
<i>District I-IV</i>		
Bay Refining Co.	2,160	2,700
Great Northern Oil Co.	22,480	28,100
International Refineries, Inc.	8,400	10,500
Northwestern Refining Co.	9,200	11,500
Murphy Corporation (a)	3,440	4,500
Leonard Refineries	2,710	.....
West Branch Refineries, Inc.	200	.....
Shell Oil Company and other quota allocations	18,910	6,800
Sub-total	67,500	64,100
<i>District V</i>		
General Petroleum Corp.	19,120	23,900
Shell Oil Company	24,320	30,400
The Texas Company	15,440	19,300
Sub-total	58,880	73,600
TOTAL	126,380	137,700

(a) Successor to Lake Superior Refining Company.

Source: Compiled by Commission staff from information supplied by the United States Department of the Interior.

As a result of the reduction made for District V, General Petroleum's quota was reduced from 23,900 to 19,120 barrels per day and, because this was the only company in District V taking Canadian crude, exports of Canadian crude to this District were thereby reduced correspondingly. A total of 39,760 barrels per day was available under the new quota for Shell Oil Company and The Texas Company. These companies did not use their quotas to acquire any Canadian crude but continued to import overseas crude. However, in April, 1959, immediately prior to the exemption of Canadian oil from the mandatory import restrictions, Shell Oil Company nominated for 12,000 barrels per day of Canadian crude for use in its Anacortes refinery in May, 1959.

In the St. Paul area the Great Northern Refining Company, which had been taking its full import quota in Canadian crude, had its quota reduced under the mandatory import restrictions from 28,100 to 22,480 barrels

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per day. Other refiners in the Middle West area which used Canadian crude had been operating below their quotas and were not directly affected by the relatively small decrease made in them.

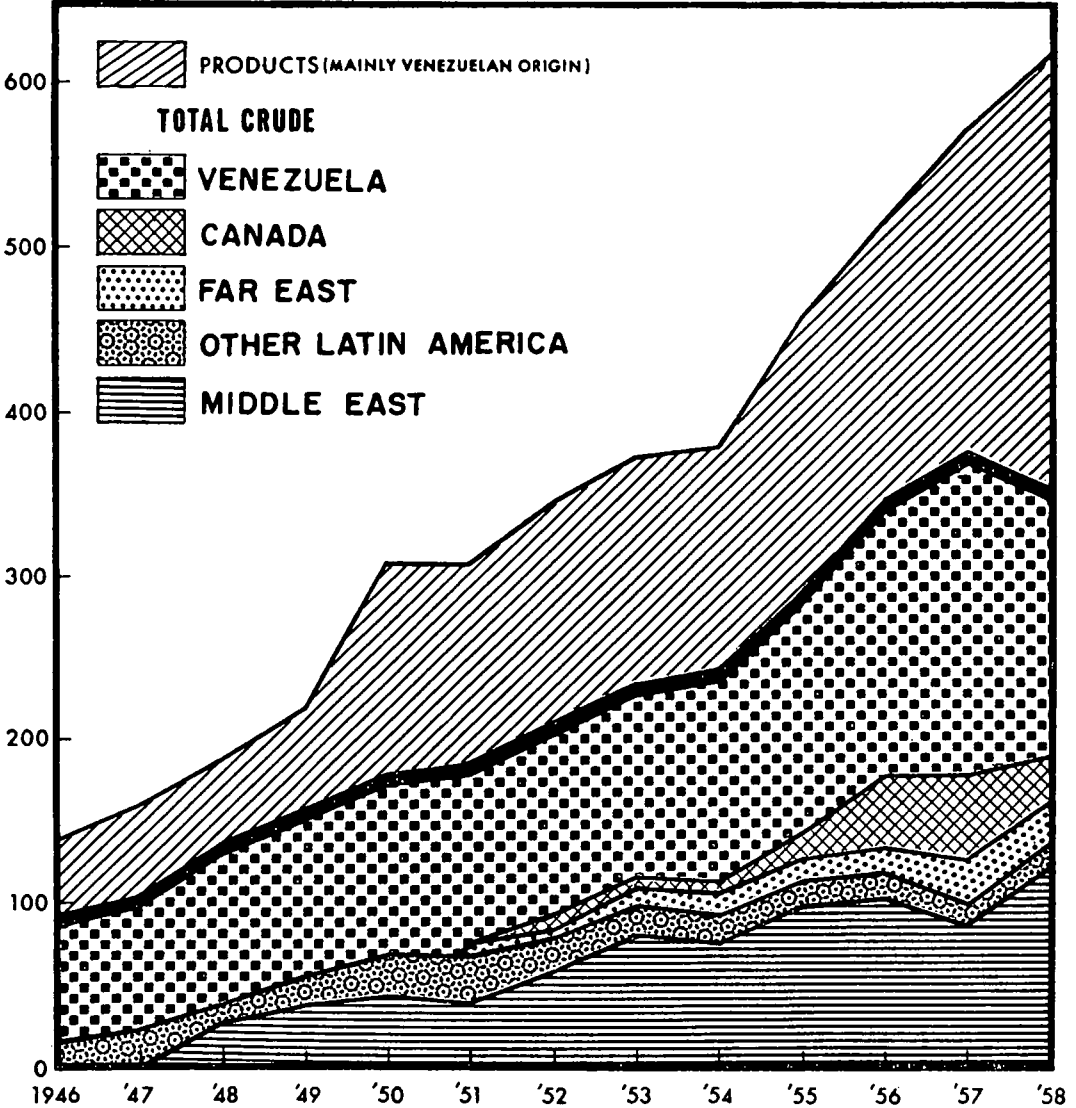
Thus, during the period July, 1957 to May, 1959, when Canadian crude exports to the United States were subject initially to voluntary import controls and subsequently, for a short period, to mandatory controls, exports from Canada to the Pacific Coast states decreased from approximately 100,000 barrels per day to a volume at the end of 1958 of little more than one-tenth of this figure, while exports to the Middle West area failed to record any significant growth. By the end of April, 1959, when the exemption of Canadian crude from mandatory controls was announced, total Canadian exports of crude oil were no higher than the level which had been reached in late 1955, before the Suez crisis threatened. While a part of the decline was attributable to the disappearance of the abnormal situation created by the closure of the Suez Canal, the major Canadian oil companies appearing before the Commission made it clear that, in their opinion, the export of Canadian oil to the United States had been adversely affected by United States import controls. According to a study given to the Commission by one of these companies, experience in the Puget Sound area demonstrated that under the system of voluntary quotas, markets for Canadian crudes were lost to Venezuelan crudes, in spite of the fact that Canadian crudes were more than competitive on a posted price basis with these sea-borne crudes. The restrictions on United States imports would appear to have accentuated the concern of the United States refining companies and their international affiliates to import overseas rather than Canadian crudes in order to secure the greater overall return derived from the use of wholly-owned overseas crudes. There is no doubt that the mandatory controls would have made the export of Canadian crude to the Puget Sound area even more difficult. However, mandatory controls only affected Canadian crude for several weeks.

By a Presidential Proclamation of April 30, 1959, the system of mandatory controls, which had become effective on March 11, 1959, was modified to exempt from quotas, effective June 1, 1959, crude oils, unfinished oils and finished petroleum products entering the United States by pipe line, motor carrier or rail from the country of production. Thus these exemptions were limited to Canada and Mexico, the only two countries which can comply with the requirements for exemption. Tanker shipments are not exempt and ocean shipments from British Columbia to California, such as those made during 1956 and 1957, are still subject to the import quota system. The great bulk of exports from Canada has been by pipe line and it is those exports which are now fully exempted from any quotas. In Chapter 4

CHART 7

UNITED STATES OIL IMPORTS 1946-1958

MILLION Bbl



SOURCE: PETROLEUM PRESS SERVICE

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we endeavour to assess the significance of the exemption of Canadian crude from United States import controls on the future prospects of exports of such crude to United States markets.

Chart 7, "United States Oil Imports 1946-1958" illustrates the growth in oil imports into the United States since 1946, and shows the prominent role of Venezuela in both crude oil and product supply, the increasing shipments from the Middle East and the relatively small volume of Canadian crude oil reaching United States markets.

Some Factors in the World Oil Industry Affecting the Export of Canadian Crude Oil

The broader significance of the United States import restrictions is apparent when these restrictions are related to changes in basic conditions of the world oil industry which have occurred in recent years. A world surplus of oil of major proportions had developed by 1958, which gave rise to an intensification of United States import restrictions and resulted in a weakening of petroleum prices. In addition, world shipping conditions had altered and tanker rates had declined.

The surplus of petroleum in the world arose, in large part, from the discovery and development of vast new reserves. In Venezuela, crude oil and natural gas liquid reserves increased from 7.3 billion to 16 billion barrels during the decade after 1947. During the same period, Venezuelan production rose from 435 million to 1,027 million barrels per year. The fact that Venezuelan oil fields are close to tidewater and ocean transportation gives the country a strong competitive position in the world oil trade. Middle East reserves in 1947 stood at 19.6 billion barrels and constituted about 37 per cent of the total world reserves (excluding the U.S.S.R. and associated countries) at that time. By 1957 reserves had risen to 169.5 billion barrels or 70 per cent of total world reserves. During the period 1947-57, Middle East production increased from 310 million to 1,290 million barrels per year giving the Middle East, in 1957, one-fifth of the world's markets. Moreover, sufficient reserves had been discovered so that this level of production could be maintained for well over a century without further exploration. As in the case of Venezuela, oil in the Middle East has ready access to tidewater, which gives this region a particularly strong competitive position when tanker rates are low.

Table XIX summarizes the relative growth in reserves and production in the United States, Venezuela, the Middle East and other countries during the period 1947-57.

Export of Canadian Oil

**TABLE XIX — WORLD RESERVES AND PRODUCTION OF OIL AND
NATURAL GAS LIQUIDS**

(excluding the U.S.S.R. and associated countries)
(in billions of barrels)

	<i>Reserves</i>		<i>Production</i>	
	1947	1957	1947	1957
U.S.A.	24.7	36.0	1.99	2.91
Venezuela	7.3	16.0	0.43	1.03
Middle East	19.6	169.5	0.31	1.29
Other Countries	1.9	19.1	0.06	0.79
Total	53.5	240.6	2.79	6.02

Source: Compiled by Commission staff from various official sources.

Chart 8, "Petroleum Reserves, Selected Countries, 1947-1952-1957", further illustrates the growth of crude oil reserves, exclusive of natural gas liquids, in the principal oil producing areas of the world.

