The Potential for the U.S. Energy Sector in Cuba

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Introduction

Cuba is an island nation about the size of the state of Pennsylvania, located in the Caribbean basin. It has a population of 11 million of whom roughly 70% live in urban areas. Cuba's GDP was estimated at around US$18.6 billion in 1999 with a growth rate of about 6%. About 20% of its 4.5 million person workforce is engaged in the agricultural sector where sugar, citrus, tobacco, coffee and rum are key exports. Cuba's key trading partners are Russia, Canada and the Netherlands.

Cuba is strategically located close to US markets but the United States maintains economic sanctions against Cuba. The sanctions have resulted in lost opportunities for both countries. This report investigates the state of Cuba's energy industry and the impact on that industry --were US sanctions against Cuba to be lifted. In looking at future Cuban energy needs and the Cuban energy industry, it can be clearly estimated that a lifting of sanctions against participation in the Cuban energy sector could provide over $2 to 3 billion annually in oil and gas trade business opportunities for U.S. energy firms.

Cuba's waters could also provide a rich source of natural gas, potentially for export to Florida by pipeline. While it is hard to predict how much natural gas might be discovered in the coming years were U.S. sanctions against Cuba to be lifted, demand for the relatively clean fuel in Florida is expected to grow substantially over the next decade. A 2 MM tons a year or 0.27 bcf/d pipeline to Florida would represent a business opportunity of roughly $300 million a year.

Though it is slowly moving in the direction of a mixed economy**,** Cuba continues to have a command, planned economy where the government owns and runs the means of production. About 75% of the work force is employed by the state. The Cuban economy is still suffering from the aftermath of the collapse of the Soviet Union, which provided generous economic subsidies including energy supplies. To alleviate the economic downturn that began in the early 1990s, Cuba has introduced some market-oriented reforms including opening the economy to tourism**,** decentralizing agriculture and authorizing self-employment in 150 occupations. By the mid-1990s, tourism surpassed sugar as the primary source of foreign exchange. Roughly 1.6 million tourists visited Cuba in 2000 providing over $2 billion in gross revenues. Cuba has also invited foreign investment, including its energy sector to private international firms. Several firms have explored for oil and gas off Cuba's coastline but with only limited success. Cuba's refining sector is also in need of investment and upgrading.

Energy Demand Trends in Cuba

Almost all energy in Cuba derives from oil and gas. Of the 373.1 trillion BTUs consumed in 1998, 357.2 or 95.7% was in the form of petroleum products. Natural gas accounted for 4% with coal taking up the remaining 0.3%. Over 80% of the oil was imported as was all of the coal. According to the US DOE, Cuba generated 13.309 quadrillion BTUs of electricity in 1998, of which 94% came from thermal powered generators. Hydroelectric power is miniscule, accounting for less than 1%. These data are not fully consistent with claims from the Cuban Society for the promotion of Renewable Energy sources (CUBASOLAR) that non-fossil fuel, hydro and solar accounted for 30% of total energy consumption in 1997 [1]. The discrepancy may reflect the fact that energy production from renewable and biomas sources are not as easily observable as that from larger commercial scale generating units.

At the end of the 1970s, Cuba began to pursue an ambitious program of building nuclear generating capacity. Construction began in 1983 on the first of two planned nuclear reactors at Juraguá in Cienfuegos province. In 1992, work was suspended with the cessation of financing from Russia. The two 440 megawatt nuclear reactors are reportedly 75% and 30% respectively, completed. The USSR had paid for most of the US$ 1.1 billion invested in the project. A further US$ 750 is said to be needed to complete the first reactor. Subsequent to 1992, Cuba and Russia have talked about restarting construction but in 2000 they agreed to abandon the project. Each reactor when fully running would have saved Cuba around 600,000 tons of oil annually.

Almost all Cuban households (95%) have electricity, accounting for 35% to 40% of total energy consumption in 1997. Approximately 100 million cubic meters (3.53 billion cubic feet) of natural gas was also consumed by households (in Havana) in 1997.

Table 1 shows primary energy consumption during the 1990s. Reflecting the collapse of the Soviet Union and end of Soviet aid, energy consumption fell sharply from 1990 to 1991 and has remained surprisingly constant thereafter. The consumption data are surprising in light of the fact that GDP fell sharply, by almost 40%, during the “special period” in the early 1990s and then rose in the second half of the decade. The per cent change in GDP shown in Table 1 is measured in constant 1981 Cuban prices.

