

M. KING HUBBERT CENTER FOR PETROLEUM SUPPLY STUDIES

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PETROLEUM POSITION OF THE UNITED STATES

by
L. F. Ivanhoe

Introduction

This is one in a series of graphs to be published in this newsletter. Future articles will update these data. We hope that the graphs and their brief explanatory notes will be of permanent value to you. We suggest that these newsletters be saved for future reference.

A heavy Black line outlines the nation's "Oil Production" in the figures on pages 4 and 7. "Exports", if any, are patterned with light/open dots, while "Imports" are distinguished by a heavier/dense dot pattern.

Graph scales vary to cover all countries. The different volume scales (rectangular scale in upper left corner of graphs) include: 10,000 million barrels (MMB) for example (USA, USSR, Saudi Arabia); 2,000 MMB for example (China, Canada, Mexico, etc.); 500 MMB for example (Australia, Argentina, Colombia, etc.).

Pertinent data are summarized in the upper left corner of each graph, including: Year of data; Billions barrels oil (BBO); (Ratios in years); Reserves (R)/Production (P); and Consumption (C).

USA (Figure 1 on page 4)

Oil Production

Figure 1 shows the total U.S. yearly production, consumption, and imports of all liquid fuels since 1930. The information available on the U.S. is more nearly complete than for any other nation. Consequently, the U.S. graph is more detailed than for other countries. The U.S. was

“King of World Oil” before its oil production topped out in 1970. In spite of the restricted U.S. oil imports allowed in previous years, the Texas Railroad Commission (TRRC) effectively controlled world oil prices when it prorated Texas well production.

Production is broken down into “Lower 48 states (US48) onshore” crude oil and lease condensate, including stripper wells (Av.=3 B/D) and enhanced oil recovery (EOR) of heavy oils; oil production from “Offshore”; Alaska; Natural Gas Liquids (NGL = a by-product from natural gas wells); plus Miscellaneous/minor fuels. The total equals all of the LIQUID FUELS produced in the USA, rather than the commonly used statistics of CRUDE OIL & NGL only.^{3,4} IMPORTS include: Crude Oil and Refined Products (heavy dotted pattern).

The bump on U.S. Figure 1 at 1985 represents a “maximum effort peak” when the nation’s oil industry went all-out to produce local oil during a period of high OPEC oil prices.

Miscellaneous Liquid Fuels include alcohol (ethanol & methanol), benzol, hydrogen, refinery processing gains, and unaccounted for crude oil, which can be used to blend with gasoline and other petroleum products. The volume of such alternative fuels may, or may not be included in different data bases and statistics. The volume of these alternatives has increased steadily since they were first identified in 1959 tables to 1.3 MMB/D at end 1996.

TABLE 1
World Petroleum Supply and Disposition, 1994
(Thousand Barrels per Day)

Region Country	Primary Supply			Deposition			Bunkers	
	Oil Production ¹	Crude Oil Imports	Total Imports of Refined Petroleum Products	Crude Oil Exports	Total Exports of Refined Petroleum Products	Apparent Consumption (Including Bunkers) ²	Residual Fuel Oil	Distillate Fuel Oil and Other Products
North America								
Canada.....	2,328	636	133	865	528	1,727	9	2
Mexico.....	3,174	0	185	1,423	110	1,822	7	2
United States.....	9,413	7,063	1,933	99	843	17,718	388	132
Other.....	0	0	4	0	0	4	0	1
Total.....	14,915	7,699	2,255	2,386	1,481	21,272	404	136

¹Oil production includes crude oil, natural gas plant liquids, other liquids, and refinery processing gains.

²Apparent consumption includes internal consumption, refinery fuel and loss, and bunkering. Also included, where available, are liquefied petroleum gases sold directly from natural gas processing plants for fuel or chemical uses.

(s)=Value less than 500 barrels per day.

Note: Sum of components may not equal total due to independent rounding.

Reference: DOE/EIA-0219(95)

Table 1: World Petroleum Supply and Disposition 1994 summarizes the primary petroleum supply and deposition for the three North American nations: U.S., Canada, and Mexico. These data differ slightly from the Oil & Gas Journal (O&GJ)³ and BP⁴ numbers. It is difficult to find any two sets of data with identical details, so the explanatory footnotes should be read carefully.