A study by World Oil in August, 1955, showed that United States companies controlled 57 per cent of all oil reserves outside of the United States, exclusive of those in the U.S.S.R. and associated countries. A Chase Manhattan Bank study indicates the extent of United States oil companies' participation in the oil industry in foreign countries, in terms of investment in gross fixed assets, as at December 31, 1957:

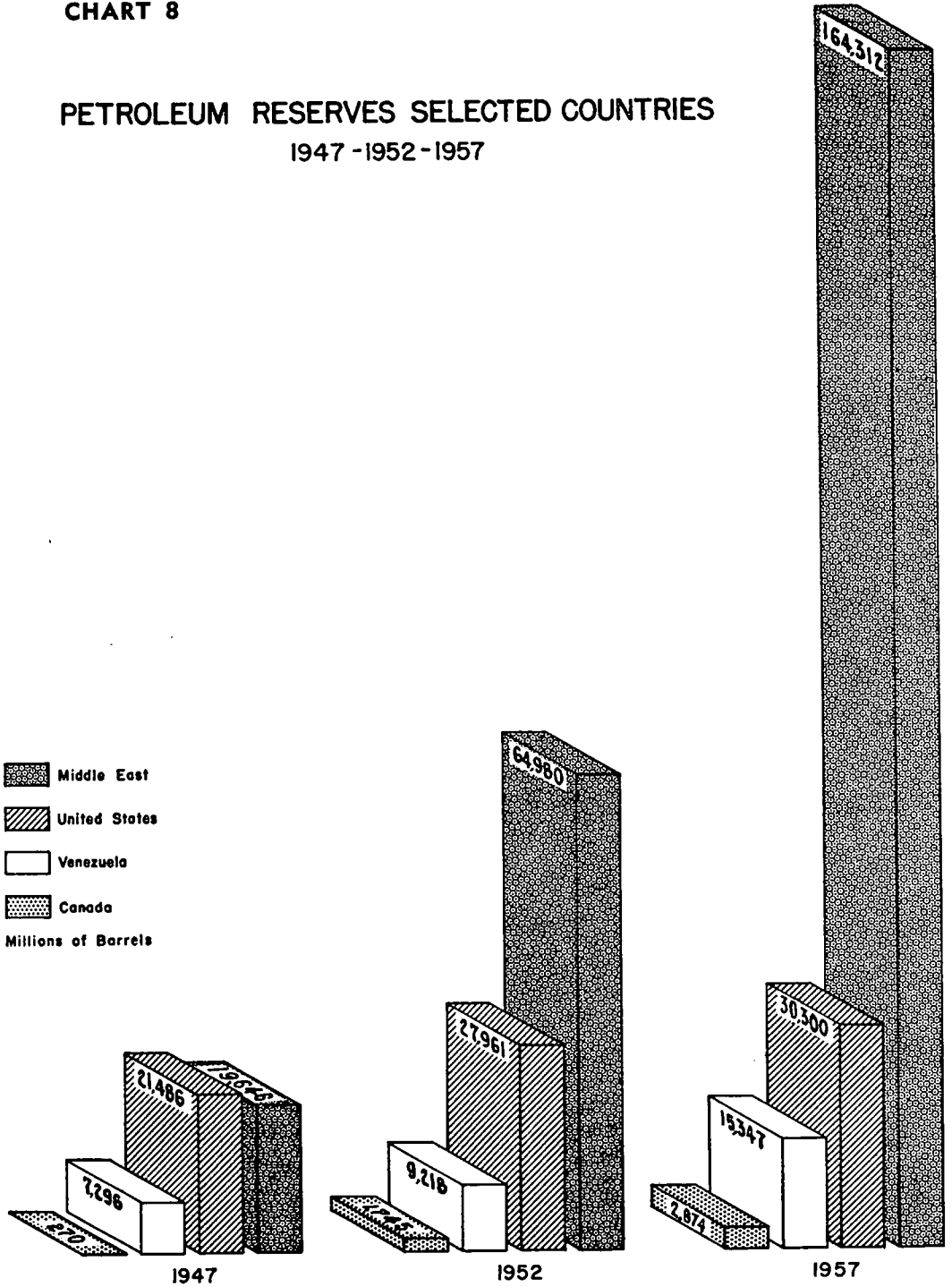
Canada	57 per cent
Venezuela	64 per cent
Western Europe and Africa	22 per cent
Middle East	47 per cent
Far East	33 per cent
Other countries and foreign flag tankers	19 per cent

These companies produced 56 per cent of the total output of crude oil in these countries in 1957. Their participation in Middle East production was 58 per cent and in Venezuela was 64 per cent.

The dominant position in the world oil industry, exercised by United States companies, is held by five companies, namely: Standard Oil Company of New Jersey, Gulf Oil Company, Socony Mobil Oil Company, The Texas Company and Standard Oil Company of California. It has been estimated that these five companies in 1956 accounted for 54 per cent of all oil production outside of the United States. In a recent Fordham University study it is indicated that Standard Oil of New Jersey and Gulf Oil derive two-thirds of their net income from foreign operations and Standard Oil of California,

CHART 8

PETROLEUM RESERVES SELECTED COUNTRIES
1947 - 1952 - 1957



PREPARED BY COMMISSION STAFF

Export of Canadian Oil

one-half. The vital interest that these five international companies, which account directly for about one-half of all the United States oil imports and indirectly for additional amounts, have in foreign oil operations is indicated by the fact that each of them has at least 90 per cent of its reserves located in foreign countries. The companies have foreign oil reserves equivalent to about three times the total proved reserves of the United States. At the same time these five companies, together with the British Petroleum and Royal Dutch-Shell Groups, account for about 85 per cent of the world's oil production outside of the United States and the U.S.S.R. and associated countries. The United States oil industry is thus heavily involved throughout the world.

In spite of the dominant role played by the five companies referred to with respect to the reserves of oil located in foreign countries, these companies own less than one-third of the reserves of oil located within the United States. The larger portion, at least two-thirds of these reserves in the United States, is owned by numerous other United States oil companies. These five companies are dominant, however, in the refinery sector of the industry in the United States.

Owing to the development of a world oil surplus United States companies have encountered increasing difficulties in holding and expanding the markets for oil produced from their overseas holdings. Their efforts to use oil from these sources in their own or affiliated refineries in the United States have therefore tended to increase. On the other hand, the use of Canadian oil owned by these refining companies tends to be less attractive financially since, under the prorationing of production applied in Alberta, for example, United States refiners using Canadian crude are required to purchase oil produced by other companies as well as from their own holdings. For this reason, their purchases in Canada may well benefit their competitors more than themselves, which is not true of their purchases from overseas. In some instances the percentage of company "owned" crude would be relatively small as compared with the total amount of crude purchased by the company in Canada. This would be so if the purchasing company's oil reserves in Canada, and the corresponding prorated share in production, were small.

This situation may be contrasted with that of a company importing "owned" crude from a concession area in Venezuela, the Middle East or the Far East. Under the "concession" system of ownership practised overseas, the systems of multiple land ownership in oil areas and prorationing used in North America are virtually non-existent, so that a United States refining company is able to import and refine crude oil obtained exclusively from its own or affiliated properties. By so doing it is able to earn profits from its

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production as well as from its refinery operations. Under such circumstances, it might prove more profitable, for the production and refining operation as a whole, to import and use company-owned crude in its United States refinery even if the per barrel cost were somewhat higher than that of crude obtained from an alternate North American source. The ability of United States oil companies to realize such profits on production, when using their own overseas crudes in United States refining operations, explains, in part, the difficulty which Canadian crude has had in gaining a larger share of the Pacific Northwest market despite the fact that Canadian crude has been competitive with the posted prices of offshore crudes.

Where replacement costs overseas are low and proved reserves are sufficient to support production over many decades in the future without further exploration, as in the Middle East, the use of "owned" crude from such sources also means that the revenues obtained from production can be considered as freely available, in the sense that the producing company does not need to use any appreciable part of them to replace its reserves. By contrast, in Canada, the reserves are not sufficient to avoid the necessity of re-investing a large part of the revenues obtained from production if the company desires to replace the oil which is produced and thereby maintain its position in the industry. In addition, replacement costs in Canada are high relative to revenues from production. It should be mentioned that the force of these various incentives to use "owned" crude, rather than Canadian crude, can be expected to vary from time to time reflecting, inter alia, the stability of international affairs and political conditions within the different oil producing countries overseas.

The weakness of product prices in the United States during 1957 and early 1958, with resultant adverse effects on refinery margins, appears also to have been a factor in the large number of applications for quotas by independent refining companies which had not previously imported crudes. (There is little doubt that the greater intensity of competition in domestic and overseas markets over the last year or more has increased the desire of refining companies to take advantage of low tanker rates and to use overseas "owned" crude wherever possible, even though crudes could have been purchased somewhat more cheaply from Canadian sources on the basis of posted prices.

The behaviour of ocean tanker rates since the Suez crisis has contributed to the difficulties of marketing Canadian crude in the Puget Sound area. Tanker rates in general have been reduced during this period as a result of several factors. The greatest influence has been the increase in the tanker tonnage available, stimulated in part by the efforts made at the time to overcome the scarcity created by the closing of the Suez Canal and the

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resultant necessity of sending tankers over the longer sea routes to the Middle East. Many tankers, which had formerly been laid up, were brought back into service during the Suez crisis and the construction of new tankers was accelerated. A further increase in tanker tonnage developed as new "super tankers" designed for low cost transportation of oil became available.

The result of these developments has been that ocean tanker rates have fallen appreciably since the period 1956-57, when Canadian crude was expanding its sales into the Puget Sound area. Spot tanker rates, which had been as high as USMC plus 200 per cent or more in late 1956 and early 1957 in the Western Hemisphere, fell to a level as low as USMC minus 50 per cent or less in early 1958. The vast majority of tanker shipments to the North American refineries, of course, were not affected by price fluctuations of this range. The shipment of overseas oils to these refineries is covered, in the main, by long-term tanker contracts. Nevertheless, the period of low or "distress" rates in spot charters, which began to develop in the latter part of 1957, has had a marked effect in reducing tanker rates in general.

Since the latter part of 1957 Canadian exports of oil, particularly to the Puget Sound area, have felt the impact of all these adverse factors operating in the world oil economy. It is difficult to determine how long each of them can be expected to persist. Some of these factors seem to be inherent in the structure of the world oil economy while others may be of a temporary nature. It is clear, however, that full account must be taken of these changing factors, as well as of changes in import regulations, in any assessment of future exports of Canadian crude oil to the United States.

Future Markets for Canadian Oil

Markets for Canadian oil are likely to be confined to Canada and to the United States. While Canada has large reserves of crude oil they are not located near tidewater but are "landlocked" in Western Canada. This crude must move long distances overland in order to reach large and growing markets. Costs of exploration, development and production of crude oil in Canada are, on the average, higher than in Venezuela and the Middle East. The combination of these circumstances puts Canadian crude at a disadvantage in world markets and limits possible export markets to the United States.

United States Markets

Supply and Demand in the United States

The United States is the largest consumer of petroleum products in the world, both in absolute and per capita terms, and this situation may be expected to continue for some time. The Chase Manhattan Bank, among other authorities, has estimated the growth of consumption of petroleum products to be anticipated from an expected increase in population of approximately 30 million in the next 10 years. Estimates have also been made by various authorities as to the capacity of the industry in the United States to meet this greatly increased demand. Some of these demand and supply estimates are shown in Table XX.

The Chase Manhattan Bank estimate of petroleum demand in 1967 is based on a 5 per cent annual increase during the period 1957-67. Another authority has expressed the view that demand is more likely to increase at the lower rate of 3 per cent annually.* The significance of the different

*"This estimate of new crude oil necessary for the next decade is considerably less than some recent forecasts which assume a 5 per cent annual rate of increase in demand and that discoveries must be one and one-half times production. The estimate of The Chase Manhattan Bank that 57 billion barrels of additional domestic crude oil would be necessary, if domestic production is to continue to supply 90 per cent of the nation's oil needs, will probably prove to be incorrect for two reasons. First, demand is more likely to increase at a rate of 3 per cent rather than 5 per cent, for reasons already stated; and second, improvements in reservoir management will permit reserves to be produced more rapidly. These considerations require a rate of additions to oil reserves only slightly higher than that of the past 10 years."

("The Dynamics of Domestic Petroleum Resources" by Morgan J. Davis, President of Humble Oil and Refining Company, an American Petroleum Institute Paper, November, 1958).

Future Markets for Canadian Oil

TABLE XX — ESTIMATES OF PETROLEUM DEMAND AND POTENTIAL DOMESTIC PRODUCTION IN THE UNITED STATES — 1957 and 1967

(in thousands of barrels daily)

	1957	1967
<i>Total petroleum demand</i>		
The Chase Manhattan Bank (a)		
Total United States	8,817	14,400
<i>Potential petroleum production</i>		
The Chase Manhattan Bank (a)		
Crude oil	8,500	9,500
Natural gas liquids (Actual production)	807	1,300
Total	9,307	10,800
Warren B. Davis, Gulf Oil Corp. (b)		
Crude oil		9,000
National Petroleum Council, U.S.A. (c)		
Crude oil	9,867	
Independent Petroleum Association of America (d)		
Crude oil	9,250	
Natural gas liquids	850	
Total	10,100	
Resources For The Future, Inc. (e)		
Crude oil		13,700

(a) The Chase Manhattan Bank, "Future Growth of the World Petroleum Industry", New York, November, 1958.

(b) Warren B. Davis, Gulf Oil Corporation, "The Long-Range Crude Oil Productive Capacity of the United States", a Society of Petroleum Engineers of A.I.M.E. paper, February, 1958.

(c) This estimate published by the National Petroleum Council Committee on Petroleum Productive Capacity in October, 1957, applies to January 1, 1957.