TABLE 1: Primary Energy consumption and GDP changes in Cuba

Year	Energy Consumption Quadrillion BTUs	% Change in GDP (constant 1981 prices)
1990	0.50	-3.0

1991	0.46	-10.7
1992	0.41	-11.6
1993	0.40	-14.9
1994	0.41	0.7
1995	0.42	2.5
1996	0.43	7.6
1997	0.39	2.5
1998	0.37	1.3
1999	0.39	6.2
Source:	Primary energy consumption EIA, DOE. Change in GDP: Economic Commission for Latin America and the Caribbean (ECLAC)	

While total primary energy, shown in Table 1, has remained fairly constant or fallen in the last part of the 1990s, net electricity consumption has shown a steady increase. Consumption fell from 13.2 billion kilowatts (kw) in 1990 to 9 billion kw in 1993. But in recent years, electricity consumption has increased to 13.4 billion kw in 1999. Consumption in 1999, although roughly equal to that of 1990, does not reflect a return to the pattern of usage that prevailed in the period before the collapse of the Soviet Union. Electricity blackouts and shortages of fuel for transport services continue from the "special period," albeit at a reduced level of severity. Instead, at least some of the increase in electricity consumption in the latter part on the 1990s is probably due to the rapid growth in tourism and tourists' demand for air conditioned rooms and restaurants and possibly better outdoor lighting as well.

Estimating Per Capita Petroleum Use: The Cuban Case

Medlock and Soligo [2] have examined the pattern of end sector energy use as a function of the level of economic development as measured by per capita GDP. The model permits the forecasting of end-use energy demand for a country on the assumption that economies tend to follow a similar pattern of development and of energy use, after allowing for country specific characteristics. However, placing Cuba into this framework

is difficult because we do not have data on Cuba's per capita income, even in current dollars. Data are published in terms of Cuban pesos but there is no agreement as to how to convert these data into US dollar terms. Furthermore, inter-country comparisons are usually more accurate when country GDP is converted into US dollars using purchasing power exchange rates that are not available for Cuba. The only estimate available, from the U.S. Central Intelligence Agency (CIA), places Cuban per capita income at $1700 for the year 2000 in 2000 PPP dollars.

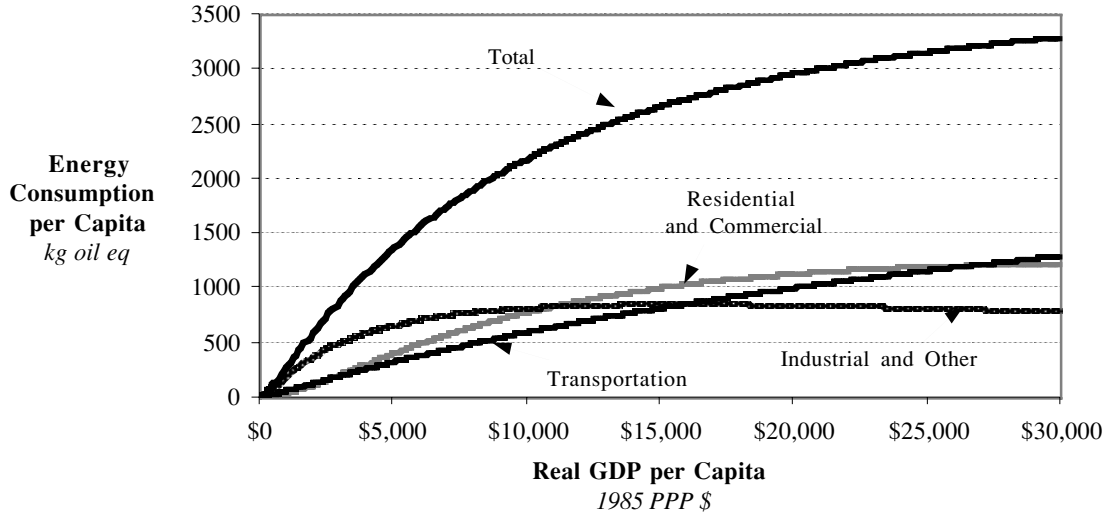
Since the Medlock/Soligo model uses 1985 PPP dollars as the measure of per capita income, it is necessary to covert the CIA estimate into 1985 dollars. Unfortunately, a lack of data makes this impossible. One alternative approach is to assume that the rate of inflation was the same in Cuba as in the US. In this case, the per capita income for Cuba in 2000 in terms of 1985 PPP dollars would be roughly $2400. For lack of a better alternative, our analysis below is based on this assumption.

