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Latin America: Energy Supply, Political Developments, and U.S. Policy Approaches

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Latin America: Energy Supply, Political Developments, and U.S. Policy Approaches

Summary

Western Hemisphere countries supply the United States with almost 50% of its imported oil and petroleum products. Three countries in the hemisphere — Canada, Mexico, and Venezuela — account for the lion's share. Other significant oil producers in the region include Ecuador, Colombia, Brazil, Trinidad and Tobago, and Argentina.

In terms of proven oil reserves, the Western Hemisphere has about 24% of reserves worldwide. After Canada, Venezuela has the second largest amount of proven oil reserves in the hemisphere, almost 80 billion barrels, but this does not include as much as 270 billion barrels of extra-heavy and bitumen deposits from the Orinoco belt. If these deposits became recoverable, Venezuela's proven reserves would exceed those of Saudi Arabia. In terms of natural gas, the United States has the largest amount of proven reserves in the hemisphere, about 37%, followed by Venezuela, with 29%. Canada, Trinidad and Tobago, and Bolivia also have sizeable reserves. Almost all of the gas imported by pipeline into the United States comes from Canada, while Trinidad and Tobago accounted for about 67% of U.S. liquified natural gas imports in 2006.

While oil and gas producers such as Venezuela, Mexico, Argentina, Bolivia, Colombia, Ecuador, and Trinidad and Tobago are net energy exporters, most other Latin American and Caribbean nations are net energy importers. Moreover, with the exception of Trinidad and Tobago, most Caribbean and Central American nations are highly dependent on energy imports.

High oil prices have spurred the rise of resource nationalism in several Latin American energy-producing countries, which has raised concerns about access to energy resources and political interference with the level of energy production and investment in the region. Such nationalism is often fueled by poverty, and appears to be strongest in countries where people believe that they are not benefitting from the exploitation of their countries' natural resources. Yet many analysts assert that such nationalism is a logical outcome of higher energy prices, and is similar to the actions by energy-producing countries around the world that want to capture more of the profit from their natural resources.

This report examines Latin America's current political environment and its apparent effect on energy production in the region. It also discusses efforts to help many Latin American and Caribbean countries dependent on energy imports, including Venezuela's preferential oil programs, the Mexico-led Meso-American Energy Integration Program, and U.S.-Brazilian cooperation on biofuels. The report also examines policy approaches that have been proposed for increased hemispheric energy cooperation, congressional interest in the topic of hemispheric energy security, and related legislative initiatives: S. 193 (Lugar), the Energy Diplomacy and Security Act of 2007, and S. 1007 (Lugar), the United States-Brazil Energy Cooperation Pact of 2007. This report will be updated to reflect legislative action.

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Introduction[1]

The United States is the top oil consumer in the world, consuming some 20.7 million barrels of oil per day (mbd) in 2005, according to the Department of Energy, with net oil imports accounting for 12.1 mbd or 58% of the total.[2] Western Hemisphere countries supplied the United States with 49% of oil and petroleum product imports and just over 50% of U.S. crude oil imports in 2005. Three countries in the hemisphere — Canada, Mexico, and Venezuela — account for the lion's share of U.S. crude oil imports from the region while other Latin American and Caribbean countries account for the balance. Other significant oil producers in the region include Ecuador, Colombia, Brazil, Trinidad and Tobago, and Argentina. (See **Table 1**.)

In terms of proven oil reserves, the Western Hemisphere has some 316 billion barrels, about 24% of reserves worldwide. Canada leads the pack with 179 billion barrels, with 174 billion barrels consisting of oil from Alberta's tar sands, which is replacing output from aging conventional fields. Venezuela is second in the hemisphere with 80 billion barrels of proven oil reserves, but this does not include as much as 270 billion barrels of extra-heavy and bitumen deposits from the Orinoco belt in eastern Venezuela. If these deposits became recoverable, Venezuela would more than quadruple its proven oil reserves, exceeding Saudi Arabia's proven reserves of 264 billion barrels. Other countries with significant oil reserves include the United States, with about 22 billion barrels, Mexico, with 12 billion barrels, Brazil, with 11 billion barrels, and Ecuador, with almost 5 billion barrels of reserves. (See **Table 2**.)

Western Hemisphere nations, including the United States, produced about 17.2 million barrels of oil per day (mpd) in 2006, amounting to almost 24% of worldwide production. The top producers were the United States (5.1 mpd), Mexico (3.3 mpd), Venezuela (almost 2.6 mpd), and Canada (2.5 mpd). For several nations, such as Mexico, Venezuela, and Ecuador, oil production declined in 2006 compared to the previous year. For Mexico in particular, production and reserves have been falling

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[1] Statistics in this section are drawn from "Worldwide Look at Reserves and Production," *Oil & Gas Journal*, December 18, 2006, as well as information from the U.S. Energy Information Administration (EIA), available at [http://www.eia.doe.gov/]. The EIA has not yet published annual statistics on U.S. oil imports by country for 2006.

[2] House International Relations Committee, Hearing on "Western Hemisphere Energy Security," Testimony by Karen A. Harbert, "Assistant Secretary for Policy and International Affairs, U.S. Department of Energy, March 2, 2006.

for the last several years, largely because of depletion of the Cantarell oil field in the shallow waters of the Gulf of Mexico. In several other countries, however, such as Canada and Brazil, oil production has been increasing. The outlook appears good for Brazil to increase its oil reserves and production substantially. (See **Table 3**.)

