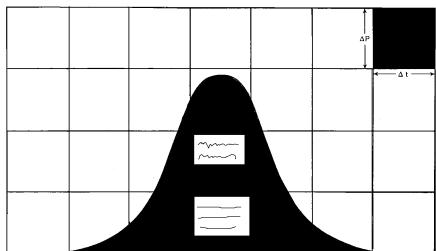


HUBBERT CENTER NEWSLETTER # 99/3



M. KING HUBBERT CENTER FOR PETROLEUM SUPPLY STUDIES

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PETROLEUM POSITIONS OF BRAZIL AND VENEZUELA

L. F. Ivanhoe

Brazil and Venezuela bracket the range of petroleum positions of South American oil producers. Figures 1 and 2 clearly show the differences between the two nations' Consumption/Production/Exports/Imports.

BRAZIL (Figure 1)

Brazil has the eighth largest economy of the world. Like any semi-industrialized nation, there are great differences in income between the rich and poor social classes and different states/provinces.

Brazil has by far the largest area, population, and economy of South America. It is larger than the Lower 48 States of the U.S.; its population (160 Million) is approximately 40 percent of South America's, and it uses 36 percent of the continent's oil consumption. Brazilians speak Portuguese, in contrast to the rest of Latin America where Spanish is the basic language.

Oil Production

Onshore Brazil is not particularly "oily", much of the country being covered by the basement rocks of the Brazilian Shield. However, the government has done its utmost in an attempt to find and develop the country's oil resources to offset the high cost of importing fuel. The national oil company Petrobras was formed in 1953. Brazil's first oil discovery, near an oil seep, was in 1939 in the onshore Reconcavo Basin north of the port of Bahia. Brazil's oil future now appears to be tied to discoveries in ultra-deep (more than 1000 meters/3300 feet) waters in the Atlantic Ocean. Petrobras now produces most of Brazil's crude oil from deep-water fields where the oil production costs are extremely high. The company is probably the most experienced ultra-deep water operator in the global oil business. However, Brazil's poverty and social problems require major economic solutions which conflict with Petrobras' needs for

national funds to bring more production onstream from the known deep-water fields. Oil production in 1998 was 990,000 barrels per day, (1), the second largest in South America after Venezuela, (Table 1).

Oil development rights have always been politically restricted to Brazilians, with rare intervals when foreign companies were allowed to have service contracts with Petrobras. Foreign consultants were hired during the 1950s, and during the 1960s Petrobras continued active exploration and development programs in most of Brazil's sedimentary basins. These efforts were rewarded by the discovery of 55 significant "small to large" fields. The high level of exploration and development continued into the 1970s with greater emphasis on offshore activities resulting in much success. After the 1973 Arab oil embargo and four-fold increase in the global oil price, Brazil met the resulting foreign exchange drain by changing their laws to allow foreign companies to join Petrobras' search by means of "risk contracts". In 1975 Brazil produced 200,000 barrels of oil per day and consumed 835,000 barrels per day. Under the risk contracts, more than 50 foreign firms spent in excess of \$1.66 billion to drill 161 wells during the 1970s and 1980s. Only a very small oil field was found by the foreign investors, while more than 90 significant fields were found by Petrobras. So the foreign companies moved on. A new constitution in the 1980s again prohibited foreign investment in petroleum development, so Petrobras had to continue Brazilian oil and gas operations with little outside assistance. Despite severe economic problems, Petrobras' development work continues. Financing, in addition to technology and geology, may become a problem in future production plans, (3).

Oil Consumption

Brazil has always imported oil. The nation's oil consumption now increases along with its population – at a faster rate than new deepwater fields are brought on production. The national oil consumption in 1998 was 1,800,000 barrels per day, (1) so they have to import half of their oil needs. The costs of the fuel imports strains the Brazilian economic and social problems. Hyper-inflation was common, and several currencies were introduced during the 1950s and 1990s as the government tried to keep ahead of the economic/social problems involved with the hyper-inflation. Brazil had to devalue its currency again in January 1999, after having a relatively stable currency for four years.