(d) Independent Petroleum Association of America, Committees on Supply and Demand and Productive Capacity. This estimate applies to the year-end.

(e) Based on estimates by Bruce C. Netschert, "The Future Supply of Oil and Gas", Resources For The Future, Inc., Washington, D.C., January, 1958.

assumptions is indicated by the fact that the lower rate of increase would result in a requirement of some 11,815,000 barrels per day in 1967, in contrast to the requirement of 14,400,000 barrels per day shown in the table.

It is generally conceded that, difficult as it may be to estimate potential demand in 1967, it is just as difficult to estimate potential supply. There are even differences of opinion regarding the present potential capacity of the industry in the United States. It will be seen from Table XX that estimates of crude oil producibility in the United States at the end of 1957 ranged from 8.5 million to approximately 10 million barrels per day. Inasmuch as the actual domestic production of crude oil in 1957 averaged some 7.2 million barrels per day, The Chase Manhattan Bank estimate would indicate a total

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surplus capacity of about 1.3 million barrels per day for that year, whereas the other estimates would indicate a surplus capacity for crude oil of 2 to 3 million barrels per day.

The variation in estimates of potential production for the year 1967 is of significance for any appraisal of Canada's possible exports of crude oil to the United States. The National Petroleum Council foresees no difficulty in sustaining the present crude oil producibility, if the present rate of drilling activity of 41,000 to 50,000 wells annually is continued in the United States. The estimate of Resources For The Future, Inc., referred to in Table XX, concluded that "the indicated total domestic availability of crude oil in the United States in 1975, at no appreciable increase in constant dollar costs, is on the order of six billion barrels". On the basis of this estimate, producibility in 1967, as shown in Table XX, could be some 13,700,000 barrels per day. If this level of production were achieved in 1967 it would amount to about 95 per cent of the demand, as estimated by The Chase Manhattan Bank. On the other hand, the Bank estimate of a production of 10,800,000 barrels per day (crude oil and natural gas liquids) in 1967 indicates the extent to which, in the opinion of that institution, the increased requirements for petroleum products will be met from domestic sources in 1967 after taking into account, among other things, the role of continued imports and an assumed rise in replacement costs in the United States. The estimate by Warren B. Davis of about nine million barrels per day as the "producing rate" in 1967 assumes a drilling success rate better than that of the past nine years but poorer than that of the past 20 years, a crude oil price rising to \$4.00 per barrel (in 1956 dollars) and a maximum annual producing capacity equivalent to 10 per cent of year-end reserves.

There appears to be disagreement also on the important question of cost trends. Certain projections of recent experience in finding and developing new oil reserves in the United States have suggested that costs are likely to rise. For example, a cost study by H. J. Struth, a United States petroleum consultant, indicates that current dollar costs of finding oil in the United States are continually rising and shows an average discovery cost, on a three-year moving average basis, for the years 1954-56 of 98 cents per barrel, compared with 51 cents per barrel for the years 1950-52 and 32 cents per barrel for the years 1945-47.* The study concludes that in the past ten years there has been a substantial increase in discovery costs and a narrowing of the differential between costs and market prices. Other authorities consider that improved technology, the increasing part to be played by natural gas and natural gas liquids in meeting the costs of discovery, together with an

* H. J. Struth, "Oil Finding Costs Hit New Peak", *The Petroleum Engineer*, January, 1959, p. B-27.

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improvement in conservation procedures, will offset any tendency towards higher costs. The preponderance of opinion, however, seems to be that this tendency towards higher costs will continue.

The estimates in Table XX suggest that the domestic supply-demand position of the United States in 1967, in respect of crude oil and natural gas liquids, could range from one approaching self-sufficiency to one requiring the importation of some 25 per cent of the country's petroleum requirements. Total oil imports in 1967 could, therefore, be relatively minor or could be as high as four million barrels per day,* compared with the importation in 1958 of some 1.6 million barrels per day.

Imports of crude oil (exclusive of products) into the United States over the past five years have been as follows:

1954—656,000 barrels per day	1957—942,000 barrels per day
1955—782,000 barrels per day	1958—961,000 barrels per day
1956—934,000 barrels per day	

There is the further factor of the future import policy of the United States. If the system of mandatory import restrictions is continued, the growth in crude oil imports generally into the United States may be at a slower rate than that experienced during the past five years. In view of the many uncertain factors and the wide divergence of opinions that have been expressed, the Commission has not attempted to estimate United States requirements for crude oil imports. It seems reasonable to conclude, however, that even under existing import controls there is likely to be an increase in total crude oil imports over the next 10-year period.

While the prospects for the export of Canadian crude to the United States will be affected by the magnitude of the oil deficiency of that country, they will also be influenced by other factors, including the future world supply and demand situation.

Future World Oil Supply and Demand

Most estimates of the world oil supply and demand situation suggest that the present surplus producing capacity in the oil industry is likely to persist over the next decade. Table XXI sets out The Chase Manhattan Bank's projection of world supply and demand for the year 1967. This table also gives statistics for the years 1946 and 1957 illustrating, for all countries

* In a paper entitled "World Oil Trade and International Payments", presented at the Fifth World Petroleum Congress, New York, June, 1959, by Bernard T. Stott, United States oil imports by 1967 are forecast in the range of three to four million barrels a day.

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excluding the U.S.S.R. and associated countries, the rapid growth in demand and the change in the pattern of supply that has occurred and is forecast for the period up to 1967.

Although this estimate is restricted to a 10-year period, longer term forecasts indicate a continuing high rate of growth in oil demand. A forecast by Walter J. Levy* for the year 1975 places world oil demand, excluding bunkers, at 37.1 million barrels per day compared with 13.1 million barrels per day in 1956. This increase in demand represents an annual rate of growth of 5.6 per cent. Although the growth of demand for oil in North America during the period 1956-75 is forecast at 3.4 per cent per annum, in contrast to about 5 per cent which may be inferred from Table XXI for the period 1957-67, the daily demand for oil in North America in 1975 would be approximately 15.8 million barrels or almost double the 1956 demand. Thus the general order of growth trends to 1967, indicated in Table XXI, seems to conform to the longer term forecast.

TABLE XXI—WORLD SUPPLY AND DEMAND
(excluding the U.S.S.R. and associated countries)

	1946	1957	1967	1946	1957	1967	Annual growth rate 1957-67 (per cent)
	(in thousands of barrels per days)			(per cent)			
<i>Supply</i>							
Canada	20	497	1,300	0.3	3.0	4.4	10.1
Mexico	135	252	500	1.9	1.5	1.7	7.0
Venezuela	1,065	2,779	5,000	15.3	17.0	17.0	6.1
United States	4,751	7,976	10,800	68.4	48.7	36.6	3.2
Other Western Hemisphere Countries	214	419	1,000	3.1	2.6	3.4	9.1
Total Western Hemi- sphere	6,185	11,923	18,600	89.0	72.8	63.1	4.3
Middle East	700	3,533	8,650	10.1	21.6	29.3	9.5
Far East	22	465	750	0.3	2.8	2.5	5.0
Other countries	42	286	1,000	0.6	1.8	3.4	13.5
Total Eastern Hemisphere	764	4,284	10,400	11.0	26.2	35.2	9.2
Total Free World	6,949	16,207	29,000	100.0	99.0	98.3	6.0
Other Sources .....	.....	165	500	.....	1.0	1.7	11.7
Total	6,949	16,372	29,500	100.0	100.0	100.0	6.0
<i>Demand</i>							
United States	4,912	8,817	14,400	69.3	55.1	48.8	5.0
All other countries	2,179	7,173	15,100	30.7	44.9	51.2	7.7
World	7,091	15,990	29,500	100.0	100.0	100.0	6.3

Source: The Chase Manhattan Bank. (Calculations of percentages by Commission staff.)

* Walter J. Levy and Milton Lipton, "Some Major Determinants of Future Oil Requirements and Supplies", a paper presented to the Fifth World Petroleum Congress, New York, June, 1959.

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Chart 9, "World Petroleum Supply and Demand", illustrates the growth in the production and consumption of petroleum which took place throughout the world during the period 1946-57. The estimates in Table XXI suggest a similar rate of growth for the next ten years.

One of the important features of recent changes in the world pattern of oil supply has been the growth of output in the Middle East and Venezuela. The consensus is that this trend will continue over the next decade. The estimates given in Table XXI indicate that production in the Middle East in 1967 is expected to constitute almost 30 per cent of world production, excluding the U.S.S.R. and associated countries, compared with approximately 22 per cent in 1957. Venezuela's share is expected to remain at approximately 17 per cent of the greatly increased world production. On the other hand, production in the United States is expected to decline from approximately 49 to 37 per cent of world production by 1967.

As indicated in Chapter 3 of this report, the proven oil reserves of the Middle East as now established are sufficient to support the present level of production for more than a century. There can be no doubt as to the capacity of the countries of this area to meet a greatly increased demand. The reserves of Venezuela are also very large. The fact that they are now sufficient to sustain production at the present level for only 16 years is probably explained by the leasing policy of the Venezuelan Government, which did not grant any new concessions during the period from 1943 to 1956. The 16-year supply figure is, therefore, hardly representative of Venezuela's potential oil producing capacity.

The world supply of oil will undoubtedly be greatly augmented by recent discoveries which have occurred in the northern portion of the Continent of Africa.

The oil reserve position in the United States is in sharp contrast to that in the Middle East and in Venezuela. In the United States reserves are sufficient to support production for only about 12 years at the present rate of output, despite a relatively high level of exploration and development.

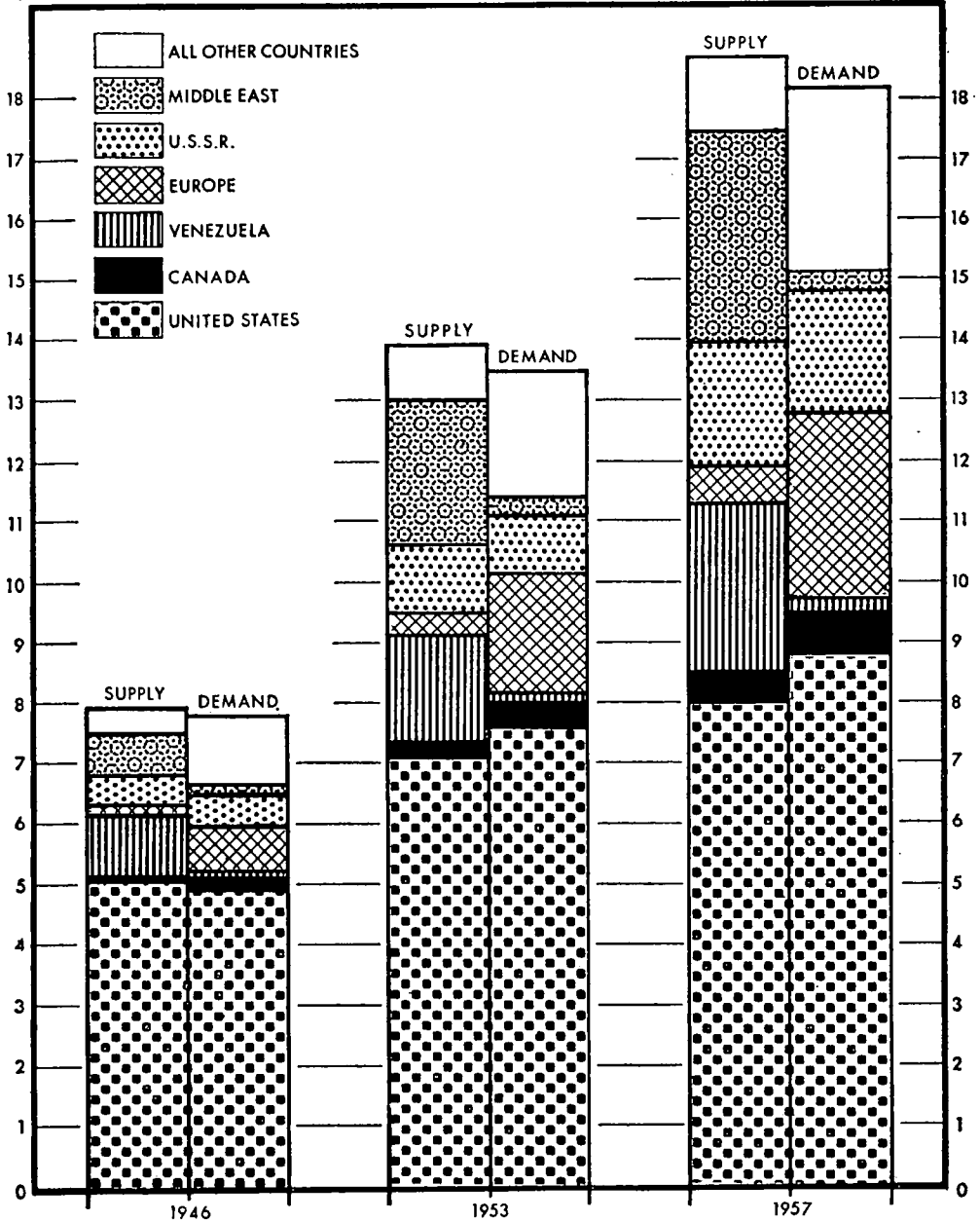
The estimates given in Table XXI suggest that the requirements of the United States over the next decade will become a smaller factor in world demand than heretofore. By 1967 the United States demand is estimated to constitute 49 per cent of total world demand compared with 55 per cent in 1957. This change arises from the faster rate of growth in demand anticipated for countries outside the United States. The table illustrates that the growth in demand for oil in the United States is estimated at 64 per cent over the next decade compared with 110 per cent for the rest of the world.