The United States is the top consumer of natural gas in the world, with about 21.8 trillion cubic feet (tcf) consumed in 2006, and net gas imports of about 3.4 tcf or almost 16% of total U.S. natural gas consumption. Canada accounted for the almost all of the 3.6 tcf in natural gas imported by pipeline in 2006, while a small amount was imported from Mexico. Trinidad & Tobago accounted for 0.4 tcf in U.S. liquified natural gas (LNG) imports in 2006, about 67% of total U.S. LNG imports.[3]

Table 1. U.S. Crude Oil Imports from Western Hemisphere Countries, 2005
(Annual, Thousands of Barrels)

	Annual, Thousand Barrels	Percentage of Total U.S. Crude Oil Imports
Canada	599,681	16.34
Mexico	565,919	15.42
Venezuela	449,196	12.24
Ecuador	100,681	2.74
Colombia	57,002	1.55
Brazil	34,459	0.94
Trinidad & Tobago	22,687	0.62
Argentina	20,608	0.56
Guatemala	3,885	0.11
Peru	1,501	0.04
Bolivia	264	.001
Total, Western Hemisphere	1,855,883	50.56
Total, U.S. Imports Worldwide	3,670,403	100.00

Source: U.S. Department of Energy, Energy Information Administration

In terms of proven natural gas reserves, the Western Hemisphere has over 517 tcf, or about 8% of total world reserves. The United States has the largest share of proven natural gas reserves in the hemisphere, with over 204 tcf or 37% of the total, followed by Venezuela, with reserves of over 152 tcf, Canada with almost 58 tcf, Bolivia with 24 tcf, and Trinidad and Tobago with almost 19 tcf. (See **Table 2**.)

[3] U.S. Department of Energy, Energy Information Administration, *Natural Gas Monthly*, March 2007, Tables 1 and 4.

Table 2. Western Hemisphere: Proven Oil and Gas Reserves, 2007

	Proven Oil Reserves (billion barrels)	Proven Natural Gas Reserves (trillion cubic feet)
Argentina	2.468	16.090
Barbados	.002	.006
Belize	.006	—
Bolivia	.440	24.000
Brazil	11.772	10.820
Canada	179.210	57.946
Chile	.150	3.460
Colombia	1.453	3.996
Cuba	.124	2.500
Ecuador	4.517	—
Guatemala	.083	—
Mexico	12.352	14.557
Peru	.929	[a]8.723
Suriname	.111	—
Trinidad & Tobago	.728	18.770
United States	21.757	204.385
Venezuela	[b]80.012	152.380
Total, Western Hemisphere	316.117	517.633
Total, World	1,317.447	6,182.692

Source: "Worldwide Look at Reserves and Production," *Oil & Gas Journal*, December 18, 2006.

a. Peru's proven natural gas reserves reportedly could increase to 15-16 tcf upon the completion of seismic work on a block of the Camisea Gas Project. See U.S. Department of Energy, Energy Information Administration, "Country Analysis Briefs: Peru," May 2006.

b. This amount does not include as much as 270 billion barrels of extra-heavy Venezuelan crude oil.

The Western Hemisphere produces more than 80% of the world's biofuels, led by Brazil producing ethanol from sugar and the United States producing ethanol from corn.[4] In 2006, the United States was the largest producer of ethanol, with almost 4.9 billion gallons, followed closely by Brazil with 4.5 billion gallons; together, the two countries produced 69% of ethanol in the world. Brazil became the largest source for U.S. ethanol imports in 2006, supplying 434 million gallons. Several Caribbean and Central American countries — Costa Rica, El Salvador, Jamaica, and Trinidad and

[4] Inter-American Development Bank (IDB), *A Blueprint for Green Energy in the Americas*, April 2007, p. 7.

Tobago — exported smaller amounts of ethanol to the United States that together totaled about 220 million gallons in 2006.[5] Several other countries in the region produce ethanol, but largely for their domestic markets, while several countries have expanded investment in biodiesel production, including Colombia, which has focused on palm oil, and Brazil.

Table 3. Western Hemisphere Oil Production, 2006

	Actual 2005 (1,000 b/d)	Estimated 2006 (1,000 b/d)	Change from 2005 (%)
Argentina	645.4	635.0	-1.6
Barbados	1.0	1.0	5.3
Belize	—	1.0	—
Bolivia	41.6	45.0	8.2
Brazil	1,634.0	1,710.0	4.7
Canada	2,368.8	2,500.0	5.5
Chile	10	10.0	—
Colombia	526.1	530.0	0.7
Cuba	38.6	39.0	1.0
Ecuador	532.0	500.0	-6.0
Guatemala	18.5	16.5	-10.6
Mexico	3,334.2	3,273.0	-1.8
Peru	111.2	113.0	1.6
Suriname	12.0	12.8	6.7
Trinidad and Tobago	144.5	150.0	3.8
United States	5,178.4	5,135.0	-0.8
Venezuela	2,705.8	2,563.0	-5.3
Total, Western Hemisphere	17,301.8	17,234.3	-0.4
Total, World	72,361.6	72,486.5	0.2

Source: "Worldwide Look at Reserves and Production," *Oil & Gas Journal*, December 18, 2006.