Alcohol: Along with attempting to increase oil production, Brazil has made an effort to reduce oil consumption by encouraging the use of ethyl alcohol as a motor fuel. This effort has surpassed similar attempts elsewhere in the world, but the cost has been high. Alcohol, which costs between \$50 and \$60 per barrel (42 gallon) to produce from sugar cane, is given huge subsidies to allow it to be priced 30 percent below domestic gasoline. (U.S. gasoline costs approximately \$30 per barrel before taxes.) Since the alcohol program was started in the late 1970s, demand increased to 185,000 barrels per day in the late 1980s, while gasoline utilization decreased to just over 100,000 barrels per day. In recent years, drivers have preferred to use the more expensive gasoline because of long-term damage to motor engines burning alcohol as fuel. The alcohol subsidies reduce the amount that Petrobras can spend on domestic oil development, (3).

VENEZUELA (Figure 2)

Venezuela (somewhat larger than the State of Texas) is much smaller than Brazil, with the fifth largest population (est. 23 million) and the third largest oil consumption of South America. It is Venezuela's oil exports (2,950,000 barrels per day in 1997) that set the nation apart from other American countries (1). Venezuela, a founding member of the Organization of Petroleum Exporting Countries (OPEC) is one of the world's major oil producers, and one of the four largest 1997 oil exporters to the U.S. – (which include: Venezuela, Canada, Saudi Arabia, and Mexico). Venezuela's oil consumption (1998 = 475,000 barrels per day) is insignificant when compared to the nation's oil production (1998 = 3,335,000 barrels per day).

Oil Production

Venezuela is the only “super oily” nation outside of the Persian Gulf region. A west-to-east trending branch of the Andes Mountains divides Venezuela's oil basins into the Maracaibo basin on the northwest and the Transandean basins to the south and east. All of the basins produce oil.

Asphaltic residues and oil seeps were used by the Venezuelan Indians long before the Spanish conquest. Venezuela's first oil concession was granted in 1866 and in 1878 seepage oil production was established near Cucuta. Serious interest in Venezuela's conventional oil deposits began around the beginning of this century. The 1905 Mining Law made highly prospective lands available to explorers. Heavy oil was discovered in the Guanaco area of eastern Venezuela in 1912. The first major commercial accumulation of conventional oil was discovered in 1914 at the Mene Grande field east of Lake Maracaibo. This field is still productive. Major production was discovered between 1917 and 1922 in the Bolivar Coastal Fields along the eastern margin of Lake Maracaibo. By 1926 oil had become Venezuela's major export commodity. During the 1930s wood and concrete platforms in shallow waters made possible the development of oil accumulations beneath Lake Maracaibo. During the 1940s, 36 oil fields were discovered in Eastern Venezuela. During the 1950s, further significant discoveries were made in the Eastern Venezuela and Maracaibo basins, and the “Orinoco Heavy Oil Belt” was outlined (4).

In 1960, the Organization of Petroleum Exporting Countries (OPEC) was formed in response to reductions in prices paid for non-U.S. oil by the foreign (U.S.) oil companies. An Arab oil embargo was declared against the U.S. which sided with Israel during the 1973 Arab-Israeli war. This was followed by unilateral OPEC increases in global oil prices. This was the “First oil shock” which wrecked havoc to oil-importing economies around the world. Oil producing nations soon declared independence from the international oil companies then producing their countries' oil, and “nationalized” the oil companies' concessions, operations, etc. In Venezuela, such nationalization took place on August 29, 1975, whereafter oil production and marketing rights of Venezuela were turned over to the national oil company Petroven/PDVSA. PDVSA paid off some of the smaller operators and signed technical service contracts with several of the major oil companies. As could be expected, Venezuela's PDVSA's exports to the U.S. and the rest of the world were very profitable. This resulted in the euphoric country borrowing large amounts of money to continue social programs after the global oil price

collapsed after 1985. By 1989, Venezuela's foreign debt was \$30 billion, while their public's social expectations were based on the boom days of 1980. The extra-low price of gasoline became a "sacred cow" (as in the U.S.).