Figure 1 shows that typical pattern, plotting per capita energy use against per capita income measured in 1985 PPP dollars. In the early stages of development, energy use by the industrial sector rises rapidly as countries begin to industrialize. At some stage of development, this process slows down and energy use in the industrial sector levels off. However, per capita energy use in the transport and commercial/residential sectors increases. In the long run, the demand for energy is inelastic with respect to changes in per capita GDP. That is, the demand for energy, per capita, rises at a slower rate than output. However, at low levels of per capita income, this elasticity is greater that unity. Countries at specific levels of per capita income will deviate from the predicted level of energy use to the extent that there are differences in climate, population density, energy taxes or other policies that affect energy prices, and so on.

This study assumes that, despite data limitations and institutional differences, the model may be useful in predicting energy consumption in Cuba. In fact, current energy usage in Cuba falls fairly closely to the usage of the typical country having the same level of per capita income. For a *typical* country having a per capita income in 1985 PPP $US 2400 the model predicts a per capita energy use of approximately 697 Kg (or 0.7 tonnes) of oil equivalent. This estimate is of end-use energy, which will be lower than primary energy use because of losses in the refining process and in conversion of fuels into electricity. These conversion losses depend on the composition of energy use as well as the extent to which a country imports refined products or domestically processes imported crude. These losses typically amount to 15% of primary energy use for the US to 30% for some for developing economies. Applying an adjustment for conversion losses of 20%, taking a midpoint in the range experienced by various countries, yields an estimate of per capita primary energy use of 0.87 tonnes of oil equivalent. This compares with the actual consumption in 1999 (the last year for which we have data) of approximately 0.88 tonnes of oil equivalent.

While it is possible to fit Cuba into the Medlock/Soligo framework, the model may still not be reliable in estimating future energy demand for Cuba, because of the "command" nature of the Cuban economic system. The model has been estimated using data from more market-oriented economies. Since the current trend in Cuba is toward a more open, mixed economy, this is a reasonable hypothesis from which to proceed.

Figure 1: Per Capita Energy Use by Sector for a Hypothetical Country



Sector curves are constructed from simulated data (see text).

Because Cuba is not a typical developing economy in the sense that it remains a planned economy, the level and composition of energy use that will emerge over time may not follow the pattern of development experienced by more market-oriented economies. In particular, private motor vehicle ownership is substantially lower in Cuba than in other countries with comparable per capita incomes, reflecting the different priorities of the planning authorities as well as the more equal distribution of income. Cuba's energy mix shows a surprisingly low use of motor gasoline, with Cubans relying mainly on buses fueled by road diesel or on bicycle travel. Similarly, the extent to which the public has and uses modern consumer durables such as air conditioning has been determined by government decisions to produce or import these goods rather than by the preferences of households.

The uniqueness of Cuba can be seen in comparisons with other Central American and Caribbean countries. Table 2 gives some relevant comparisons.

Despite having a much lower per capita income (as estimated by the CIA) than other countries, Cuba uses only slightly less energy per capita than Costa Rica. Electricity consumption is about three-quarters of the Costa Rican level. By contrast, both energy and electricity use are higher than that for the Dominican Republic, Guatemala, Honduras and Nicaragua all of which have a higher per capita income level. On the other hand, per capita consumption of gasoline is lower than that of all countries except Nicaragua.

These data reflect the special characteristics of the Cuban economy, including especially its egalitarian distribution policies. Most households have access to electricity but private transportation is more limited than in other countries.

TABLE 2. Energy Use Comparisons					
Country	1998 Population millions	1999 ppp$ Per Capita Income	Per capita Energy Use Quads (1998)	Per Capita Electricity Use kwh/yr (1998)	Per Capita Gasoline Use b/year (1998)
Cuba*	11.12	1700	0.035	1113	0.31
Dominican Rep.	8.21	4653	0.024	813	0.66
Costa Rica	3.53	5770	0.037	1456	1.20
Guatemala	11.52	3517	0.012	240	0.49
Honduras	6.18	2254	0.013	513	0.39
Jamaica	2.64	3276	0.059	2148	1.43
Nicaragua	4.81	2154	0.006	498	0.24
*Per capita income for Cuba is for year 2000					

Given these realities, how do we estimate future Cuban energy consumption? Will Cuba be able to hold per capita primary energy consumption relatively constant as GDP continues to grow? In our opinion, this latter possibility is unlikely. Energy consumption has been severely repressed during the past decade. As per capita income grows, the public will demand better public, if not increasing access to private, transportation and fewer black-outs. Also, as tourism, the primary engine of growth, continues to increase, demand for transportation fuels and electricity will similarly grow. Tourists will demand access to air conditioned hotels and restaurants (especially important given Cuba's climate) and rental cars or transportation by private taxi.