[5] Renewable Fuels Association, "Industry Statistics," online at [http://www.ethanolrfa.org/industry/statistics/#D].

Figure 1. Map of Latin America and the Caribbean

Source: Map Resources. Adapted by CRS. (K.Yancey 10/16/06)

Energy and Latin America's Political Environment

High oil prices have spurred the rise of resource nationalism in several Latin American countries, which has raised concerns about access to energy resources and political interference with the level of energy production and investment in the region. Such nationalism often develops as a response to conditions of poverty, and appears to be strongest in countries where people believe that they are not benefitting from the exploitation of their countries' natural resources. Yet many analysts assert that such nationalism is a logical outcome of higher energy prices and closely follows the actions taken by energy-producing countries around the world that want to capture more of the profit from their natural resources.[6]

The populist government of Hugo Chávez in oil-rich Venezuela has asserted firmer state control over the state-run oil company, *Petróleos de Venezuela* (PdVSA), steering more of its proceeds to fund the government's infrastructure projects and social programs and asserting government control over foreign investment in the petroleum sector in Venezuela. The government of Evo Morales in Bolivia has fulfilled his campaign pledge of nationalizing the significant natural gas sector, calling for foreign companies to be "partners, not owners" of the country's gas resources. Ecuador has moved to capture more of the windfall profits from foreign oil companies operating in the country, and in May 2006 terminated the contract of Occidental Petroleum after a long dispute over whether the company had broken laws in selling some of its oil-drilling rights in Ecuador to a Canadian firm. In Peru, which is poised to become a significant exporter of natural gas, the 2006 electoral victory of former President Alan García over Ollanta Humala, an admirer of Hugo Chávez, eased international concerns about the future development of Peru's energy sector. In Mexico, the main energy issue is how to deal with declining oil reserves and insufficient funds for maintenance and exploration, and whether Mexico will open its state-controlled oil production to private and foreign investment.

Because of rising resource nationalism, foreign oil companies in a number of Latin American countries are having to pay more to do business in terms of increased taxes and royalties. Some observers fear that this could slow foreign investment in the region's energy sectors, which is already hindered by political and social instability in some countries. Others contend that foreign companies will continue to invest where there is a likelihood of profit.[7] Some energy-producing countries in the region, such as Brazil and Colombia, continue to follow a capitalist model for energy investment that allows foreign companies to own and operate energy concessions. Nevertheless, across the region, there is continuing underinvestment in energy infrastructure, with some analysts maintaining that many countries are at

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[6] Steven Dudley, "High Prices an Incentive for Tighter State Control," *Miami Herald*, July 5, 2006; Sara Miller Llana, "Latin America Demands More for Its Oil and Gas," *Christian Science Monitor*, April 9, 2007.

[7] "The Shape of Leftwing Economic Polices in the Region," *Latin American Economy & Business*, January 2006.

risk for widespread electricity shortages.[8] In the case of Colombia, the situation has been exacerbated by a long civil conflict that makes resource exploitation difficult and costly.

There has been some concern about the potential for heightened competition for Latin American energy resources from countries like China and India, which are seeking new sources for their growing energy needs. The Chinese government has been acquiring interests in exploration and production abroad, including in Latin America. China and Venezuela have signed a series of energy-related agreements since 2005, including joint ventures for oil and gas exploration in Venezuela and to increase Venezuela's supply of oil to China. The state-run China Petrochemical Corporation (Sinopec) signed an agreement in April 2006 with Brazil's Petrobras to build a natural gas pipeline linking the northeast and southeast of Brazil. China is also exploring energy deals in Ecuador, Bolivia, Peru, and Colombia, as well as offshore projects in Argentina and Cuba. India has recently begun to increase its energy assets in Latin America by pursuing joint ventures with established public and private companies operating in the region. For example, ONGC Videsh (OVL), a state-owned Indian energy company, recently bought a 15% stake in a Brazilian oil field and a 30% stake in a partnership for oil and gas exploration in Cuba. The same company is discussing a possible $1 billion investment in a Venezuelan oil field. In 2006, Sinopec and ONGC issued a successful joint bid for a 50% stake in the Omimex oil company of Colombia, a subsidiary of the U.S.-based Omimex Resources energy company.

Venezuela

Since Venezuela is the fourth major supplier of foreign oil to the United States (after Canada, Mexico, and Saudi Arabia) providing about 1.2 million barrels per day (mbd) or about 12% of U.S. crude oil imports, a key U.S. interest has been ensuring the continued flow of oil from that country. Venezuela's state-oil company also owns CITGO, which operates three crude oil refineries and a network of some 14,000 retail gasoline stations in the United States. Although the United States traditionally has had close relations with Venezuela, there has been tension in relations under the rule of President Hugo Chávez, first elected in 1998. U.S. officials and human rights organizations have expressed concerns about the deterioration of democratic institutions and threats to freedom of speech and press under the Chávez government. The Chávez government has benefitted from the rise in world oil prices, which has increased government revenues and sparked an economic boom. As a result, Chávez has been able to increase government expenditures on anti-poverty and other social programs associated with his populist agenda.[9]

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[8] "Latin America Forecasts: Energy in 2006," in *Latin American Advisor, Latin American Forecasts: 2006*, Inter-American Dialogue, Washington, D.C., January 2006.