Orinoco Heavy Oil: Venezuela is the only OPEC nation in the Western Hemisphere, which makes the country a natural oil exporter to the importing nations of Latin America and to the great market of the U.S. It has raised or lowered its assigned OPEC oil production quotas much more faithfully than have the several Arab OPEC nations. In recent years, Venezuela's PDVSA and its foreign associates have applied new petroleum engineering techniques (horizontal drilling, etc.) that have enabled the nation to produce much more of the previously non-commercial "Orinoco Heavy Oil Sands" as "Orimulsion" (sold by the tanker as boiler fuel to foreign electric power plants) and as low-grade crude for upgrading in special refineries. "Declared Reserves" are important to OPEC, because each OPEC country's production quota is partly based thereon. Venezuela's Orinoco non-conventional oil resource was not previously deemed to be a "Reserve" for OPEC purposes. But after Venezuela added some Orinoco oil to its "Reserves" in 1987, the various Arab OPEC countries each declared additional ("political") reserves to bring the various OPEC quotas back into line with the pre-1987 "Reserve" numbers. Venezuela's increase in Orinoco oil production after 1986 is one of the reasons for the 1998 global "oil glut" and low oil prices. The resulting oil glut has decreased the amount of development capital available around the globe, so new deep-water, etc. fields needing costly investments to bring them on production are being deferred worldwide.

Table 1 World Petroleum Supply and Disposition, 1996
(Thousand Barrels per Day)

Region/Country	Primary Supply			Disposition			Bunkers	
	Oil Production	Crude Oil Imports	Total Imports of Refined Petroleum Products	Crude Oil Exports	Total Exports of Refined Petroleum Products	Apparent Consumption (Including Bunkers)	Residual Fuel Oil	Distillate Fuel Oil and Other Products
Central & South America								
Argentina	805	15	36	324	67	479	7	4
Bahamas, The	0	0	55	0	39	17	3	1
Bolivia	37	0	3	0	5	35	0	0
Brazil	1,014	560	269	2	79	1,718	20	22
Chile	22	160	46	0	1	217	5	0
Colombia	633	0	24	324	65	278	1	3
Costa Rica	0	12	22	0	4	30	1	(s)
Cuba	32	103	69	0	4	192	0	1
Dominican Republic	1	41	34	0	0	78	0	0
Ecuador	406	0	18	241	38	138	8	2
El Salvador.	0	15	17	0	2	30	0	0
Guatemala	13	15	29	13	0	44	0	0
Honduras.	0	0	25	0	0	25	0	0
Jamaica	0	21	42	0	1	62	0	1
Netherlands Antilles	6	266	32	10	227	69	28	6
Nicaragua	0	12	7	0	(s)	19	0	0
Panama	1	51	15	10	9	47	14	7
Paraguay	0	3	16	0	(s)	19	0	(s)
Peru	123	56	29	37	18	153	(s)	1
Puerto Rico	0	59	99	0	12	152	2	1
Trinidad and Tobago	133	41	4	67	89	20	2	3
Uruguay	0	33	12	0	11	34	4	5
Venezuela (OPEC)	3,105	0	11	1,976	669	444	14	13
Virgin Islands, U.S.	(s)	405	12	0	330	83	1	2
Other	8	19	65	8	4	81	(s)	14
Total	6,339	1,887	991	3,012	1,675	4,466	110	88

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

Apparent 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.

Table 1: World Petroleum Supply and Disposition, 1996
Central and South America.

This table is taken directly from the U. S. Department of Energy report: International Energy Annual – DOE/EIA-0219(97), Apr. 1999. This compilation combines data from several sources, to present the oil production/consumption/imports/exports of each of the listed nations. The Table is always a couple of years late due to the complexity of assembling and analyzing the various data into one table. It is included here to allow direct comparison between the several factors for each of the nations of the table or other newsletters. The key nations mentioned in this newsletter are underlined.