Tourism to Cuba has been growing rapidly as appropriate infrastructure has been built. The number of hotel rooms increased from 5,000 in 1987 to over 30,000 in 1999. In nominal terms, revenues from tourism have grown fromUS$243 million in 1990 to US$2 billion in 2000, an increase of over 700%.

During 1999-2000, gross income from tourism to Cuba grew by 8.1% [3] despite the restriction on travel by US citizens. In 1998, US tourists accounted for 60% [4] of all tourists to other Caribbean islands. Without the embargo, ordinary Americans would be free to travel to Cuba possibly adding an addition $1 billion to Cuban tourist earnings within a few years [5].

Table 3 compares total revenue and per capita revenue from tourism for several countries in 1998. Per capita tourist income in Cuba is fourth, behind Jamaica, Dominican Republic and Costa Rica. Given its proximity to the US and the combination of both historic and natural beauty, Cuba has great potential for future growth in this sector

TABLE 3: Tourist Income (1998)		
Country	Tourism Income $million	Per Capita Tourist Income
Cuba	1816.00	163.31
Dominican Rep.	2141.70	260.86
Costa Rica	901.50	255.38
Guatemala	314.40	27.29
Honduras	164.40	26.60
Jamaica	1197.00	453.41
Nicaragua	100.10	20.81

Source: Association of Caribbean States, web site: http://www.acs-aec.org/

Forecasts of Energy Demand

In generating some estimates of future energy demand in Cuba, we use a number of different approaches. First, we assume that per capita energy demand will follow the pattern of the Medlock/Soligo model. Second, we assume that demand will grow at the same rate as per capita income. This is equivalent to assuming a demand elasticity of unity. Finally, we assume that the per capita energy demand in Cuba in 2015 will become similar to that of other "comparable" countries in the region in 1998.

As Table 1 showed, Cuban GDP growth has recently averaged about 4 per cent per annum. If *per capita* income were to grow at this rate, per capita income will increase from year 2000 levels by 48% by 2010 and 80% by 2015. By 2015, Cuban per capita income in US PPP dollars would be slightly below the 1999 level for Jamaica.

Clearly, the future growth rate for Cuba will depend on a number of factors including future US policy towards the island. Removal of sanctions will increase the rate of growth, more so if the Cuban government encourages trade and investment with the US. Growth prospects are higher if sanctions are removed and foreign relations are normalized within the context of the current political regime so that property claims and other contentious issues can be dealt with in a stable and orderly manner. A chaotic transition accompanied by civil strife and a struggle to assert old property claims could seriously set back growth and development.

Table 4 shows projections for total energy use, electric generating capacity and gasoline demand for Cuba in 2015 under various estimating methods. The first assumption is that that Cuban per capita energy consumption will increase according to the pattern estimated by Medlock/Soligo. Second, the assumption is that per capita energy demand as well as per capita electric generating capacity and gasoline consumption will grow by the same 4% growth as per capita GDP. The remaining scenarios assume that by 2015, Cuba's per capita energy use will be the same as each of the other countries in the comparison. That is, we present scenarios assuming that the pattern and level of energy use in Cuba, circa 2015, will look very much like that of Dominican Republic, Costa Rica and Jamaica in 1998. In the "Like Jamaica" scenario, we apply the Jamaican per capita energy use, electric generating capacity and gasoline use as given in Table X above to Cuba. A similar procedure is followed for the other "country" scenarios. The Dominican Republic has a population comparable to Cuba's and an important tourist industry. Jamaica is a smaller country but represents a country with a highly developed tourist industry that could typify a future Cuba. Costa Rica is also small but represents a country that, albeit on a smaller scale, shares Cuba's focus on human development with high literacy rates and universal health provision. Its tourist industry is smaller that that of Jamaica and features eco-tourism where per diem expenditures of tourists are lower than the resort oriented tourism of Jamaica.

For all of these scenarios, it is assumed that the Cuban population will increase by a total of 8% between 1998 and 2015, roughly the same rate of growth (about .5% per annum) as experienced in the 1990s. Calculations in the Table below assume that Cuba's population will be roughly 12 million by 2015.