[9] For additional information, see CRS Report RL32488, *Venezuela: Political Conditions and U.S. Policy*, by Mark P. Sullivan.

By March 2006, the Venezuelan government completed the conversion of its operating agreements with foreign oil companies in marginal or low-yielding oilfields into joint ventures with PdVSA majority ownership. Of the original 32 operating agreements, 25 are now joint ventures, with PdVSA holding a majority share of between 60-80%. Five of the operating agreements were voluntarily turned over to PdVSA, and two operations, run by France's Total and Italy's ENI, were confiscated by the government after the companies rejected the terms proposed by Venezuela. Under the new joint ventures, income taxes were raised to 50% (from 34%) and are retroactive to 2001 in compliance with a hydrocarbons law enacted in 2000.[10]

PdVSA has been a minority owner in four extra-heavy oil Orinoco River Basin projects involving six foreign companies — U.S.-based ConocoPhillips, Chevron, and Exxon Mobil, Norway's Statoil, Britain's BP, and France's Total — but the Venezuelan government is bringing these projects under its majority control. President Chávez set a deadline of May 1, 2007, and on that date formally announced the government's control of the projects. Nevertheless, the Venezuelan government has given companies until June 26 to negotiate the terms of their conversion to minority partners. With the exception of ConocoPhillips, the foreign oil companies have signed memorandums of understanding for the Venezuelan takeover.[11]

Majority state ownership in the oil sector fulfills a policy goal of the Chávez government to assert greater control over the country's oil reserves but has reportedly slowed the rate of foreign investment. Production also has reportedly not been able to recover from the firing of some 18,000 PdVSA employees in early 2003 and from continued underinvestment in maintenance and repairs.[12] Some oil analysts question whether PdVSA is prepared to take over operation of the heavy oil fields in the Orinoco.[13]

Despite notable frictions in bilateral relations, Venezuela continues to be a major supplier of oil to the United States. Oil exports account for some 90% of Venezuela's exports to the United States, and 68% of Venezuela's oil exports are destined for the United States, highlighting the current dependency of Venezuela on the U.S. market. Even though Venezuela opposed the Bush Administration's Operation Iraqi Freedom, the Chávez government announced before the military conflict that it would be a reliable wartime supplier of oil to the United States.

At various junctures, however, Chávez has threatened to stop selling oil to the United States, including in February 2006 when he asserted that the "U.S.

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[10] Economist Intelligence Unit, "Venezuela Country Report," June 2006.

[11] Sheila McNulty, "Conoco Holds Out on Venezuela Terms," *Financial Times*, May 7, 2007.

[12] Danna Harman, "Venezuela's Oil Model: Is Production Rising or Falling,?" *Christian Science Monitor*, May 31, 2006.

[13] Juan Forero, "Venezuela Set to Assume Control of Its Oil Fields," *Washington Post*, May 1, 2007.

government should know that, if it crosses the line, it will not get Venezuelan oil."[14] In April 2006, he warned that his government would blow up its oil fields if the United States ever were to attack.[15] Venezuela's Ambassador to the United States asserted in late July 2006 that oil-cutoff comments by Venezuelan officials, including President Chávez, only reflect what would be Venezuela's response against "aggression" initiated by the U.S. government.[16] Many observers believe that Chávez's threats have been merely part of his rhetoric that is designed to bolster his domestic political support.

Some observers, however, have raised questions about the reliability of Venezuela as a major supplier of foreign oil. There are also concerns that Venezuela is looking to develop China as a replacement market, although Venezuelan officials maintain that they are only attempting to diversify Venezuela's oil markets. Energy analysts maintain that there are two major difficulties with Venezuela substantially increasing its exports to China: first, China's limited capability to refine Venezuela's heavy crude oil, and second, high freight costs because of the large distance between the two countries.[17] Nevertheless, PdVSA announced in May 2006 that it would buy 18 oil tankers from China that would help Venezuela increase its oil exports to Asia. During his August 2006 visit to China, President Chávez announced that Venezuela would boost its oil exports to China to 500,000 barrels per day (bpd) in five years from a current level of 150,000 bpd. China has also promised investment of $5 billion in energy projects in Venezuela by 2012.[18]

In June 2006, the Government Accountability Office (GAO) issued a report, requested by Senate Foreign Relations Committee Chairman Richard Lugar, on the issue of potential Venezuelan oil supply disruption. The GAO report concluded that a sudden loss of all or most Venezuelan oil from the world market could raise world prices up to $11 per barrel and decrease U.S. gross domestic product by about $23 billion. It also concluded that if Venezuela does not maintain or expand its current level of oil production, then the world oil market may become even tighter than it is now, putting pressures on both the level and volatility of energy prices.[19] Energy analysts maintain, however, that Venezuela, which is dependent on the U.S. oil market, would plunge into economic chaos if it ceased oil shipments to the United States. Venezuela's Ambassador to the United States Bernardo Alvarez rejected the idea that his country would take unilateral action to cut oil exports to the United

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[14] "U.S. Warned to Back Off or Risk Losing Oil Supply," *Miami Herald*, February 18. 2006; "Chávez Threatens to Cut Oil in Case U.S. 'Crosses Line,'" Open Source Center, Foreign Broadcast Information Service, February 18, 2006.