CHART 9

WORLD PETROLEUM SUPPLY AND DEMAND 1946 - 1953 - 1957

MILLIONS BARRELS
PER DAY

MILLIONS BARRELS
PER DAY



PREPARED BY COMMISSION STAFF

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We have already indicated some of the difficulties in assessing the future supply and demand situation in the United States but even greater difficulties are involved in assessing the future world supply and demand situation. The evidence indicates, however, that the world oil supply will be more than sufficient to meet the greatly increased demand which is anticipated. The Chase Manhattan Bank has estimated that, despite the fact that the present producing capacity of the world industry is more than sufficient to meet current requirements, additional investments of \$63 billion will be made in the oil producing areas of the world, outside of the United States, over the next decade, compared with \$26 billion made in the period 1948-57.

The intensity of the competition among oil exporting countries for the United States market is indicated in the Memorandum of the Director of Civil and Defense Mobilization to the President of the United States, dated February 27, 1959, in which it is concluded that low-priced crude oil and products were being imported from offshore sources in such quantities and under such circumstances as, in his judgment, "to threaten to impair the national security". He stated:

"Finally, it is apparent to me that in the current world over-supply situation, excessive quantities of low-priced oils from off-shore sources are seeking a United States market. In such a situation, without control of production in relation to demand by the countries of origin, it is to be expected that there would be substantial economic incentives to increase imports into the United States.

The consequences would continue to upset a reasonable balance between imports and domestic production, with deleterious effect upon adequate exploration and the development of additional reserves which can only be generated by a healthy domestic production industry.

Accordingly, as a result of my investigation pursuant to Section 8 of the Trade Agreements Extension Act of 1958, I advise you of my determination that crude oil and the principal crude oil derivatives and products are being imported in such quantities and under such circumstances as to threaten to impair the national security."

Other Factors

Reference has already been made to the prominent role played by United States oil companies in the development and marketing of world oil resources. In more recent years such activities have been characterized also by the participation of an increasing number of new companies, in contrast to the earlier situation when exploration and development in the concession countries were carried out almost exclusively by a relatively small number of international oil companies. In 1957, 190 United States companies were engaged in oil exploration and development in 91 different countries; at the end of World War II only 28 United States companies were so engaged in 78 different countries.

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This greatly increased participation by United States companies in overseas oil regions has not only led to an increased productive capacity in these areas but, as noted earlier, affects the selection of the foreign crudes imported. We have already indicated that, in our opinion, the use by United States refiners of overseas crude oils, owned by themselves or by their affiliates, has been partly responsible for the decline in exports of Canadian crude to the United States. The extent to which this overseas "owned" crude will continue to restrict the export of Canadian crude oil to the United States may well depend, in part, on whether the crudes owned by these companies can be advantageously marketed elsewhere in the world. The intensity of competition for markets may also tend to depress world prices of crude oil in the future, or to prevent them from rising, as the new companies are often less able than the older and larger international companies to forego the revenues that immediate production would bring. Consequently these new companies may find it necessary to reduce prices to secure markets and thereby obtain immediate revenues.

When industry costs are considered, it seems clear that the competition faced by Canadian crude in the United States markets could be intensified by reductions in the selling prices of Middle East or Venezuela crudes. In testimony before a Congressional Committee in 1957, the Independent Petroleum Association of America presented data, based on a 1956 report by the Arabian-American Oil Company, to demonstrate that the total cost of finding, developing and producing Middle East oil does not exceed 30 cents per barrel. Information given to the Commission was to the same effect for the Middle East and also indicated, on a comparable basis, a cost of about 75 cents per barrel for Venezuela crude and somewhat in excess of \$1.00 per barrel for Canadian crude. These cost figures are before taxes and royalties. The lower finding, development and producing costs of Middle East crude, compared with Canadian crude, arise from the size of the reserves found in relation to the investment and the enormous potential production per well as compared with average Canadian experience.

A cost comparison, however, cannot stop at this point. The large expenditures that are made in the Middle East on projects of a social and general economic nature, in addition to direct expenditures on oil installations, obviously add to the low original cost of the oil itself. Information given to the Commission was that the relative profit margins per barrel of production in the Middle East, Venezuela and Canada, after taxes and royalties, do not differ materially, although there is a very great difference in the relative returns on investment. The significant fact is that in the Middle East the finding costs for the future production of 100 to 150 billion barrels of oil have already been incurred. Consequently, exploration costs for many years

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may be negligible and Middle East development and production costs in the future will be relatively small because of the high productivity of wells already drilled. Profits from Middle East oil operations may not need to be reinvested in further exploration and development in order to ensure continuity of operations and, therefore, may be available for other investment. On the other hand, in North America, a substantial portion of profits must be reinvested in order to ensure a safe ratio of reserves to production.

Low replacement costs, the desire for a relatively rapid amortization of investment in concession areas and the terms and conditions of concessions, all result in strong pressures to market Middle East crudes. Regardless of whether or not any major price break should take place in the future, the huge reserves of Middle East oil, constituting 70 per cent of the world total, will be highly competitive in world markets.

Tanker freight rates are a large element in the laid down cost of overseas crudes and will continue to influence the competitive position of Canadian crude oil in United States markets. A recent appraisal by The Oil and Gas Journal* indicates that the existing surplus of tanker tonnage should increase during the next few years and that tanker rates are likely to remain at low levels. The estimate made of tanker tonnage for the years 1958 to 1961, expressed in numbers of ships of T-2 equivalent,** is set out in the following tabulation:

	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961 ..</u>
Existing fleet less normal obsolescence	2,575	2,525	2,475	2,410
New deliveries (accumulative)	435	795	1,115	1,415
Potential fleet availability	3,010	3,320	3,590	3,825
Tonnage requirements	2,570	2,700	2,935	3,060
Theoretical surplus	440	620	655	765
Per cent surplus	14.6	18.7	18.2	20.0

This tabulation indicates an increase in tanker surplus from almost 15 per cent in 1958 to 20 per cent in 1961. Tanker tonnage requirements are based on a growth of 6 per cent per year in world oil demand, excluding the U.S.S.R. and associated countries. This theoretical surplus might be reduced by less new construction than is now planned and by the obsolescence of the older, smaller tankers. The new ships will be larger, faster and more economical than those now in use. Forecasts of continuing tanker surplus of these proportions give support to the view that charter rates for tankers could remain at their present low levels for at least several years.

*The Oil and Gas Journal, December 29, 1958—Vol. 56, No. 52, p. 141.

**A T-2 tanker is defined as a bulk petroleum carrier of some 16,765 tons dead weight and having a speed of about 14.5 knots.

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On the other hand, some authorities expect tanker rates to increase during the next few years because, they claim, present rates reflect a temporary surplus situation and the rates are not considered sufficiently profitable to support an adequate tanker fleet to meet an anticipated growth in the ocean transportation of oil. Current tanker rates of USMC minus 40 to minus 50 per cent are considered by these authorities to be distress rates. Higher rates, they feel, will be required to ensure the construction and maintenance of a modern efficient fleet of tankers, in spite of the increased efficiency of the modern ships and some reduction in construction costs in recent years.

It should be noted that on the basis of price the competitive position of Canadian crudes in the Puget Sound area would improve relative to Middle East oils by 22 cents a barrel for each increase of 10 percentage points in the USMC rate. Similarly, on the basis of price, the competitive position of Canadian crudes relative to Venezuela oils would improve by 11 cents per barrel.

The factors affecting entry of Canadian crude oil into United States markets do not apply to the same degree in the different sections of that country and it is important to consider them in relation to the specific market areas which have heretofore been supplied, in part, by Canadian crude or which offer prospects for exports from Canada. In examining these particular market areas the Commission took note of the general pattern of regional demand for crude oil in the United States. Expressed in terms of refining capacity, the Gulf Coast accounts for about 33 per cent of total United States crude oil demand. The regions of the Atlantic Coast, Pacific Coast and the major producing states each accounts for approximately 15 per cent of total demand and the inland market, north and east of the major crude oil producing area, accounts for approximately 22 per cent.

Particular Market Areas

The Chase Manhattan Bank in 1957 made an estimate of the future demand for petroleum products on the West Coast of the United States. Based on this estimate, total oil demand would rise by 1967 to some 1,900,000 barrels per day, of which approximately one million barrels of crude oil would be supplied by local production and a further 250,000 barrels from other United States sources. The estimate concludes that the balance of some 650,000 barrels will have to be met from imports. In May, 1959, The Oil and Gas Conservation Board of Alberta estimated that the crude oil requirements of District V (Washington, Oregon, California, Nevada and Arizona) would grow from the 1958 level of 1,156,000 barrels per day to 1,524,000 barrels per day in 1965. It also estimated that production of

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crude oil in District V would remain at 950,000 barrels per day. Consequently by 1965 the difference between demand and production of crude oil would be 574,000 barrels. The Board further concluded that by 1965 refineries in the State of Washington would account for 15 per cent of total District V crude oil demand, or 229,000 barrels per day.

One of the hazards in estimating the future requirements of the West Coast market for crude oil is the difficulty of assessing the extent to which sales of natural gas will affect the demand for petroleum products. Increased exports of natural gas from Canada may, therefore, have an adverse influence on the volume of Canadian crudes which will be exported to the area. A further difficulty in assessing the prospects of this market for Canadian crude is that of determining the extent to which the demand might be met from sources of production in Alaska. In 1958 oil was discovered on the Kenai peninsula and United States oil companies are now actively engaged in the search for oil in Alaska. The preference of the United States for the use of its own domestic crudes would suggest that any major discoveries of oil in this State could seriously affect the prospects of exports of Canadian crude to the West Coast, including the Puget Sound area.

Chart 10, "Principal Petroleum Refining Areas, Western Canada and Western United States, January, 1959", illustrates the importance of this West Coast area as a possible market for crude oil and the favourable geographical position of Canadian crude sources with respect to it.

The relatively short history of refining in the States of Minnesota and Wisconsin makes it difficult to forecast the increase in the requirement for crude oils in this section of the Middle West. Table XXII illustrates the history of Canadian crude exports to this area and contains a short-term projection of the prospective markets for it.