TABLE 4: Projections for Cuba (2015)

	Total Energy Use: Thousands b/d oil equiv.			Total Electric Capacity in thousands Megawatts			Total Gasoline Consumption in b/d		
	1998	2015	Change	1998	2015	Change	1998	2015	Change
Medlock/Soligo	179	363	184	4.33					
Growth at 4%	179	349	170	4.33	9.11	4.78	9.32	19.61	10.29
Like Jamaica	179	327	148	4.33	5.40	1.07	9.32	46.90	37.58
Like Costa Rica	179	206	27	4.33	4.81	0.48	9.32	39.43	30.11
Like Dominican Rep	179	132	-47	4.33	3.40	-0.93	9.32	21.61	12.29

Projections based on the Medlock/Soligo model yield the highest estimates for 2015 at 363 thousand barrels a day of oil equivalent, an increase in consumption over 1998 levels of 184 thousands of b/d of oil equivalent. As noted earlier, the income elasticity of energy demand is typically greater than one at low per capita income levels and this is the case for Cuba under this scenario.

The 4%/annum growth scenario (which assumes an elasticity equal to one) produces a slightly smaller increase in demand than the Medlock/Soligo model. However, this scenario produces a much greater increase in total energy consumption and electric generating capacity than the other "country specific" scenarios. The relatively modest increase predicted under these last scenarios reflects the fact that per capita energy and electricity consumption in Cuba already compares favorably with the other countries in the comparison. Hence, if consumption and generating capacity grow at 4% per annum, they will be significantly above the per capita levels prevailing in the comparison countries in 1998.

On the other hand, the predicted growth in gasoline consumption is much lower under the 4%/annum scenario than in the "country specific" scenarios. This reflects the current very low per capita gasoline consumption in Cuba. Even at a 4% per annum growth rate, Cuban per capita consumption of gasoline in 2015 would be below the 1998 levels prevailing in the comparison countries. Note that the negative number for electric generating capacity under the Dominican Republic scenario reflects the fact that electricity generating capacity in that country is below the current Cuban level. The Dominican Republic has been experiencing severe electricity shortages indicating that per capita capacity is currently below demand. Current construction projects are designed to raise capacity in the Dominica Republic and eliminate the severe shortages in electricity.

An important factor in these projections is that we have assumed that Cuban population growth will continue at the very modest growth rates of the past, roughly 0.5% per annum. This low rate reflects, to some extent, the higher education standards and better access to health care in Cuba. To the extent that current birth rates reflect other factors such as limited and crowded living space or pessimism about the future, population growth rates may increase. Indeed, the 1990s was a period of severe economic contraction. The estimates of future energy use would be markedly affected if higher population growth rates were to occur. For example, an increase in annual population growth rates to 1% would, under the Medlock/Soligo model generate an energy demand for 2015 of 408 thousand b/d, an additional 45 thousand b/d.

To summarize, we project that Cuban energy needs will increase by 148-184 thousand b/d by 2015. This increase will have to be met by additional imports or increases in domestic production of crude or natural gas. Using the modest population growth rate and the experience of Costa Rica and Jamaica, it would appear that Cuba would require additional electric generating capacity of 48-107 megawatts by 2015. That would bring Cuban per capita usage to the levels prevailing in those countries today. However, if electricity demand grows at 4% per annum, Cuba will need to install an additional 478 megawatts of capacity by 2015. Additional refining capacity for gasoline would have to increase by 30-38,000 b/d to bring Cuban usage in 2015 to current Jamaican and Costa

Rican levels. These estimates should be regarded as a lower bound. Higher population growth rates or GDP growth rates will increase these investment requirements.

Cuba's Energy Industry

Cuba has proven crude oil reserves of about 283.5 million barrels, while its proven natural gas reserves total 636 billion cubic feet. Due to its limited natural resources, the Caribbean island nation currently is dependent upon oil imports to meet about two-thirds of its 190,000 b/d domestic needs. In 2000, Cuba produced about 46,500 barrels a day (b/d) of crude oil, mostly from the north central coast in the state of Matanzas, and 600 million cubic meters of natural gas. State oil firm Cubapetroleo (Cupet) has also recently suggested that it plans to boost output from output from 52,000 b/d in 2001 to 120,000 b/d in 2005, though those figures appear speculative in light of recent exploration disappointments.

Approximately half of Cuba's crude output is produced from wells operated by Canadian mining firm Sherritt International Corp., with most of the remaining accounted for by Cupet. Toronto-based Sherritt holds an indirect interest in seven exploration/production-sharing contracts with the Cuban government that encompass most of the island's existing crude fields, totaling 3.55 million acres. Increases in oil output over the past two years have come primarily from new wells in the Puerto Escondido and Varadero West blocks east of Havana, as well as exploratory wells in the Yumuri, Canasi and Seboruco fields along the island's north coast. Because approximately 90% of the crude that Cuba produces comes from the northern coast and is heavy oil with high sulfur content – 8 to14 degrees API gravity with about 8% sulfur -- it is only suitable for use in specialized plants that produce cement, electricity and nickel.