[15] "Chávez Says He'll Blow Up Oil Fields if U.S. Attacks," *Miami Herald*, April 20, 2006.

[16] Andy Webb-Vidal, "Venezuela Will Not Cut Off Oil Despite Hostile U.S. Attitude," *Financial Times*, August 1, 2006.

[17] Andy Webb-Vidal, "Chávez on Oil Export Mission in China," *Financial Times*, August 24, 2006.

[18] Myra P. Saefong, "Venezuela-and-China alliance: Troubling in More Ways Than One," *Market Watch* (DowJones), September 1, 2006.

[19] U.S. Government Accountability Office, "Energy Security: Issues Related to Potential Reductions in Venezuelan Oil Production," GAO-06-668, June 2006.

States as absurd. He maintains that oil exports provide revenues to the Venezuelan government "that are vital for its programs and essential to its very viability."[20]

Bolivia

Bolivia boasts the second-largest natural gas reserves in Latin America. Industry experts say Bolivia needs technical assistance and billions of dollars in foreign direct investment (FDI) to better exploit its natural gas reserves. Bolivia's chronic instability, combined with a May 2005 hydrocarbons law that includes tax hikes on foreign firms, prompted FDI in the country's oil and gas sectors to plummet between 2003 and 2005.

The gradual realization that Bolivia has neither the technological nor financial capacity to exploit its natural gas reserves on its own has forced President Evo Morales to moderate the terms under which he carries out the nationalization of his country's hydrocarbons industry.[21] In May 2006, Morales' sudden nationalization move significantly raised energy costs for neighboring Argentina and Brazil and increased tax and royalty rates for companies operating in Bolivia to a level that some investors perceived to be unprofitable. It prompted Brazil's Petrobras and Spain's Repsol-YPF — the largest foreign investors in Bolivia's energy sector — to halt all new investments in the country. It has since become apparent that, even with new investments and advisors from Venezuela, Bolivia's state-run oil company, *Yacimientos Petroliferos e Fiscales Bolivianos* (YPFB), lacks the expertise and the resources necessary to develop and export the country's gas resources. YPFB has had four presidents in the last 14 months, and errors in the new contracts it drafted with foreign companies as part of the nationalization process have delayed their implementation.[22]

On a more productive note, in February 2007, after months of difficult negotiations, the Morales government reached an agreement with Brazil on the price that Petrobras will pay for Bolivian natural gas. The agreement is expected to result in at least $100 million in extra revenues for Bolivia in 2007, but only increase Brazil's total spending on Bolivian gas by between 3-4% from last year.[23] Bolivia has also signed an agreement to raise its gas exports to Argentina significantly by 2010, a development that has sparked interest among private investors.

Brazil

Brazil has a fairly balanced energy matrix and has significantly reduced its dependence on foreign energy sources. Some 65% of Brazil's power is generated by

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[20] Andy Webb-Vidal, "Caracas Rejects U.S. Probe into Its Oil Policy," *Financial Times*, July 11, 2006.

[21] "Latin America: Nationalism Revived," *Economist Intelligence Unit - Business Latin America*, April 16, 2007.

[22] "Bolivia Energy Nationalization Marred by Errors," *Reuters*, March 13, 2007.

[23] "Bolivia Gas Pact Highlights Brazil Petrobras Political Risks," *Dow Jones Commodity Service*, February 21, 2007.

hydroelectric plants. In addition, Brazil boasts significant oil and gas reserves, nuclear energy, and a successful alternative energy program. Petrobras, Brazil's state-owned oil company, is a leading energy company in Latin America. In addition to being close to achieving oil self-sufficiency, decades of state investment have helped Brazil become the world's largest consumer and producer of ethanol from sugar cane, which now supplies some 40% of the country's motor fuel and is extremely competitive with gasoline. Ethanol use has accelerated since 2003, when automakers introduced "flex fuel" motors in Brazil designed to run on ethanol, gasoline, or a mixture of the two. In 2006, flex-fuel vehicles represented more than 78% of new cars sold in Brazil.[24] Brazil's sugar-based ethanol is considered more efficient than corn-based derivatives developed in the United States.

Brazil's experience with ethanol has not been without its share of problems, however. For instance, Brazil has at times had to import large amounts of ethanol when its sugarcane crop has been damaged by drought or simply fallen short of rising demand. In addition, the expansion of sugarcane production has occurred in areas previously used for cattle ranching and accompanying meat production, another important Brazilian export. Finally, human rights groups argue that the increasing demand for sugarcane has put undue pressure on the peasants forced to harvest the sugar under extremely difficult working conditions.[25]

The primary weakness in Brazil's energy regime is the country's over-reliance on natural gas from neighboring Bolivia. Some 50% of the gas used in Brazil, and 75% of the gas used in the industrial state of São Paulo, flows from Bolivia. Most analysts predicted that since Petrobras produces some 15-20% of Bolivia's GDP, Brazil would be able to exert leverage over the populist government of Evo Morales, but those predictions were not borne out with Bolivia's nationalization of its natural gas industry.[26] In response, Petrobras halted all new investments in Bolivia and dramatically sped up efforts to exploit Brazilian natural gas supplies. Although Petrobras and YPFB have reached an agreement over a price increase for Bolivian gas exports to Brazil, it remains to be seen whether Petrobras will continue to make significant new investments in Bolivia.