The U.S. is the world's largest oil consumer, using more than any other entire continent. Most is used for transportation (cars, trucks, trains, etc.). Petroleum is also used as the chemical base for thousands of products - from artificial rubber to plastics to road/roofing asphalt, etc. There are no substitutes for many of these products/uses. There are some 200 million vehicles (cars, trucks, buses) in the U.S. vs some 630 million vehicles in the entire world. Large diesel-fueled trucks maintain the high American standard of living by transporting goods to supermarkets and service stations, and replacing all products at two-week averages. Urban dwellers would be in precarious situations if the delivery trucks were delayed and missed even one of their scheduled fortnightly deliveries of food and fuel.

Half of the current public does not remember the upheaval in daily living the 1970's oil embargo caused. Anyone under 35 years of age has no personal history relating to rationing (free market generated or government induced) or "gas lines".

In 1995 the daily end use of petroleum products in the U.S. was as follows,¹: (Millions of barrels per day = MMBD). Transportation 11.68 MMBD; industrial 4.61 MMBD; residential and commercial 1.13 MMBD; electric utilities 0.29 MMBD. Total 17.70 MMBD.

Oil Imports

The U.S. is the world's biggest importer of crude oil and petroleum products.

All nations try to diversify their oil imports from several foreign countries to reduce the possibilities of local political interruptions in supplies. Crude oil constituted 82% of the total U.S. imports of petroleum and its products in 1995. In that year, in dollar value, crude oil imports totaled \$44.3 billion and represented the largest single item in the U.S. deficit in international balance of payments. Of this amount, imports from Saudi Arabia were \$7.8 billion, Canada \$6.3 billion, Venezuela \$6.2 billion, Nigeria \$4.1 billion, U.K. \$2.2 billion, and others \$11.6 billion.¹

Colorado Oil Shales

The "Oil Shales" of northwestern Colorado - are chemically "kerogen" rather than "petroleum". The oil shales produce a liquid that can only be burned as "fuel oil" in boilers. The "kerogen" lacks a hydrogen atom to become "petroleum" which can be refined into gasoline and other fuels. The extra hydrogen for kerogen conversion is normally extracted from water (H₂O) or gas (CH₄). Unfortunately, NW Colorado has no surplus water or gas that can be used to upgrade the kerogen to petroleum. It has been suggested that "shale oil" might be better used directly as a chemical base for petroleum by-products (plastics, etc) rather than to be transformed into gasoline and other petroleum motor fuels. An additional environmental problem is how to dispose of the processed "oil shale" which expands like popcorn when heated. These problems have prevented commercial development of Colorado's oil shales in spite of decades of serious research by major oil companies and the U.S. government.

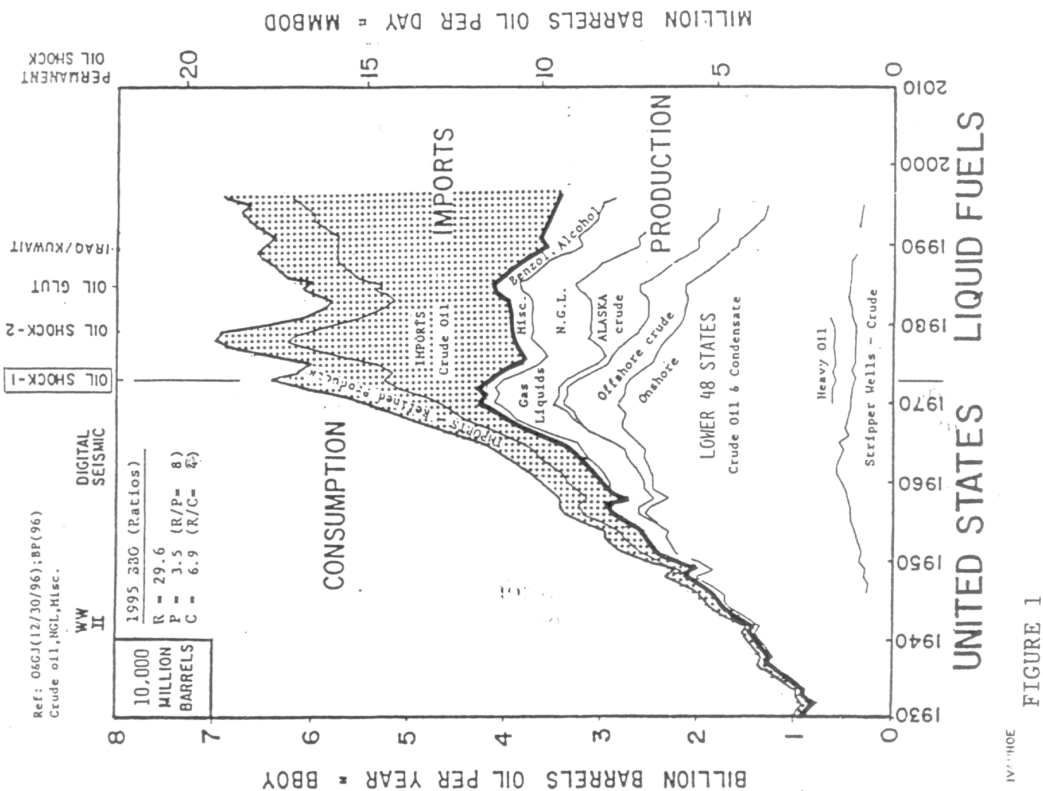
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Selected References