Cuba currently relies heavily upon crude imports from Venezuela. Prior to 1999, Cuba received almost all the oil it needed from a long-term sugar-for-oil barter arrangement with Moscow. That agreement collapsed in 1999 though Cuba continued to receive a very small volume of Russian oil in exchange for use of a monitoring station on the island. Venezuela, under populist leader President Hugo Chavez who came into office in 1999, moved to fill the void left by Moscow's departure as a main crude supplier to the island state. Based on a new agreement inked in October 2000, Caracas now provides about 53,000 b/d of Venezuelan crude or refined products to Havana, while financing up to a fourth of the cost. The deal allows for additional Venezuelan oil supplies in exchange for Cuban medical services and advice on athletics and agriculture. According to the agreement, Havana must pay for a portion of the Venezuelan crude at international market prices within 90 days of delivery.

Chavez has been willing to stand up to the U.S. extraterritorial legislation, the 1996 Helms-Burton Act or Libertad Act, that has sought to penalize new investment in Cuba but which has never been strongly enforced by Washington. The U.S. government currently has sanctions in place under Helms-Burton against Sherritt and the B.M. Group, a Panama-based company controlled by Israeli investors, for their activities in Cuba, banning executives and large shareholders of those firms entry into the U.S. U.S. President George W. Bush in July 2001 continued the policy of his predecessor to waive

a provision in the act that would permit legal action against those investing in properties once owned by Americas of former Cuban citizens that was expropriated by the Cuban government.

Although Cuba may not have the energy potential of some of its Caribbean or Latin American neighbors, there is continued interest from foreign oil firms in exploring for crude and natural gas in the island state. Between 1991 and 1999, foreign investment in oil exploration and production in Cuba increased by about $600 million. Roughly half a dozen foreign companies are currently active in Cuban waters, either exploring for or producing oil, despite the threat posed by the Helms-Burton Act. In early 2000, Cuba offered up 59 deepwater offshore blocks in its 112,000 sq km exclusive economic zone in the Gulf of Mexico to a handful of international firms. About 20 of the 59 blocks that were tendered have subsequently been awarded to companies from the U.K., Canada, France, Spain and Sweden.

Spain's Repsol YPF was awarded six exploration blocks totaling 10,200 sq km that are located along the island's coast northwest of Havana. The Spanish firm is to provide start-up capital for at least two wells, and if drilling proves successful, will share the profits with Cuba. The exploration efforts in Cuba's sector of the Gulf of Mexico are targeted on the "northern band," an area that extends from Guanabo in Havana province to Corralillo, 150 km to the east. But, foreign investors are also eyeing the new offshore opportunities cautiously, following the decision by Brazilian state oil firm Petrobras and its junior partner Sherritt in June 2001 to withdraw from an agreement they had signed with Cupet in 1998 to explore Block 50,a 3,000-sq km area off the north central coast, after the consortium drilled a $15 million dry well in April 2001. The structure had previously been believed to hold as much as 500 million barrels of crude.

Although Cuba opened its petroleum industry to outside investment in 1991, it has gained its biggest momentum with the recent tendering of the deepwater blocks in the Gulf of Mexico, an area that is estimated to contain 3-4 billion barrels of recoverable crude reserves. The difficulty lies in the location of these blocks, with depths that range between 2,000 to 4,000 meters. The northernmost of the blocks that Cuba put up for tender lies south of three areas that the U.S. has put into contention for its own exploratory efforts in its section of the Gulf of Mexico. The westernmost Cuban blocks come close to the eastern of two "donut holes," areas of disputed deepwater acreage. Foreign firms that have been exploring in Cuba in recent years include several small Canadian companies – Beau Canada Exploration, Perbercan, Cubacan and Alturas Resources -- U.K. firm Premier Oil, France's Maurel & Prom and Sweden's Taurus. Although French-Belgian giant TotalFinaElf stopped exploration in 1994 after drilling two dry wells, the company is believed to be in discussions with the Cuban government on natural gas and liquefied petroleum gas opportunities.

Since Moscow drastically cut economic assistance to Cuba as a result of the collapse of the former Soviet Union, the island state's domestic consumption has dropped from a peak of about 245,000 b/d in 1987 to as low as 110,000 b/d before it recovered to current levels of about 190,000 b/d. Since 1998, Cuba's crude production has slowly increased, from 38,500 b/d to 46,500 b/d in 2000. Roughly half of the crude production comes from Sherritt's operations in the north central Varadero fields. The firm currently leads other

foreign investors in production-sharing agreements, supplying capital, technology and know-how in exchange for 50% of output, which is subsequently sold to Cupet. Sherritt is also involved in a $150 million joint venture to process natural gas for electricity generation on the island.