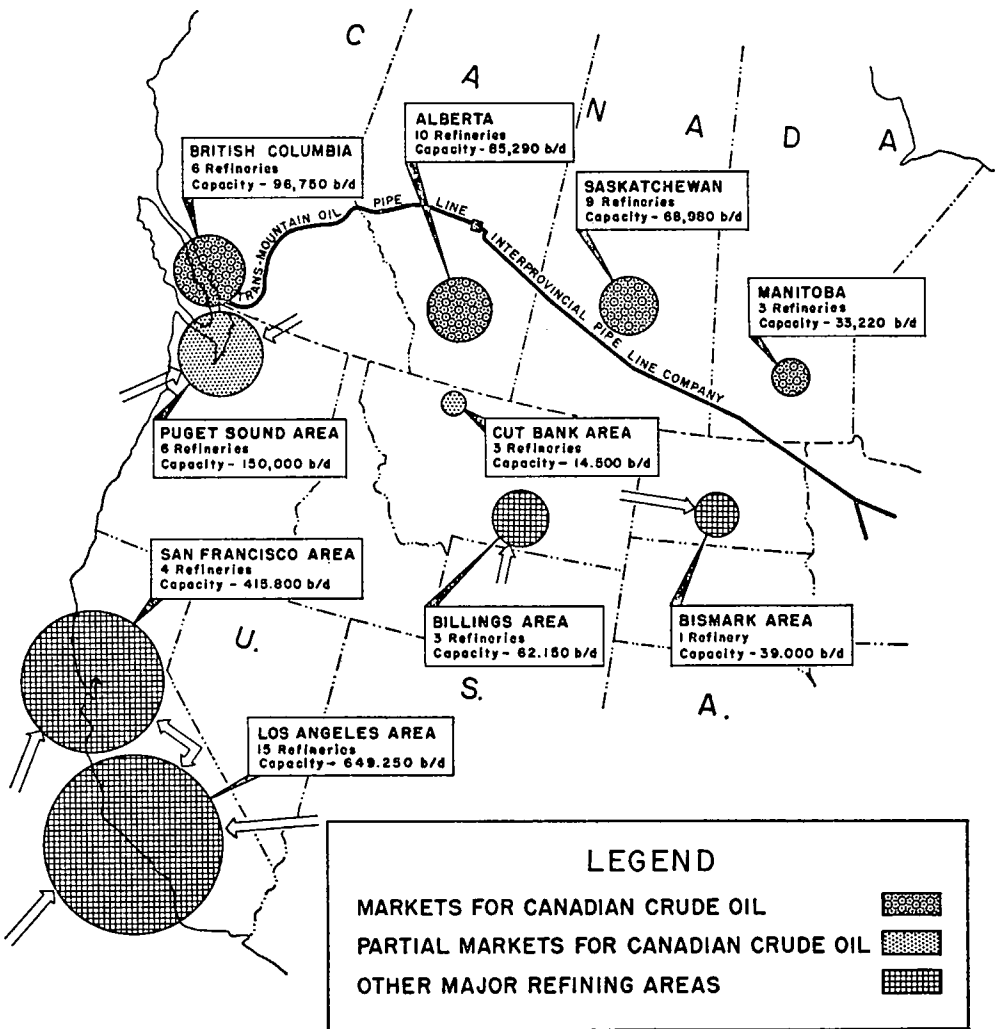
TABLE XXII — RELATIONSHIP OF IMPORTS OF CANADIAN CRUDE OIL TO TOTAL CRUDE DEMAND IN MINNESOTA-WISCONSIN MARKETS, 1953-1960
(in thousands of barrels daily)

	1953	1954	1955	1956	1957	1958	1959	1960
Crude oil demand	293	305	329	341	352	365	379	394
Refining capacity	30.0	30.0	61.2	68.0	78.0	78.0	85.0	102.0*
as % of demand	10.2	9.8	18.6	19.9	22.2	21.4	22.4	25.9
Canadian imports	7	5	15	49	56	70	75	88
as % of demand	2.4	1.6	4.6	14.4	15.9	19.2	19.8	22.3
as % of capacity	23.3	16.7	24.5	72.1	71.8	89.7	88.2	86.3

*Northwestern Refining at St. Paul Park will add 17,000 bbl/day to capacity in 1959, of which 50 per cent is assumed to be run on Canadian crude.

Source: Supplementary Submission of Shell Oil Company of Canada Limited, July, 1958.

**PRINCIPAL PETROLEUM REFINING AREAS
WESTERN CANADA AND WESTERN UNITED STATES
JANUARY 1959**



PREPARED BY COMMISSION STAFF

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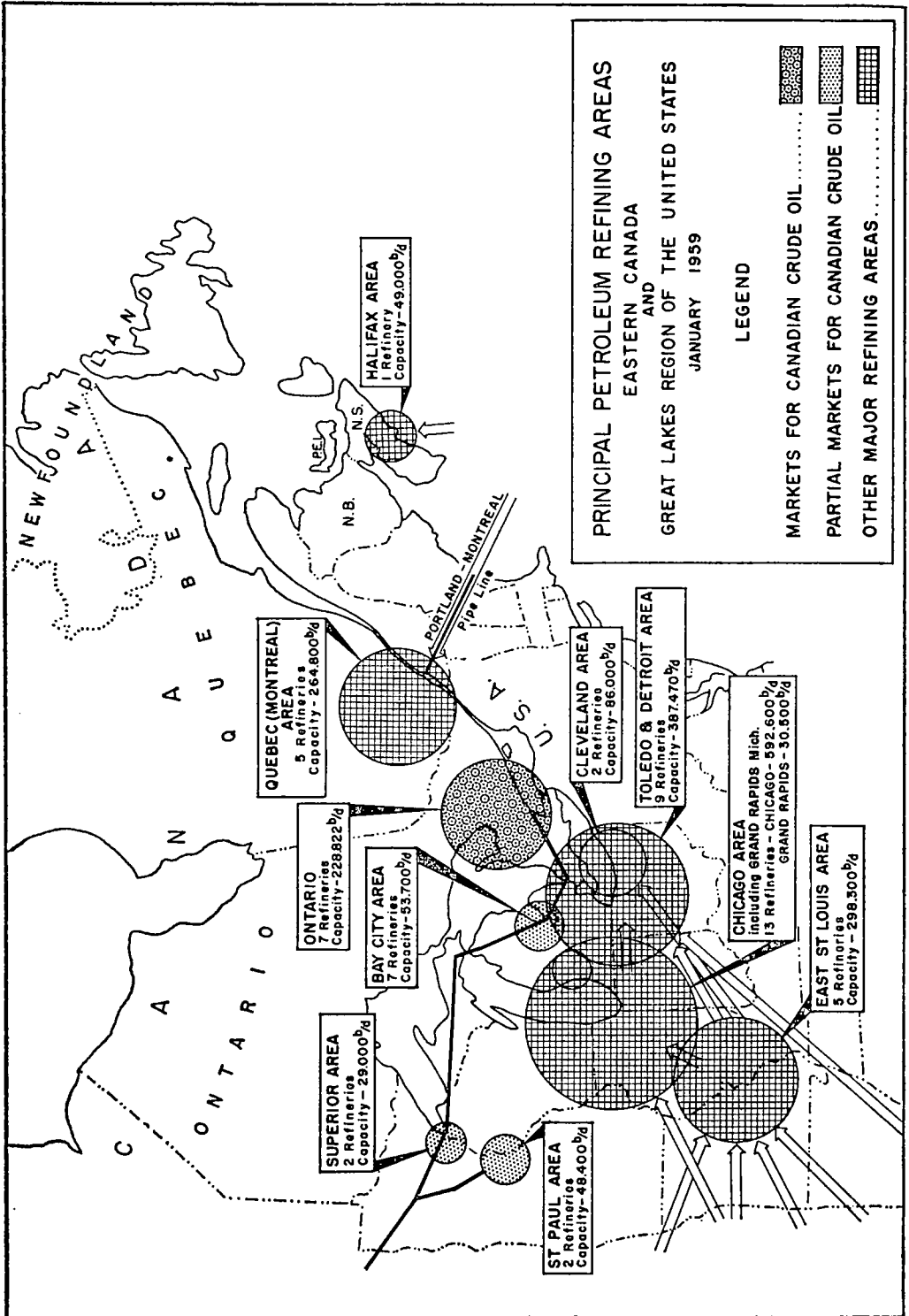
Any estimate of the prospects of this market for Canadian crude must take into account the possibility that crude oil reserves may be established on a substantial scale in the Williston basin in North Dakota and Montana. Exploration in this area has had some favourable results. If these developments progress to the point where the construction of a pipe line from eastern Montana and North Dakota into the St. Paul-Minneapolis area becomes feasible, United States crude would be given direct access to this market, thus eliminating the special transportation advantage now enjoyed by Canadian crude in the St. Paul-Minneapolis area.

The St. Paul-Minneapolis area is on the fringe of the very large and important Great Lakes area of the Middle West, which includes such refining centres as Chicago and Detroit. Canadian crudes have so far not secured any substantial outlets in this area, which represents almost one-fifth of the total market for petroleum products in the United States. In 1957 the area required some 1,582,000 barrels of petroleum products per day. On the basis of the growth of demand over the past 20 years in the area, the demand by 1967 would amount to some 2,600,000 barrels per day. As mentioned in Chapter 3, however, the refiners in the Great Lakes area of the Middle West traditionally have drawn their crude oil supplies from domestic sources, in which they have corporate interests, and have participated in the creation of a network of pipe lines from the major oil fields in Texas, Oklahoma, Kansas and Illinois.

Since 1950 Wyoming has emerged as a new source of crude oil and now supplies approximately 15 per cent of the total annual refinery requirements of the Great Lakes area. The development of further reserves in the Rocky Mountain region would postpone the time when Canadian or overseas crudes might be needed in the Great Lakes area to supplement supplies from domestic sources.

To the extent that new domestic sources are inadequate to meet the annual growth in the huge Great Lakes area in the future, it is possible that, as new pipe lines become necessary to supply increased demand, some of these would be linked to Canadian sources of crude oil. However, as the United States increases its imports from overseas sources, United States domestic crude may increasingly supply interior markets and overseas crudes the coastal markets.

Chart 11, "Principal Petroleum Refining Areas, Eastern Canada and Great Lakes Region of the United States, January, 1959", illustrates the magnitude of the Great Lakes refinery market. The size of this market is further demonstrated by the fact that the receipt of 200,000 barrels per day of crude from Canada would constitute less than 20 per cent of current crude oil runs in the area. It should be noted that, at the expected annual



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rate of growth of 5 per cent, crude oil receipts in the area will double over the period of the next 15 years. The Great Lakes market, therefore, from the point of view of its size, expected rate of growth and location seems to present favourable long-term prospects for the export of Canadian crude oil.

Estimates of Future Exports

Any attempt to estimate the prospects for exports of Canadian crude to the Pacific Coast or Middle West markets of the United States is made difficult not only because it is hard to predict the extent to which the markets will be in a deficit supply position but because of other uncertainties. There are hazardous assumptions to be made regarding the intensity of competition, either direct or indirect, to be faced by Canadian crude from other crudes. These assumptions involve the extent to which the world productive capacity of crude oil will exceed the demand, the likely trend of tanker rates and the influence which special corporate relationships will exert in the selection of the crudes to be imported into these market areas.

On certain assumptions the prospects of expanded exports of Canadian crude to the Puget Sound area and perhaps other sections of the West Coast would appear to be attractive. The Puget Sound is a rapidly growing market for petroleum products. On the basis of posted prices Canadian crudes have been generally competitive in the area with foreign crudes; pipe line facilities from Canada to the area are in existence; and refining companies in the area have an indirect financial interest in Canadian production and in the pipe line facilities, through ownership of substantial reserves of crude in Western Canada and, with respect to Shell Oil, a definite financial interest in the pipe line facilities.

The prospects for Canadian exports of crude oil to the Great Lakes area of the Middle West would appear to be favourable over the long-term but the shorter term prospects are more problematical. This area, as already stated, constitutes a very large market for petroleum products and various industry estimates suggest that demand will continue to expand substantially. However, the supply pattern in the Great Lakes area is well established and the ability of Canadian crude to capture a portion of this market does not depend on price alone. As previously mentioned, refiners in the area have corporate interests in other sources of supply and in established transportation facilities. These factors are not conducive to any ready change from present sources of supply.

For the near future, the brightest prospects in the Middle West appear to lie in the St. Paul-Minneapolis area. Although the market in this area is not by any means comparable in size to the markets in either the West Coast

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or Great Lakes regions, Canadian crudes have a certain advantage in reaching the market, inasmuch as Canadian-American corporate relationships have already been established and pipe line facilities constructed. In the normal course of events, it would seem reasonable to assume that Canadian crudes will share in the growth of demand for petroleum products in the St. Paul-Minneapolis area.