- ¹ U.S. DOE/EIA, 1996; Annual Energy Review 1995; Reports # DOE/EIA-0384(95); Dec. 1996.
- ² U.S. DOE/EIA, 1996; International Energy Annual, 1995; Report # DOE/EIA-0219(95); Dec. 1996.
- ³ Oil & Gas Journal, 1996; Worldwide Production Issue; O&GJ, Dec. 30, 1996.
- ⁴ British Petroleum, 1996; BP Statistical Review of World Energy 1996; (Statistics as of 12/31/95).
- ⁵ Ivanhoe, L.F., 1990; Liquid fuels fill vital part of U.S. economy; O&GJ, April 23, 1990, p. 106-109.
- ⁶ -----, 1995; Future oil supplies: There is a finite limit; World Oil, Oct. 1995, p. 77-88.

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L.F. (Buzz) Ivanhoe, Petroleum Consultant, Ojai, California, is a registered geologist, geophysicist, engineer and oceanographer with 50 years domestic and international experience in petroleum exploration with various private and government oil companies. He was associated with Occidental Petroleum from 1968 to 1980 where he was senior advisor of worldwide evaluations of petroleum basins from 1974-1980. On leaving Oxy, he moved to Santa Barbara and formed Novum Corp., an international energy exploration consulting firm. Now located in Ojai, Mr. Ivanhoe is the author of numerous papers on various technical subjects, including more than 50 on the evaluation of foreign prospective basins and projections of future global oil supplies.



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HUBBERT CENTER NEWSLETTER # 98/1-2

PETROLEUM POSITIONS OF CANADA AND MEXICO

by
L. F. Ivanhoe

These two oil-exporting nations have the unique advantages/disadvantages of being next-door neighbors to the U.S.A., the world's number one superpower (pop. = 263 million in 1995) and consumer of 6.9 billion barrels/year or 25% of the world's oil production.² The U.S.A.'s 1995 oil imports were 8.8 MMB/D.

CANADA (Figure 1 on page 7)

Canada's population (30 million in 1995) is geographically spread out mostly within 200 miles from the northern U.S. border; most of them east of the Great Lakes. Canada currently finds it most economical to import crude oil from Venezuela for its eastern provinces, while it exports oil southward from its western fields to the U.S. states of Montana and Washington. Canada exported \$6.3 billion (1.2 MMB/D) of crude oil to the U.S. in 1995^{1,2}; part of this being "tar sands" oil. Considerable gas is exported to the U.S./California as pipelines are expanded.

Alberta Oil Province

Most of the known Canadian oil and gas fields are located in the sedimentary basin along the eastern side of the Canadian Rocky Mtns. Oil and gas fields have been found from the U.S. border on the south to the Arctic Ocean (Beaufort Sea) on the north.

Atlantic Coast Offshore

The giant (Estimated Ultimate Recovery = EUR = 1.6 BBO) Hibernia offshore oil field on the Grand Banks of Newfoundland was discovered in 1979 and is finally to go on stream in late 1997. A major problem was how to protect the production platform from melting Greenland icebergs that are carried into the area by the prevailing ocean currents. Hibernia is expected to eventually produce 135,000 B/D.⁵ When put on production, the Hibernia oil province will help many of Eastern Canada's oil needs for decades.