Ecuador

President Rafael Correa, a leftist economist who took office in January, campaigned on a pledge to increase the state's share of oil revenues from the current 50% level that was established in April 2006. President Correa signed a framework agreement for oil and natural gas modernization and exploration with President Chávez of Venezuela in April 2007. He supports the prior government's May 2006 termination of its contract with the U.S. firm Occidental Petroleum (Oxy) over an alleged breach of contract, a controversial move which is currently in dispute

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[24] See David Sandalow, "Ethanol: Lessons from Brazil," *Brookings Institution*, May 2006; "Brazil: Racing Cars," *EIU - Business Latin America*, January 22, 2007.

[25] "With Big Boost From Sugar Cane, Brazil is Satisfying Its Fuel Needs,"*New York Times*, April 10, 2006.

[26] "Bolivia's Populism Steps on Brazil," *Christian Science Monitor*, May 8, 2006.

settlement. In addition, President Correa's populist tendencies, including his recent moves to outmaneuver opposition members of the Ecuadorian Congress, have concerned private investors. These actions have added to the difficulties that private companies have long experienced when investing in the Ecuadorian oil industry, stemming from the country's chronic instability and tendency for conflicts with private producers. Production by Petroecuador, the state-owned oil company, has fallen by 50% in the last ten years, and a lack of capital has forced the company into a deep financial crisis. Petroecuador reports that it loses some $200 million per year in production due to protests and other community-related problems.[27]

Mexico

Mexico is the second largest supplier of crude oil to the United States after Canada, accounting for 15.4% of U.S. imports in 2005. Oil continues to be important for the Mexican economy, accounting for 10% of exports and one-third of government revenues, with the state-oil company, *Petróleos Mexicanos* (Pemex), providing about 60% of its revenues to the federal government. In part because of the government's heavy fiscal demands, Pemex has had financial difficulties, with its debt increasing and the company registering an annual operating loss since 1998. In 1938, Mexican President Lázaro Cárdenas nationalized the oil sector and created Pemex. Cárdenas is still revered as a national hero for his action, and Mexicans today are largely opposed to altering the government's control of the oil sector.

There are concerns, however, that Mexico's proven oil reserves are declining because of insufficient funds available for maintenance and exploration. The Cantarell field in the Gulf of Mexico, which accounts for almost two-thirds of Mexico's crude oil production, is in steep decline. In March 2006, the Mexican government announced a new oil find in the Gulf of Mexico off the coast of Veracruz that could hold 10 billion barrels, but it will take substantial investment and up to a decade to bring it into production. Pemex reportedly does not have the money or the expertise to tap billions of barrels of oil in the deep waters of the Gulf.[28]

During the 2006 presidential campaign, Felipe Calderón called for a limited opening of Pemex to allow it to negotiate freely with private companies, while his leftist rival Andrés Manuel López Obrador opposed any opening of Pemex to private interests. Given the closeness of the race, with Calderón defeating Obrador by less than a quarter million votes, it appears unlikely that energy reform will be at the top of President Calderón's agenda, especially given the sensitive nature of the issue among Mexicans. Nevertheless, the Calderón government is reportedly considering

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[27] "Tightening His Grip," *Economist*, April 21, 2007. "DJ Petroecuador Ex-President: Company Faces Deep Financial Crisis," *Dow Jones Commodities Service*, February 10, 2006; "Oil Sector Protests Become Norm in Ecuador,"*Platts Oilgram Price Report*, March 26, 2007.

[28] Elisabeth Malkin, Output Falling in Oil-Rich Mexico, and Politics Gets the Blame," *New York Times*, March 9, 2007.

regulatory changes that would allow greater foreign participation in the oil sector without the need to amend the Constitution.[29]

Support for Countries Dependent on Energy Imports

While oil and gas producers such as Venezuela, Mexico, Argentina, Bolivia, Colombia, Ecuador, and Trinidad and Tobago are net energy exporters, most other Latin American and Caribbean nations are net energy importers.[30] With the exception of Trinidad and Tobago, most Caribbean Basin nations are highly dependent on energy imports. According to the Department of Energy, oil dependency is a major problem among Caribbean island nations, where oil accounts for more than 90% of total energy consumed.[31]

Many of these nations that are dependent on oil imports experienced dramatic increases in their oil bills after oil price hikes began in 2005 and prompted such initiatives as Venezuela's preferential oil programs; the Mesoamerican Energy Integration Program involving Mexico, Colombia, the Dominican Republic, and the countries of Central America; and U.S.-Brazilian cooperation on biofuels.

Venezuela's "Oil Diplomacy"

President Chávez has used so-called "oil diplomacy" to provide oil to Latin American and Caribbean nations on preferential terms, and there has been some U.S. concern that Venezuela is using these programs to increase its influence in the region. In the Caribbean, Venezuela is offering oil on preferential terms in a new program known as PetroCaribe launched in June 2005. Since 1980, Caribbean nations have benefitted from preferential oil imports from Venezuela and Mexico under the San José Pact, and since 2001, Venezuela has provided additional support for Caribbean oil imports under the Caracas Energy Accord. PetroCaribe, however, goes further with the goal of putting in place a regional supply, refining, and transportation and storage network, and establishing a development fund for those countries participating in the program.