The Cuban government has been working to upgrade its refining system to be able to accommodate a blend of imported and domestic crudes. The country has four refineries with nameplate capacity of about 301,000 b/d, with two units, one in Havana (122,000 b/d) and the other in Santiago de Cuba (100,000 b/d), accounting for the bulk of that capacity. A smaller refinery in the Ciego de Avila province produces about 2,000 b/d of lubricants for the local market.

The 76,000 b/d Russian-built Cienfuegos plant, designed in the early 1990s to handle Russian shipments, was not brought on stream due to the collapse in supplies from the former Soviet Union. An estimated $250 million is required to bring it into service. A number of foreign oil firms have been in on-again, off-again discussions with Cuba about establishing joint ventures to reactivate the unit.

Venezuelan state oil firm Petroleos de Venezuela S.A. (PDVSA) initiated discussions earlier this year to make a multi-million dollar investment in the unit to get the Cienfuegos refinery up and running but decided against the venture, reportedly on commercial grounds. The attempt was the second time PDVSA had looked at the investment opportunity and rejected it.

Other state oil firms, including Petrobras, Mexico's Pemex and Colombia's Ecopetrol have also been eyeing opportunities to invest in the plant. So far, nothing has come of the talks.

Over the past two years, Repsol YPF has tried to position itself to tap opportunities in the Cuban energy business to compliment planned exploration activities there as well as other investment positions elsewhere in the Caribbean and Latin America. Repsol YPF produces over 900,000 b/d in the Americas. At the end of 2000, the Spanish firm announced it would enter into joint venture activities with Cuba's state-owned Union Cuba Petroleum (Cupet) in the areas of exploration, refining, petroleum products sales and distribution, LPG and natural gas marketing and power generation.

Future Foreign Investment Opportunities in Cuba's Energy Sector

The Cuban energy market continues to be of interest to European and Latin American energy firms. While the growth potential is not considered large, the country's geographic position near to growing markets in the U.S. and Mexico make it an interesting possible entrepot for energy project development.

Overall high-end growth possibilities of around 150,000 to 184,000 b/d of oil equivalent and 36,000 b/d of gasoline by 2015 still represent a solid business opportunity for regional players. Possible electricity demand growth of 48 to 107 megawatts by 2015 could also be of interest to foreign energy firms.

Combined with a base oil import market of 100,000 b/d or more, high-end growth possibilities of the Cuban oil import market potential could represent gross sales business value of over $1.4 billion to $1.65 billion a year beyond the next decade. Electricity sector expansion could also represent a substantial business opportunity for American firms. Many existing Cuban power plants are also aging and in need of refurbishment or upgrading.

It is harder to predict the potential value of future upstream exploration activities in Cuba. Such exploration activities have produced only mixed results to date. Petrobras' hopes of a 500 million barrel of oil equivalent field were dashed last year, and the prospects for Repsol YPF's activities in deeper waters remains to be seen.

Industry experts believe that the Cuban sector of the Gulf of Mexico could contain as much as 3 to 4 billion barrels of recoverable reserves, mainly in deeper waters. One of Cuba's largest oil fields, the Varadero field, has an estimated 2 billion barrels of oil in place. Some acreage lies south of three US mineral management service areas off Florida's Southwest coast where in U.S. waters exploration activities are a political minefield for U.S. politicians. Development of the Cuban sector if U.S. sanctions were lifted would offer U.S. firms already active in the U.S. Gulf of Mexico an interesting opportunity to supplement activities. Cuba's production sharing contracts allow parties to dispose of its share of hydrocarbon production as it desires.

In the event that the foreign partner's share is sold inside Cuba, the foreign partner is paid the international market price. No royalties are assessed, and there is no tax on exported hydrocarbons. Annual net profits from business transacted in Cuba are taxed at a rate of 30%. The relative percentage of cost oil, that is oil that will be taken as payment to cover reimbursement for the costs of development of the field and profit oil, that is, oil lifted by the foreign company as part of its pay-out for part-stake in the field are determined by negotiation.

An offshore extension of current Cuban productive zones and its associated foreland basin remain undrilled and represent a potential petroleum bearing province. Additional potential is seen in traps and reservoir facies associated with the Florida and Campeche escarpments, around the flanks of basement high "knolls" as well as in the deep, open gulf basin [6].