The variety of conclusions which can be drawn with respect to the prospects for the export of Canadian crude to United States markets is apparent from the estimates presented to the Commission. These appear in Table XXIII.

TABLE XXIII — ESTIMATES OF CANADIAN CRUDE EXPORTS, 1959-1967
(in thousands of barrels daily)

Year	British American Oil Co. Ltd. (a)				Imperial Oil Ltd.		Oil and Gas Conservation Board of Alberta			
	Low		High		Puget Sound	Middle West	Conservative		Optimistic	
	Puget Sound	Middle West	Puget Sound	Middle West			Puget Sound	Middle West	Puget Sound	Middle West
1959	40	60	80	60	65	70	18	50	23	53
1963	40	60	250(b)	60	155(c)	90(c)	39	62	70	77
1967	40	60	420(b)	60	....	....	47	74	104	115

(a) The British American Oil Company Limited made three forecast of exports. The minimum case assumed a constant export volume through to 1967 of 40,000 barrels per day to the Puget Sound area of the West Coast and 60,000 barrels per day to the Middle West. These were the export volumes at the time of the forecast. Each of the Company's other forecasts also assumed constant exports of 60,000 barrels per day to the Middle West, but for the West Coast the upper limit of potential export demand in 1967 was estimated to be 420,000 barrels per day and the intermediate forecast (not shown in this table) was 120,000 barrels per day.

(b) Estimate applies to the entire West Coast market.

(c) Predicted for the year 1962.

Source: Submissions to the Commission. The 1958-65 forecast by the Oil and Gas Conservation Board of Alberta was extrapolated to 1967 by the Commission staff. All of the forecasts in Table XXIII were made during the first half of 1958.

It will be noted that the estimates differ not only as to the total volume of exports but also as to the relative importance attached to the various market areas which might be served.

The market forecasts of Table XXIII were made in 1958 at a time when exports of Canadian crude were subject to the voluntary import control programme in the United States and when there were some indications that these controls would become mandatory and possibly more restrictive. These forecasts might well be modified in the light of the recent exemption of Canadian crude oils and petroleum products from these controls.

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It is difficult to assess the full significance of this change in United States policy. It is clearly important that the United States has again recognized the unique position the Canadian oil industry can occupy as a continental source of supply, with all that this implies. The exemption is also very important because no orderly and progressive development of Canadian exports of crude oil to the United States could have been expected as long as Canadian crudes were subject to United States import controls. The exemption of Canada from United States mandatory import controls cannot be interpreted as effecting an automatic reinstatement of Canadian crude in United States markets in the volumes previously achieved in any of those markets. The choice of where individual refining companies in the United States, accessible to Canadian crudes, purchase their crudes is still that of the individual refiner. It is true that such refiners are now free to select Canadian crudes but with respect to the interpretation of certain of the provisions of the Presidential Proclamation, dated April 30, 1959, there would appear to be a difference of opinion as to whether or not such refiners, when they take Canadian crude, will lose some of the benefit of the quotas which they could otherwise secure. The Proclamation, however, makes it clear that the total importation of foreign crudes, whether from overseas or from Canadian sources, will not be permitted to interfere with the general purposes of the controls by discouraging domestic production.

While Canadian crudes may be fully competitive on a price basis, the broader interest of the refining companies and their overseas affiliated producing companies may be a considerable barrier to the export of large volumes of Canadian crude to United States markets. The exemption of Canadian crude does not, of course, remove certain other marketing obstacles which have developed from the application of United States import controls. An inter-company trading of "quota" oil for domestic oil can result in profitable exchanges for inland refiners in the United States. This trading of quotas, which are valuable rights in the United States, can adversely affect the acceptability of Canadian crudes to United States refiners and, indeed, under the voluntary import control regulations, did so affect Canadian crude in the St. Paul-Minneapolis area. In that area, during the latter part of 1958 and in the early months of 1959, Canadian crude lost some of its position to other crudes, probably indirectly supplied from Venezuela on an exchange of quotas. Furthermore, there may be reluctance on the part of United States companies to establish Canadian crudes as a stable or major source of supply, particularly if this means the investment of large amounts of capital in the construction of new pipe line facilities until, with the passage of time, the permanent nature of United States policy has been clearly established.

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Following the Presidential Proclamation of April 30, 1959, the Commission requested the Oil and Gas Conservation Board of Alberta and certain of the oil companies in Canada to give it their views on the effect of the exemption from United States import controls on the exports of Canadian crude oil to that country. The difficulties referred to above are reflected in the views given to the Commission in response to this request. There was general agreement that the exemption was beneficial to the Canadian oil industry, particularly on a long term basis. There was much less agreement as to the more immediate effects of this exemption. Exports to the St. Paul-Minneapolis area were not expected to increase very much, possibly by 5,000 to 10,000 barrels per day, so as to average 65,000 barrels per day in 1959. The exemption, however, was thought likely to enable a continuing growth of this order each year, so that exports to existing refineries might average 100,000 barrels per day in 1965. The general assessment by the industry would, therefore, tend to support the more optimistic estimates of this particular market area appearing in Table XXIII.

The main benefits were anticipated by the industry to arise in the Puget Sound area. Estimates of exports in the near future ranged from a slight increase over the May, 1959, level to as high as 90,000 barrels per day, rising perhaps to 150,000 barrels per day by 1965.

The Oil and Gas Conservation Board of Alberta felt that the exemption of Canadian crudes justified an increase in its earlier estimates of exports. An initial increase of some 15,000 to 25,000 barrels per day, together with relatively small amounts of liquefied petroleum gases and products would, it was thought, be followed by further increases having the effect of raising the conservative estimates for the Puget Sound area, for 1963 and 1967, shown in Table XXIII, to 78,000 and 125,000 barrels per day respectively and the more optimistic estimates to 112,000 and 190,000 barrels per day in 1963 and 1967. Slight upward revisions of 10,000 to 15,000 barrels per day were made in the forecasts for the Middle West. The Board qualified its new estimates by drawing attention to various uncertainties affecting the export of Canadian crude to United States markets and stated that "this potential market is far less desirable than the Montreal market which provides not only a greater demand but also a more predictable future".

It should be noted that there has been an appreciable increase in nominations for Canadian crude oil by the Puget Sound refining companies for July, 1959. These companies have nominated for approximately 70,000 barrels per day, compared with 27,000 barrels per day in May.

This increase in actual exports is encouraging but it is clear that the prospects for a sustained growth in exports of Canadian crude will depend on

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the concerted marketing efforts of the crude oil producers in Canada and refiners in the United States, if Canada is to obtain the maximum advantage of the exemption accorded Canadian crude from United States import controls.

Canadian Markets

Estimates of the domestic demand for petroleum products in various regions of Canada over the next decade and of domestic demand for Canadian crude oil were submitted to the Commission by several companies. These estimates did not differ to any great extent from those submitted to the Commission by the Alberta Oil and Gas Conservation Board as shown in Tables XXIV and XXV. It is apparent from these estimates that Canadian crude is expected to be used to satisfy all but a small proportion of the requirements for petroleum products in British Columbia and the Prairie Provinces and an increasing share of the demand in Ontario.

TABLE XXIV — REGIONAL DEMAND FOR PETROLEUM PRODUCTS IN CANADA, 1955-1967

(in thousands of barrels daily)

<i>Year</i>	<i>British Columbia</i>	<i>Prairies</i>	<i>Ontario</i>	<i>Quebec</i>	<i>Atlantic</i>	<i>Total</i>
1955	69	141	212	159	57	638
1956	81	149	243	183	62	718
1957	80	154	252	188	67	741
1958	85	163	270	199	72	789
1959	90	174	292	212	77	845
1960	95	184	312	224	82	897
1961	100	195	334	237	88	954
1962	105	205	354	249	92	1,005
1963	110	215	375	261	96	1,057
1964	116	226	394	274	101	1,111
1965	122	237	414	288	106	1,167
1966	128	248	434	303	111	1,224
1967	134	259	454	318	116	1,281

Source: Alberta Oil and Gas Conservation Board: Figures for 1966-67 were extrapolated by the Commission staff from the Conservation Board's 1958-65 forecast.

Markets in the Prairie Provinces were generally considered by the industry as being permanently captured for Canadian crude oil. The declining competitive position of Canadian crudes in the Puget Sound area has led to some concern as to whether these crudes might eventually prove incapable of competing even in Vancouver. Questioned on this matter, Shell Oil Company of Canada Limited told the Commission that Vancouver was

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TABLE XXV—CANADIAN DEMAND FOR DOMESTIC CRUDE OIL*, 1955-1967
(in thousands of barrels daily)

Year	British Columbia	Prairies	Ontario	Total
1955	53	150	111	314
1956	61	163	134	358
1957	62	153	141	356
1958	62	152	155	369
1959	77	170	199	446
1960	81	180	221	482
1961	85	191	246	522
1962	89	201	306	596
1963	93	211	330	634
1964	98	222	349	669
1965	103	233	369	705
1966	108	244	389	741
1967	113	255	409	777

*Includes natural gas liquids.

Source: Alberta Oil and Gas Conservation Board: Figures for 1966-67 were extrapolated by the Commission staff from Conservation Board's 1958-65 forecast. The Board also prepared a forecast assuming that Canadian crude would supply Montreal refineries, as referred to in Table XXXV of Chapter V.

considered a "long-term basically economic" point at which to sell Canadian crude. The Company stated that the California market, on the other hand, was not. Such points as Vancouver, the Company felt, would always be held for Canadian production, despite any temporary price advantage which might be gained from time to time by using imported supplies. The large financial interest, direct and indirect, of the Vancouver refining companies in the Trans Mountain oil pipe line, in addition to their investment in crude oil reserves in Canada, would tend to reinforce the view that this refinery area could be maintained as an outlet for Canadian crude. The situation, however, could become increasingly precarious if the laid-down cost of foreign crude became substantially less than that of Canadian crude. It is conceivable also that imports of refined products, manufactured from lower cost foreign crudes, could compel the refining companies to replace Canadian with cheaper foreign crude. The forecast in Table XXV assumes the continuing use of Canadian crude in Vancouver and indicates a steady growth in the demand for Canadian crude in the markets of British Columbia and the Prairie Provinces, rising from 214,000 barrels per day in 1958 to 368,000 barrels per day in 1967. This is an increase of 72 per cent over the next decade or an average annual compound rate of 5½ per cent.

In testimony before the Commission, the major oil companies stated that, in their judgment, the area of greatest potential growth in the use of

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Canadian crude is the Province of Ontario. The estimates of the Oil and Gas Conservation Board of Alberta, as shown in Table XXV, also support this opinion. This growth is related, in part, to a forecast of a greatly increased consumption of petroleum products in Ontario. It is also expected to result from the intentions of the industry, expressed to the Commission, to use Canadian crude entirely in the Ontario refineries and to expand these refineries. Such a programme would ultimately involve the displacement by Canadian crude of the small volume of foreign crudes now imported into Ontario and a progressive displacement over much of the area of the refined products now being imported mainly from the United States or brought in from the refineries in the Montreal area. The estimates in Table XXV are based on the assumption that these displacements will, in fact, take place. It will be seen from the Table that the use of Canadian crudes in the Ontario refineries is estimated to rise from 155,000 barrels per day in 1958 to 409,000 barrels in 1967, thus accounting for a major proportion of the expected expansion in the domestic market. The forecasts given to the Commission indicate that the most rapid rate of growth in Ontario is anticipated during the next five years.

This rapid increase in the use of Canadian crudes in Ontario during the next five years will depend very largely on whether the Ontario refiners succeed in carrying out their intentions. Several refining companies have indicated that they are in a position to increase their use of Canadian crudes by substituting these for imports. The British American Oil Company Limited indicated that by 1959 it would be using Canadian crude exclusively at its Clarkson refinery. Small quantities of Venezuela and United States crudes were being used early in 1958 by Sun Oil Company Limited at its refinery in Sarnia, Ontario. This use of United States crude was discontinued in June, 1958, and since then approximately 70 per cent of this refinery's crude requirements have been met from Canadian sources and 30 per cent (i.e., 5,000 bbl/day) from Venezuela. The Venezuela crude moves by tanker to the United States Gulf Coast and thence via several pipe line systems to Sarnia. The Company claimed that the laid-down price is competitive with Canadian crude, but that despite this it made earnest but unsuccessful efforts to trade this crude with eastern Canadian refineries in exchange for western Canadian crude. The Company has indicated to the Commission that these imports will probably be discontinued in the near future.