Under the program, Venezuela is offering to supply 190,000 barrels per day of oil to the region on preferential terms. When oil prices are over $50 a barrel, 40% of the volume is financed over 25 years at an annual interest rate of 1%. Cuba, a major beneficiary of PetroCaribe, receives some 90,000 barrels per day (bpd) of oil from Venezuela, while the Dominican Republic receives some 40-45,000 bpd and Jamaica receives some 23,500. Fourteen Caribbean nations are signatories of

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[29] "Mexico Politics: A First Reform Victory," *EIU ViewsWire*, March 28, 2007.

[30] International Energy Agency, "Map Energy Indicators, Latin America, Net Imports," available at [http://www.iea.org/Textbase/country/maps/LAMERICA/imports.htm].

[31] House International Relations Committee, Hearing on "Western Hemisphere Energy Security," Testimony by Karen A. Harbert, "Assistant Secretary for Policy and International Affairs, U.S. Department of Energy, March 2, 2006.

PetroCaribe. PetroCaribe also has the goal of putting in place a regional supply, refining, and transportation and storage network, and establishing a development fund for those countries participating in the program. In Central America, Venezuela reportedly will supply 10,000 bpd of oil to Nicaragua based on agreements signed with the new government of Daniel Ortega in January 2007. Moreover, Venezuela is expected to begin the construction of a 150,000 bpd refinery in Nicaragua in June 2007.[32]

Venezuela is also moving ahead with additional preferential oil agreements in the Andean region (known as PetroAndina) and elsewhere in South America (PetroSur). In the United States, Venezuela has provided subsidized oil to low-income families in New York and several New England states through Citgo, a subsidiary of PdVSA.

In addition to these preferential oil arrangements, Venezuela is investing in energy sectors in several Latin American countries. Chávez has pledged to invest $1.5 billion in Bolivia's gas industry. Ecuador and Venezuela have signed agreements for joint development in oil, gas, refining, and petrochemical sectors. In 2005, PdVSA signed an agreement to build an oil refinery in northeastern Brazil. Construction on the 200,000 bpd refinery is expected to start in 2007, and is to be supplied with oil from both Brazil and Venezuela. Colombia and Venezuela signed an agreement in July 2006 initiating a gas pipeline project that would initially supply gas to Venezuela from northern Colombia, and then reverse the flow once Venezuela develops its own natural gas reserves. Argentina and Venezuela also announced an alliance in July 2006 involving cooperation on hydrocarbon exploration and development in both countries. In Cuba, PdVSA is involved in refurbishing an unfinished oil refinery in Cienfuegos, and recently signed an exploration and production agreement with Cupet, Cuba's state-oil company.[33]

Mexico and the Meso-American Energy Integration Program

As Venezuela has launched energy cooperation programs with the Caribbean and South America, Mexico has announced an energy cooperation program with Central America, the Dominican Republic, and Colombia. In December 2005, President Vicente Fox and the Central American presidents met in Cancun to sign a Meso-American Energy Integration Program (PIEM), which builds upon the Plan Puebla Panama (PPP), an integration and sustainable development program for the region that was launched in 2001. Colombia was officially accepted to the PPP process in mid-July 2006. The Colombian government has announced plans to construct a highway to connect the country with Panama and the rest of Central America.

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[32] "Nicaragua: Venezuelan Commission Presses for Energy Accords," *LatinNews Daily*, March 5, 2007; "Venezuela to Start Construction of Nicaraguan Refinery in June," *Global Insight Daily Analysis*, April 17, 2007.

[33] "Venezuela: Oil Revenues Boost International Influence," *Oxford Analytica*, July 19, 2006.

The PIEM consists of two key initiatives. The first, which has received funding from the Inter-American Development Bank (IDB) and the Central American Economic Integration Bank, involves constructing an electricity transmission line to connect Panama to Guatemala. The transmission line, known as the Central American Electrical Connection System (Siepac), is expected to be operating by 2008. The other main initiative of the PIEM is the construction of a new refinery to be located in either Panama or Guatemala at a total cost of about $7 billion. The IDB has approved a loan for $400 million for the construction of that refinery, but the bulk of the project will be funded by the private sector. As planned, Mexico will supply the bulk of the crude oil to be processed, which will first go to satisfy the other signatories' energy needs, with surplus exported outside the region. Many assert that Mexico has launched the PIEM as an attempt to solidify its influence over Central America and act as a countervailing force to Venezuela. However, Mexico's declining oil reserves may hinder its ability to support the PIEM. President Calderón recently indicated that Mexico will only be able to supply 80,000 bpd of oil for the refinery, rather than the 230,000 bpd that former President Fox had originally pledged. In addition, some are concerned that Venezuela's pledge to build an oil refinery in Nicaragua might disrupt the PIEM project.[34]

U.S.-Brazilian Cooperation on Biofuels

Ethanol and other types of biofuels have been identified as alternative energy sources that may help some countries in Latin America reduce their dependence on imported petroleum products. In the region, Brazil stands out as an example of a country that has become a net exporter of energy, partially by increasing its use and production of ethanol. On March 9, 2007, the United States and Brazil, the world's two largest ethanol producing countries, signed a Memorandum of Understanding to promote greater cooperation on ethanol and biofuels in the Western hemisphere. The agreement involves (1) technology-sharing between the United States and Brazil; (2) conducting feasability studies and providing technical assistance to build domestic biofuels industries in third countries; and (3) working multilaterally to advance the global development of biofuels. The first countries targeted for U.S.-Brazilian assistance are the Dominican Republic, El Salvador, Haiti, and St. Kitts and Nevis.[35]