Sherritt International Corp. of Toronto, Canada, has announced that it added 8 million barrels of gross proved reserves in Cuba during 1999 at a finding and development cost of $5.03 a barrel. This cost basis could be expected to decline in the future as technological gains help bring down costs. Realized oil prices for Sherritt's production in the first half of 2001 was $22.28 a barrel against high world oil prices. Previously, in 1999, Sherritt had realized $14 for its Cuban oil production.

Sherritt's experience implies that earnings of $8 to $19 a barrel could be considered as a realistic, high-end revenue for American firms who successfully find oil in Cuban waters.

Earnings of at least $3 a barrel would be reasonable even under low oil price scenarios. Such rates would imply that discovery and development of a 30,000 b/d oil field would represent a business opportunity valued at roughly $33 million to $208 million a year for 15 years or more.

Cuba's waters could also provide a rich source of natural gas, potentially for export to Florida by pipeline. While it is hard to predict how much natural gas might be discovered in the coming years were U.S. sanctions against Cuba to be lifted, demand for the relatively clean fuel in Florida is expected to grow substantially over the next decade. A 2 MM tons a year or 0.27 bcf/d pipeline to Florida would represent a business opportunity of roughly $300 million a year. Gas finds in Cuba might also be profitably converted to liquid fuel products such as gasoline or diesel fuel through the construction of a gas-to-liquids plant.

However, it would be a mistake to tally only the direct business opportunities created by Cuba's growing import market, combined with the value of its upstream oil and gas assets. Were U.S. restrictions to be lifted, Cuba would be an ideal entrepot for energy trading, in refined oil products, natural gas processing and distribution facilities and crude oil storage for shipments to the U.S. and possibly Mexico. Already, several Caribbean islands play this transshipment role. The Caribbean currently houses independent petroleum storage facilities with a capacity of approximately 100 million barrels of crude oil and refined products tankage.

The U.S. imported over 580,000 b/d from the Caribbean in 2001, almost 90% of which was refined products from the Virgin Islands, the Netherland Antilles, Trinidad and Tobago and Puerto Rico. With domestic U.S. refining capacity said to be reaching its capacity limitations to meet rising U.S. oil demand, and with environmental restrictions making construction of new U.S. domestic facilities unlikely, Caribbean refining ventures remain a promising option for supplying growing future U.S. refined products demand. Refining capacity in the Caribbean exceeds 1.6 million b/d currently. A number of players have shown interest in Cuban refining facilities including Repsol YPF, Venezuela's PDVSA and Mexico's Pemex, but the industry could also represent an interesting opportunity for a U.S. firm. However, not all Caribbean refineries have been profitable. Sunoco has been attempting to sell its Puerto Rico facility, and El Paso Energy has not refurbished its Aruba plant closed after a fire in the spring of 2001.

Cuba could also represent a significant market for the importation of American equipment and material. Overall general imports to Cuba represent a market of over two to three billion dollars a year. The market for energy business related construction equipment such as rigs, pipes, specialized fluids and muds and other oil and gas related infrastructure development contracts and material could grow over the coming years. The country imported $32 million in tubes, pipes, valves and tanks in 1998.

Conclusion

Cuba is strategically located only 90 miles from the coast of Florida. Its offshore has proven reserves of 283.5 million barrels of oil and 636 billion cubic feet but is estimated

to house more than 3 to 4 billion barrels of potential resources. Cuba will provide an expanding opportunity for the construction of power stations and sale of electricity supplies as well as an expanding market for oil use. Its strategic location would also make it well suited as an energy-trading entrepot in refined products, oil storage and natural gas development and transshipment.

Economic sanctions against Cuba are blocking promising ventures that could help enhance U.S. energy security, create a diversified energy supply for Florida, help ease an expected shortage in U.S. local refining capacity and provide over $2 to 3 billion annually in oil and gas trade business opportunities for U.S. energy firms.

Besides oil and gas activities, additional opportunities exist for U.S. energy firms that build and operate power plants in Cuba. To meet rising electricity demand projected in this study, Cuba would have to spend $20 to $60 million or more for construction new combined cycle capacity. Moreover, Cuba also represents a significant market for the importation of energy business related construction equipment such as rigs, pipes, specialized fluids and muds and other oil and gas related infrastructure development contracts and material.

Analysis of future relations with Cuba should take these energy sector issues into account. A healthy transition for the Cuban economy that would include U.S. participation could also benefit the U.S. energy sector. It is an important factor that needs to be considered in mapping Cuba's future in our hemisphere. While energy considerations are not the only issue at stake in U.S. policy towards Cuba, it nonetheless is an important aspect that is generally ignored.

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