The displacement of some imported products presents greater difficulties. This would require either the increased manufacture of certain

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products not presently produced in sufficient quantity in Canada, resulting in surpluses of other products, or changes in the balance of refinery yields. Refined products currently imported consist largely of heating oils, aviation gasoline and lubricants. Imperial Oil Limited has stated its intention of increasing its refinery yield of heating oils in Ontario. A similar policy on the part of other refiners could bring about some increase in the use of Canadian crudes. At the same time, it is generally recognized that, having regard to seasonal variations in demand and for purposes of flexibility and efficiency in refinery operation, Canadian refineries must rely on a small percentage of product imports.

A substantial part of Ontario's requirements for petroleum products has been met by shipments from the Montreal refineries by means of a products pipe line, the Trans-Northern pipe line, extending from Montreal to the Toronto-Hamilton area. This line has a capacity of 80,000 barrels per day and is owned by three of the major oil companies, The British American Oil Company Limited, Shell Oil Company of Canada Limited and Texaco Canada Limited. These companies have stated that they anticipate that the western flow of products through the line beyond Cornwall will terminate by 1962, thus effecting the displacement in eastern Ontario and Toronto-Hamilton markets of the products presently refined from foreign crude in Montreal by products refined from Canadian crude in the Toronto area refineries. Representatives of the companies concerned stated to the Commission that it was considered economically feasible to take over this market with products refined from Canadian crude.

As part of this programme, Texaco Canada Limited has completed the expansion of its Port Credit refinery from 14,000 to 20,000 barrels per day and has built a spur line from the refinery to the Trans-Northern products pipe line. This has had the effect of expanding the Company's shipments of products to areas in the westerly section of this pipe line. Late in 1958 a new refinery with a capacity of some 20,000 barrels per day was also brought into operation in the Toronto area by Cities Service Oil Company Limited. The capacity of the refinery of The British American Oil Company Limited at Clarkson was increased by some 36,000 barrels per day during 1957, with the result that the Company's shipments of products from its refinery in Montreal into the Ontario market have since been confined to the region east of Toronto. Shell Oil Company of Canada Limited has no refinery in the Toronto area. Although the Company indicated to the Commission its intention of constructing a refinery in 1960 it stated that no definite decision had been made. Imperial Oil Limited already has

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substantial refinery capacity in Sarnia, so that its shipments of products from Montreal into Ontario are principally limited to the Ottawa Valley by way of railway tank car.

The estimates of increased use of Canadian crude in Ontario are based on the assumption that it will remain sufficiently competitive at Toronto with crudes imported into the Montreal refinery area to enable the industry to carry out its proposed programme. These estimates are appraised later, but, assuming them to be correct, they indicate a rapid increase in the use of Canadian crude in Ontario from some 150,000 barrels per day in 1958 to over 300,000 barrels per day in 1962, and to over 400,000 barrels per day in 1967. Thereafter the growth will be equal to the normal increase in demand in Ontario for petroleum products. The present facilities of the Interprovincial Pipe Line Company are capable of ready expansion, by the use of additional pumping facilities, to meet the growing volumes of estimated throughput for the period 1958-62. Further investment, amounting to what the Company estimated to be \$116 million, would be required to provide for the additional throughput which is anticipated for the later period.

The British American Oil Company Limited estimated that, as a result of the expansion of refining operations in Ontario and the resultant displacement in Ontario of products refined in Montreal, there would be a lower utilization of crude in the refineries in the Montreal area. The Company concluded that crude runs at Montreal refineries will be 222,600 barrels per day by 1962, compared with an expected capacity of at least 290,000 barrels per day at that time. Total crude runs at Montreal refineries averaged 234,000 barrels per day in 1958. The increase in refinery output in Montreal after 1962 would be largely related to the growth in product demand in Quebec. As a result of this decline in refinery output in Montreal there would be a temporary drop in imports of crude oils into Montreal.

A comparison of the estimates given in Tables XXIV and XXV indicates that crude oil import requirements of Canada as a whole will be somewhat less in 1962 than they were in 1958. It also indicates, however, that subsequent to 1962 there will be an increase in crude oil import requirements because the difference between total product demand and domestic crude oil supply in the year 1967 will be some 500,000 barrels per day compared with about 410,000 in 1962. Part of this increase would, of course, be due to the growth in crude oil requirements in the Maritimes which are solely dependent on foreign crude.

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Estimates of Future Production and Resource Development

Levels of Production

The Alberta Oil and Gas Conservation Board submitted to the Commission an estimate of the growth of the productive capacity of the Canadian oil industry over the next decade. The estimate was made largely by projecting recent trends into the future. By comparing the results with the expected level of demand for Canadian crude in domestic and export markets, the Board calculated the ratio of production to producibility which could be anticipated each year until mid-1960. The estimate of markets makes no provision for deliveries of domestic crude oil to the Montreal market. However, it does provide for both a conservative and an optimistic level of exports.

In projecting future productive capacity the Board did not assume there would be any substantial change from the recent levels of exploration and development. In reality, of course, demand, price levels and investment incentives in the future will all affect the extent of exploration and development and thus the eventual productive capacity of the industry. This qualification should, therefore, be kept in mind when examining the future production-producibility ratios under the various market assumptions, as shown in Table XXVI.

It will be seen that, according to these estimates, the ratio of production to the productive capacity of the industry would increase from 45 per cent in 1958 to 58 per cent in 1967, if exports do not increase above the Board's "conservative" estimate of 121,000 barrels per day (see Table XXIII) by that time. The more "optimistic" export estimate of 219,000 barrels per day by 1967 would provide for production at a level of 64 per cent of capacity.

As noted earlier, the Board recently revised its estimates of future exports to take account, in part, of the exemption of Canadian crudes from United States import restrictions. It felt that such revised estimates should be qualified by reference to the uncertainty of United States markets. However, if these recently revised estimates are used, the ratio of production to producibility in 1967 would change from 58 to 64 per cent under the "conservative" assumptions regarding exports and from 64 to 70 per cent under the more "optimistic" assumptions. The revised "conservative" estimate suggests an approximate production for Canada in 1967 of 990,000 barrels per day and the "optimistic" estimate, 1,085,000 barrels per day. If, due to an improvement in the volume of exports, these levels of production

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**TABLE XXVI — ESTIMATED CANADIAN CRUDE OIL PRODUCTION AND
PRODUCIBILITY,—1958-1967**

(in thousands of barrels per day)

Year	<u>Production</u>		<u>Producibility</u>	<u>Production/Producibility</u>	
	<i>Conservative</i>	<i>Optimistic</i>		<i>Conservative</i>	<i>Optimistic</i>
				<i>per cent</i>	<i>per cent</i>
1958	456	456	1,004	45	45
1959	512	520	1,072	48	49
1960	557	577	1,157	48	50
1961	611	642	1,250	49	51
1962	690	728	1,320	52	55
1963	733	779	1,386	53	56
1964	773	829	1,445	53	57
1965	814	882	1,486	55	59
1966	856	938	1,523	56	62
1967	896	994	1,556	58	64

Note: Both production forecasts assume that demand in the domestic market will rise to 777,000 barrels per day by 1967, as shown in Table XXV. The difference between the "conservative" and "optimistic" estimates of production are therefore due solely to the use of different assumptions concerning the increase in exports over the next decade. These export estimates are shown in Table XXIII.

Source: Alberta Oil and Gas Conservation Board: Forecast of the Canadian Demand and Supply for Crude Oil and Products, 1958-65. Figures for 1966-67 were extrapolated by the Commission staff.

are achieved, the production-producibility ratio should be higher in the future than it has been in the last three years. The recent ratio of production to producibility has ranged from 45 to 60 per cent. An increase in the ratio to a level of 64 to 70 per cent would represent a very substantial increase in the general level of activity of the industry.

If increased exports materialize there will be a higher level of exploration and development because of the need to establish the additional reserves to sustain a resultant higher rate of production and provide for a suitable reserve at the end of the period under review. The increase in gross oil reserves in Canada during the period 1952 to 1958 averaged 450 million barrels per year. This rate of finding is somewhat higher than the 355 to 420 million barrels per year which would be required to meet the production requirements of the revised market estimates referred to above and leave reserves equivalent to 12 times the production of the predicted level of output in 1967. This 12 year life-index is comparable to the position which has prevailed in the United States over the past few years. The annual increase in reserves in Canada over the period 1952 to 1958 is also considerably higher than the rates of discovery which would be required to

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meet the levels of production originally forecast by the Board. Under those circumstances an average rate of between 321 and 378 million barrels per year would have been required on the basis of a 12 year life-index.

However, the life-index of 12 years of future supply, assumed in these calculations, is a low index to apply to the Canadian industry in its present stage of development. While the annual discovery rates in the United States provide for an approximate reserve life-index of 12 years, it would probably be more prudent for Canada to operate under a higher reserve life-index, having regard to the relatively short exploration history of the Canadian industry. Consequently, the above estimates of annual discovery rates are likely to be considered by the industry as the absolute minimum necessary to support the hypothetical levels of production. The 1957 and 1958 reserve life-indices in Canada were actually 18 and 22 years respectively. If a remaining reserve equivalent to 18 years of production is provided for, the average addition of new reserves would have to be approximately 650 million barrels per year to meet the higher of the Board's revised estimates. Consequently, under such an assumption, a much higher level of exploration than has been experienced over the past five years would be required.

Changes in posted prices of overseas crudes have led to a reduction in field prices of Canadian crudes. As a result, the revenues earned on each barrel of oil produced for both domestic and export markets will be lower than had been anticipated when market prospects and the resultant level of activity in the industry were discussed before the Commission. The decline in field prices in Canada, while directing attention to the question of possible cost reductions, has given added emphasis to the need for market expansion and increased volumes of production. The decline in the price of imported crudes also suggests that less confidence than heretofore can be attached to the forecast of expanded domestic markets appearing in Table XXV. This expansion, in the immediate future, would depend to a considerable degree on the plans of the industry to displace imported crudes and petroleum products in the Canadian markets.

Field Prices - Recent Changes and their Implications

Whether or not the forecasts of markets for Canadian crude discussed above will be realized depends upon a number of factors. The ability of the industry to extend or even to maintain its existing markets at home and abroad might be adversely affected, for example, by any further intensification of the competition of overseas crudes and products. The increase in competition is the result of changes that have taken place over the last year or

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more in the world oil situation. During this time a pronounced surplus of crude oil and refined products has developed and there has been a tendency towards lower prices for overseas oils. Following reductions in certain posted prices in the United States the decline in posted prices of overseas crudes commenced in February, 1959, in Venezuela with a reduction of 15 cents in the price of crudes which are typical of those imported into Canada. Shortly thereafter posted prices in the Middle East were reduced 18 cents per barrel. In April, posted prices of Venezuela crude were further reduced by 10 cents per barrel. To some extent these reductions in posted prices were a recognition of the fact that many international sales were already being made at discounts below posted prices, thereby undermining the structure of posted prices and creating difficult problems for the concessionaire companies and the conceding authorities.

The extent of this decline in the posted prices of overseas crude in the early months of 1959 was such that overseas oils might well have been able to invade the Ontario market in substantial quantities, thereby reducing the market for Canadian crude. There was a possibility, for example, that, as soon as navigation in the St. Lawrence reopened, some overseas crudes might have found a market in one or more of the Ontario refineries, thus interfering with the use of Canadian crudes on which these refineries depend at present. There was a somewhat greater possibility that, without an equivalent decline in the price of Canadian crudes, some of the oil companies with refineries in Montreal would have been induced to continue and perhaps to expand the sale of Montreal refined products in the Ontario market, instead of allowing this market to be supplied to an increasing degree by products refined in Ontario from Ontario crude. Similarly, there would have been a greater inducement for jobbers in Ontario and Quebec to purchase their product requirements from the Caribbean and other overseas areas rather than from Canadian refineries. Any of these developments would have served to reduce the demand for Canadian crude and thus prevent or postpone the realization of the market expectations in Ontario referred to in previous pages.