Alberta Tar Sands

Northeastern Alberta has extensive (est. 120 billion cubic meters) "tar sands" in several deposits. The "tar" is a petroleum "asphalt" which can be removed from the mined sand by heat and chemical means. Enormous investments (\$2 billion/plant) are required to process the tar sands. Approximately 65% of the energy produced is consumed as direct input in some mines.⁹ Various Canadian studies suggest that the maximum potential production from the Alberta Tar Sands could be some 3.0 MMB/D from 15-24 expensive processing plants.⁸ Some of the by-products of the tar sand plants (asphalt, etc.) are now being exported to the U.S.

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MEXICO (Figure 2)

Mexico's population (95 million in 1995) is a Spanish-speaking developing country on the southern side of the U.S. Mexico's unique culture is very nationalistic where its oil is concerned. Their original oil business was controlled by large American oil companies until the entire Mexican petroleum industry was nationalized in 1938. Since then, PEMEX, the Mexican national oil company, has managed quite well without foreign oil corporations.

The Mexican oil fields along their east coast are in the land and offshore regions of the "oily" Gulf of Mexico. Central Mexico is mountainous and their Pacific coast is not oily. Since 1972 the discovery of large offshore oil fields in the southwestern Gulf of Mexico increased their oil production to 3.2 million B/D in 1995, of which Mexico consumed 1.8 MMB/D and exported 1.4 MMB/D, including 0.94 MMB/D (\$6.1 billion) to the U.S.

A critical question for Mexico and the U.S. is whether Mexico is "superoily" as suggested by the high PEMEX claims of its "hydrocarbon reserves" or merely "oily" as indicated by its production. A major question is how much crude can be recovered from the Chicontepec field which has no producing wells although it was discovered in 1973. PEMEX reports a total of 17 billion barrels of oil (BBOE) for this field's reserves, but the U.S. DOE/EIA FESAP (Foreign Energy Supply Assessment Program) researchers in 1983 reduced its potential to some 2.5 BBO.⁷ Mexico is now in the process of having its oil and gas reserves re-evaluated by an independent consulting firm using standard appraisal techniques.

Selected References

¹U.S. DOE/EIA, 1996; Annual Energy Review 1996; Report # DOE/EIA-0384(95).

²U.S. DOE/EIA, 1996; International Energy Annual, 1995; Report # DOE/EIA-0219(95).

³Oil & Gas Journal, 1996; Worldwide Production Issue; O&GJ, Dec. 30, 1996.

⁴British Petroleum, 1996; BP Statistical Review of World Energy 1996: (1995 data).