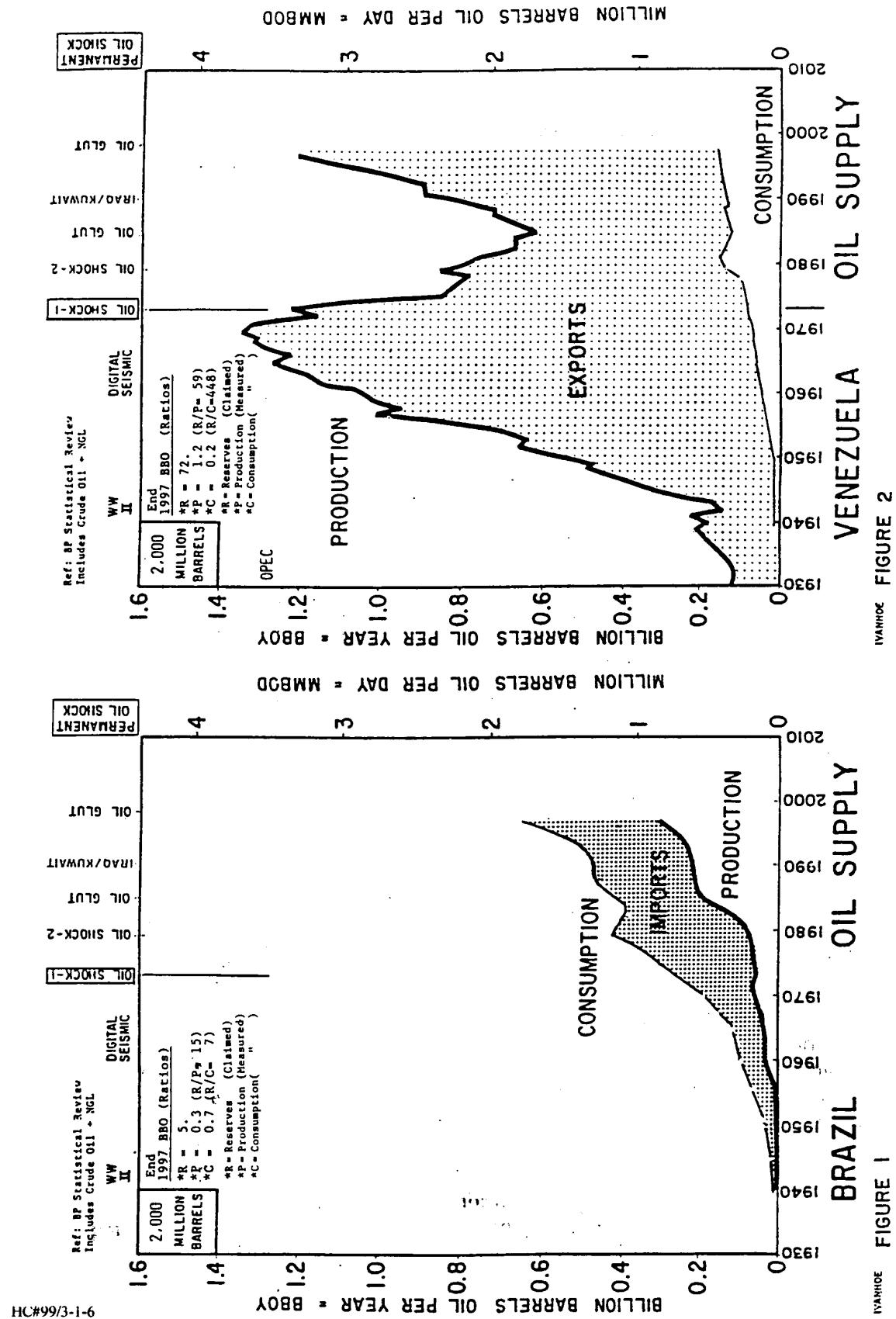
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L. F. (Buzz) Ivanhoe, Petroleum Consultant, Ojai, California, is a registered geologist, geophysicist, engineer and oceanographer with 50 years domestic and international experience in petroleum exploration with various private and government oil companies. He was associated with Occidental Petroleum from 1968 to 1980 where he was senior advisor of worldwide evaluations of petroleum basins from 1974 to 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. He is the coordinator of the CSM M. King Hubbert Center for Petroleum Supply Studies.



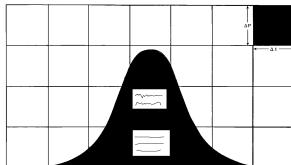
FORESEEABLE PERMANENT GLOBAL CRUDE OIL SHORTAGE

A critical date for U.S. and global oil consumption will be when the world's oil demand exceeds the global supply. This watershed will occur when the world's oil production reaches the "Hubbert Peak", i.e. when the world's oil is HALF GONE – NOT when all of the earth's oil has been consumed. The question is NOT WHETHER, but WHEN this foreseeable event will occur. Current estimates of when the Hubbert Peak will occur range from year 2005 by the most bearish to 2020 for more bullish petroleum geologists. The potential for economic dislocations and societal upheaval is enormous and frightening. Serious planning by all governments for the foreseeable energy crisis should be started immediately.

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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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