The decline in the price of overseas crudes and products might have given rise to an increase in the use of overseas products in the Vancouver refinery area and might also have had adverse implications for the export of Canadian crudes to the Puget Sound area and, to a lesser extent, the Middle West area of the United States.

The Canadian refineries reacted to this increase in potential competition by reducing the posted prices for crudes in Western Canada in March, 1959, by 14 cents per barrel in Alberta and by 17 cents per barrel

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in the other two Prairie Provinces. Almost simultaneously the Interprovincial Pipe Line Company reduced its transportation tariffs from Edmonton to Sarnia and Toronto, to mention only the principal changes, by 8 and 12 cents per barrel respectively. However, the subsequent reduction of 10 cents per barrel in the posted price of Venezuela crude was not followed by a further reduction in the posted prices of Canadian crude.

The reductions in field prices and pipe line tariffs were presumably required to counter the challenge to the position of Canadian crudes and refined products in their present markets and particularly in Ontario. They had the effect of restoring the former competitive position of Canadian crude in this important market area, as well as in Vancouver, the Puget Sound and other markets. Had Canadian field prices not been reduced, a situation could have arisen whereby at least a partial shift from the use of Canadian to the use of overseas crudes and products in markets in Ontario and British Columbia would have occurred. The commercial preferences of the integrated Canadian oil companies, of course, would have served to protect the domestic markets for Canadian crude to some degree. Many of the refineries in Ontario and British Columbia have a vested interest in the continued use of Canadian crude because of their ownership of large Canadian reserves of crude and their financial interest in the trunk pipe lines. Some of the refineries, however, are less involved financially than others in Canadian production and pipe line operations and might have found it expedient, in due course, to purchase overseas rather than Canadian crude. The decision of the refineries to reduce field prices and of Interprovincial to reduce pipe line tariffs obviously helped to lessen the danger of an increase in imports.

The price reductions in February, 1959, in Venezuela and the Middle East resulted in a fundamental change in the method of determining field prices in Western Canada. The subsequent reduction in such field prices was the first occasion in the experience of the Canadian industry when field prices have been reduced in direct response to changes in the price of overseas crudes, as distinct from that of United States crudes. It can be regarded as a distinct break in the historic relationship between the price of Canadian and Illinois crudes. The price of Canadian crudes at the refineries, and thus in the field, has become associated with and dependent upon the price at which overseas crude or products or Montreal-refined products might be laid down in the Toronto area. The result has been that the price of comparable Canadian crudes at the refineries in Sarnia and in the Toronto area is now roughly 20 cents per barrel lower than the price at which Illinois crudes could be delivered to the same refineries. Although field prices in Western Canada have always been lower than the field prices of competing United States crudes, reflecting the longer distance over which Western Canadian

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crude must be transported to the same market, the differential between Canadian and United States field prices has now become greater than heretofore.

The new situation has important implications for the Canadian producing industry. The structure of well-head prices in Canada is no longer supported by field prices prevailing in the United States. In one respect this is obviously disadvantageous to Canadian producers. United States field prices are likely to be higher than world oil prices because the United States price structure is now largely insulated from the influence of overseas prices due to the import control policy in force in that country. If crude oil prices in the United States should rise at any time in the future there is less likelihood than heretofore that Canadian field prices would rise correspondingly. On the contrary, the threat of competition of imported overseas oils in Canada will have the effect of keeping the Canadian price structure in line with the lower level of world prices.

This situation could mean that in the future Canadian crude might be laid down in certain United States markets at prices more competitive than heretofore with those of United States crudes. In short, in the Puget Sound and the Middle West areas and ultimately in any other market areas in the United States that may become available, Canadian crudes should be able to compete more effectively with United States domestic crudes. At the same time, with Canadian field prices being based on the price of overseas crudes, the competitive price position of Canadian crude in relation to that of overseas crude should continue. The maintenance of petroleum prices in Canada at a level which will enable Canadian crude to compete in United States domestic markets is important if the industry is to develop a larger volume of exports than it has achieved in the past.

The change from Sarnia as the basing point for the determination of well-head prices in Canada, however, suggests that the industry is now more subject than before to the forces of international competition and, in particular, to the competitive cost and other advantages of crudes from the Middle East and Venezuela. Further declines in overseas prices would aggravate the problems which faced the Canadian industry in the early months of 1959. Unless future price changes were matched by reductions in Canadian well-head prices, there could be a substantial importation of overseas crude and products into Ontario by tanker during the summer months. There might also be an increase in the use of overseas crudes in Montreal giving rise to the continued marketing of Montreal-refined products in Ontario. Developments of this nature could cause the plans of the industry for expanding the market for Canadian crude to be postponed. Apparently

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the industry feels that this danger is already present. The Canadian Petroleum Association in a policy statement issued on April 16, 1959, said:

"The Canadian Petroleum Association strongly urges the Government of Canada to help relieve the crisis in the producing industry, caused by the increased gravity of the world oil surplus. This threat to Canada's economic welfare results largely from conditions and recent actions outside Canada, which may displace domestic crude oil from markets presently served.

The Association has noted with regret that the world petroleum situation has deteriorated to a point where Canadian crude oil may no longer be able to compete in Canadian markets which are open to the importation of distress crude oil and products. Because the problem and the solution to it are so vital to the nation as a whole, the Association recommends that:

1) The Government of Canada immediately sponsor a meeting of leaders of Canada's petroleum industry, representing producers, transporters, refiners, marketers and importers. This meeting should seek a voluntary arrangement satisfactory to Government that will ensure the maximum practical use of Canadian crude oil in the market areas in Canada, from the Pacific Coast to the major consuming areas of Eastern Canada. The objective should be to utilize to the maximum extent possible all pipeline, tanker and refinery facilities in Canada which are or can be readily connected to Canadian reserves of crude, giving domestic oil priority to this extent in serving domestic markets. The Association earnestly hopes that industrial statesmanship will prevail at such a meeting so that voluntary actions under Government sponsorship will be entirely effective. We believe that the Government of Canada should give strong and effective leadership to such a meeting to ensure that an adequate program is adopted.

2) The Association is concerned that imports of foreign crude oil or refined products into Canada may increase abnormally during the negotiations and planning for a voluntary control program. We believe the Government should ensure that sufficient information is available to expose any substantial change in the supply of foreign crude and products while such voluntary program is being developed.

The Canadian producing industry requires opportunity to grow in new markets in Canada and in export areas. It is hoped that the actions suggested above for the immediate problem will promote and help the early resolution of the broad longer-range problems of oil markets for a Canadian industry which is capable of playing a progressively more important role in the expansion of the Canadian economy."

One method of preventing the loss of markets would be for the refineries to counter such potential foreign competition by reducing the price of products refined domestically, involving a reduction in the profit margins of the refineries. There are obvious limits to an approach of this kind. Further reductions in field prices in Western Canada would also reduce the danger of increased imports but undoubtedly would adversely affect the incentives for exploration and development, as well as the revenues of the producing provinces.

As noted earlier there was some decline in the level of investment in exploration and development in the oil industry in Canada in 1957 and 1958.

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However, it is not uncommon in the oil industry for exploration to continue on a large scale at a time when the immediate prospects of improved markets or prices are not particularly favourable. This is exemplified by the exploration programmes of certain international companies in the Middle East during the 1930's and by the exploration which has been taking place recently not only in the Prairie Provinces but in the Northwest Territories including the Arctic Islands. It would appear that producing companies which have the necessary resources tend to take the long rather than short view of future market prospects.

There are many factors which in any year affect the level of expenditures for exploration and development but the primary ability to make such expenditures comes from the actual and anticipated revenues from production. If the industry in Canada can secure the revenues of increasing sales of natural gas discovered incidental to its search for oil or in the direct search for gas this will undoubtedly stimulate the level of expenditures for exploration and development. One of the major companies has recently estimated that, at current contract prices, the gross revenues from sales of natural gas and by-products thereof would amount to nearly \$50 million by 1964.

The immediate situation is that the industry, having suffered a decline in markets in 1958, has been confronted in 1959 with a decline in field prices. The lower realization of the industry on the oil which it produces has placed an added emphasis on the need to secure additional production. The decline in field prices and low level of production has created the danger that the ability as well as the incentive of the industry to finance new exploration and development may be impaired. There is also the risk that, if the profits to be earned from oil exploration in Canada should decline in relation to earning possibilities in the United States oil industry and elsewhere, the attractiveness of the oil industry as an outlet for international investment could diminish substantially.

One argument presented to the Commission was that if the industry is to maintain the rate of exploration and development activity experienced over the last two or three years the gap between actual and potential production must be lessened by the securing of additional markets. Emphasis was placed on the adverse effects which a large amount of "shut-in" capacity has on the incentive for exploration and development, particularly in the case of the smaller independent producers. Unless the markets for Canadian crude grow in line with the expansion of production capacity, it was said, it would not be possible for producers to earn sufficiently large revenues in the earlier years of the operation of their producing properties. This constitutes a special source of difficulty for those companies which do not

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possess the financial resources to continue drilling, apart from the funds obtained from the sale of current production or from short-term borrowing based on future production. If markets do not expand more rapidly, it was said, such producers will not be able to continue drilling and, in extreme cases, may be forced to sell out to other companies in a stronger financial position. The importance of the independent companies is illustrated by the fact that as a group they have been responsible during the past decade for about 45 per cent of exploratory drilling in Canada. The rapid development of the industry in the past 10 years, stimulated as it was by the Korean War and by the Suez crisis, brought many new companies into being and encouraged a greater amount of exploration expenditures financed by borrowing. The subsequent disappointment in market expectations was said to have put some of these companies in financial straits and the reduction in field prices in March, 1959, has undoubtedly added to their problems.

Investment by the industry in exploration and development has played an important part in the generation of employment, income and economic activity in Canada. The magnitude of the growth of capital investment in the producing sector of the industry is indicated in Table XXVII, which

TABLE XXVII — CAPITAL EXPENDITURES IN THE PRODUCING INDUSTRY*,
1947-1959
(in millions of dollars)

Year	Exploration	Development and Production	Total
1947	**	9.5	9.5
1948	**	37.3	37.3
1949	**	45.0	45.0
1950	**	53.9	53.9
1951	**	72.1	72.1
1952	59.8	101.6	161.4
1953	59.1	107.2	166.3
1954	55.1	126.8	181.9
1955	67.4	201.6	269.0
1956	73.7	252.4	326.1
1957	77.3	237.8	315.1
1958	63.7	199.7	263.4
1959 (forecast)	59.7	216.8	276.5
Total	515.8	1,661.7	2,177.5

* The Canadian Petroleum Association has estimated total expenditures of all types relative to the acquisition and development of oil and gas reserves and the operation of wells at \$2,805.7 million for the period 1951-57. Capital expenditures for this period, as shown in the above table, would amount to \$1,491.9 million.

** Reported in "Development and Production" expenditures.

Source: Dominion Bureau of Statistics, Ottawa. (Forecast for 1959 made in March, 1959.)

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includes most of the direct income-generating expenditures of a capital nature but does not include payments to provincial governments for mineral rights.

When investment in other phases of the petroleum industry is also considered, the growth and importance of the Canadian oil industry during the past decade becomes even more apparent. The relative importance of capital investment in the industry is indicated by the fact that capital investment of \$946 million in 1957 represented 10.7 per cent of total capital investment in Canada in that year. In 1947 the industry accounted for only 2.2 per cent of total investment. The industry has, therefore, been an important factor in contributing to the increase in capital investment and, consequently, to the high level of economic activity in Canada in recent years.

The decline in oil production in Canada in 1958, the diminished prospects of future exports of crude oil to the United States at that time and the relatively high degree of shut-in capacity, affecting the Province of Alberta in particular, led that province and sections of the producing industry to support a policy of supplying the Montreal market with Canadian crude. This market is the only remaining major domestic market which secures its crude supplies from overseas sources. The feasibility of marketing Canadian crude in Montreal and the issues associated with government action to accomplish this were prominent in the Commission's hearings.