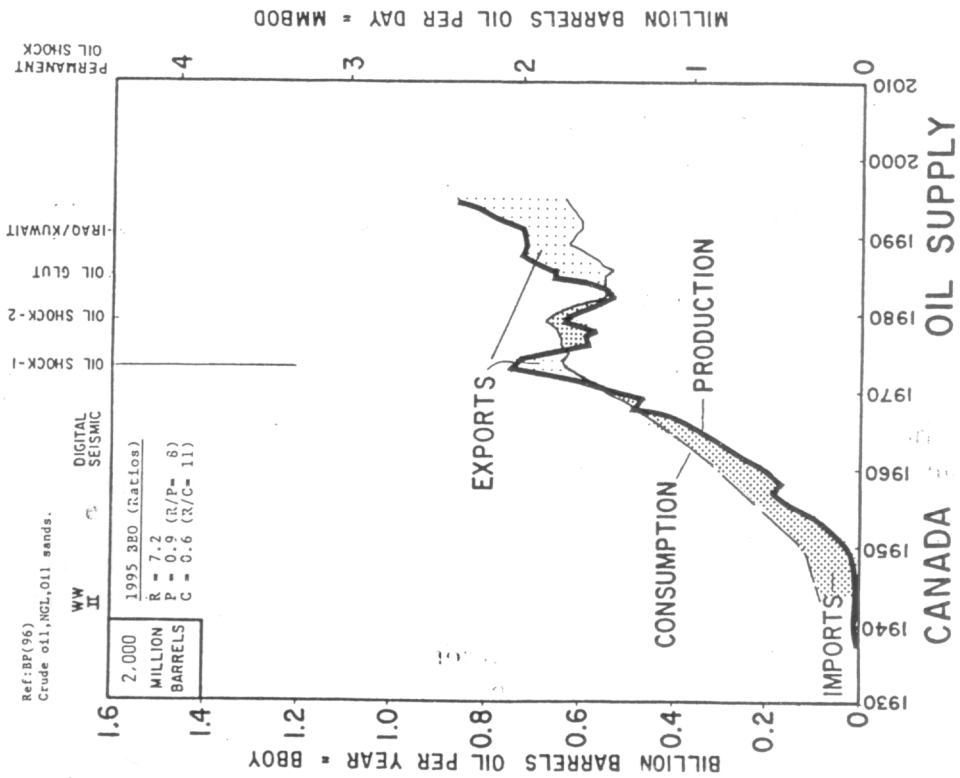
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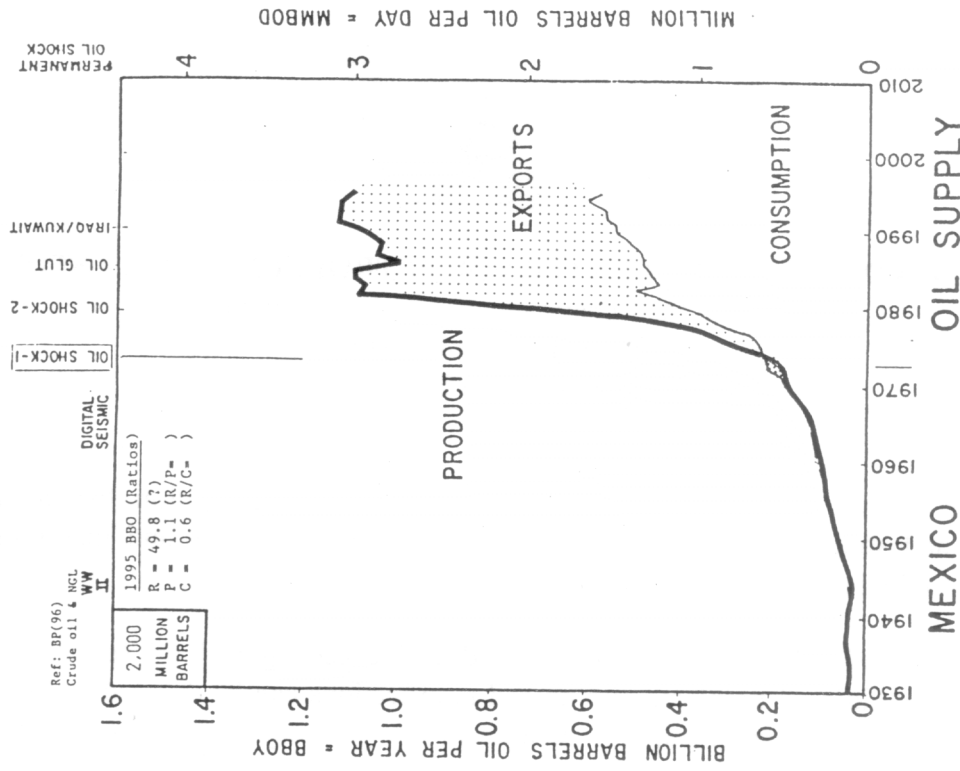
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⁸Ivanhoe, L.F., 1995; Future oil supplies: There is a finite limit; World Oil, Oct. 1995, p. 77-88.

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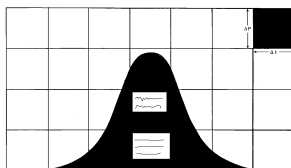


IVANHOE
FIGURE 1



IVANHOE
FIGURE 2

H.C. NEWSLETTER



The M. KING HUBBERT CENTER FOR PETROLEUM SUPPLY STUDIES

located in the Department of Petroleum Engineering
Colorado School of Mines
Golden, Colorado

The Hubbert Center has been established as a non-profit organization for the purpose of assembling and studying data concerning global petroleum supplies and disseminating such information to the public.

The question of WHEN worldwide oil demand will exceed global oil supply is stubbornly ignored. The world's oil problems, timing and ramifications can be debated and realistic plans made only if the question is publicly addressed. A growing number of informed US and European evaluations put this crisis as close as the years 2000 - 2014. The formation of this center is to encourage a multi-field research approach to this subject.

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