Analysts disagree as to whether ramping up biofuels production is a viable solution to reducing Latin America's oil dependency and promoting rural development in the region. According to the IDB, while some countries in Latin

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[34] "Mexico Challenges Venezuela in Petro-Diplomacy Game," *EFE News Service*, June 2, 2006; "Mexico Key to Refinery Plans," *Petroleum Economist*, July 1, 2006, "Mexico Slashes Supply Pledge to Planned Central American Refinery," *Platts Commodity News*, April 11, 2007; "Energy Summit was Stage for Oblique Regional Leadership Contest," *Latin American Weekly Report*, April 19, 2007.

[35] "Memorandum of Understanding Between the United States and Brazil to Advance Cooperation on Biofuels," U.S. Department of State, Office of the Spokesman, March 9, 2007, available at [http://www.state.gov/r/pa/prs/ps/2007/mar/81607.htm]; "Joint Statement on the Occasion of the Visit by President Luiz Inácio Lula da Silva to Camp David," White House Press Release, March 31, 2007; available at [http://www.state.gov/p/wha/rls/prsrl/07/q1/82519.htm].

America have developed research facilities and regulatory frameworks for biofuels, at least $200 billion in investments would have to be made in order for biofuels to provide 5% of the region's transport energy by 2020. Some analysts are concerned about the huge investment outlays needed to build up biofuels industries, as well as the potential negative effects of biofuels production on the environment, labor conditions, and costs of competing foodstuffs in the region. Others argue that the climate, surplus of arable land, and excess production of sugarcane and other potential biofuels crops make Latin America ideally suited for an expanded biofuels industry.[36]

Policy Approaches on Energy Cooperation

Policy analysts have made several recommendations to further hemispheric energy cooperation. Among these are broad calls for the U.S. government to make energy a high priority in its hemispheric relations, to take into account the energy capacities and goals of hemispheric nations when developing U.S. energy policies, and to understand that U.S. energy security will be lacking if other countries in the hemisphere are lacking energy security.[37] Many policy analysts also look to the potential role that foreign low-cost sugarcane producers can play in U.S. energy security if the producers can export sugar-based fuel ethanol to the United States without facing stiff tariffs.

The Council of the Americas, a U.S.-based business organization representing over 200 U.S. companies invested in Latin America, issued a report in 2005 making specific recommendations regarding hemispheric cooperation on energy.[38] In the report, the Council maintains that the proper development of the hemisphere's abundant energy resources could be an engine for economic development in the region and also contribute to advancing hemispheric energy security. The Council called for the United States to make a priority of increasing hemispheric partnerships in Latin America. It also recommended that, in order to increase energy investment in the region, that Latin American nations improve their investment climates by committing to energy sector stability, transparency, and an appropriate role for state-owned energy companies. The report called for trilateral energy coordination among the three NAFTA countries as well as an increase in Mexican energy exploration and production. It also called for energy diversification utilizing renewable resources in order to lessen the impact of supply shortages in the Americas. The Council also recommended that multilateral organizations such as the IDB to make energy infrastructure development a priority throughout the region.

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[36] Inter-American Development Bank (IDB), *A Blueprint for Green Energy in the Americas*, April 2007, available at [http://www.iadb.org/biofuels].

[37] Sidney Weintraub, Testimony before the House Committee on International Relations, Subcommittee on the Western Hemisphere, "The Role of the Western Hemisphere in Fostering U.S. Energy Security," March 2, 2006.

[38] "Energy in the Americas, Building a Lasting Partnership for Security and Prosperity," Council of the Americas, October 2005.

Concerns about the effect of Latin America's political environment on energy production in the region also prompted the U.S. Southern Command to issue a study in 2006 focusing on long-term oil production in several Latin American countries. The report warns against the dangers of reemerging state control in the energy sectors of several Latin American countries — especially Venezuela and Ecuador — that will likely thwart investment, increase inefficiencies, and hamper efforts to increase supplies and production. In Mexico, the report notes that the current regulatory environment and laws prohibiting foreign investment in the energy sector have dampened prospects for increasing oil reserves. The report asserts that pending any favorable changes to the investment climate, prospects for long-term energy production in Venezuela, Ecuador, and Mexico are at risk, while countries that have opened their energy sectors to foreign investment, like Trinidad and Tobago, will see increased reserves and production.[39]

An April 2007 study by the Inter-American Development Bank, *A Blueprint for Green Energy in the Americas*, reports that Latin American and Caribbean countries have shown great interest and promise in the development of biofuels that could contribute to the reduction of greenhouse gases from transport as well as the economic development of rural sectors in the region. Beyond Brazil, which has been the leader in ethanol development and production, the study also highlighted several other countries with great potential for biofuels development: Guatemala and Jamaica, with ethanol production from sugar; Colombia, with biodiesel production from palm oil; and Chile, with second-generation ethanol production from woodchips. The study also suggests ways the IDB could support the development of biofuels production in the region, including support for a biofuels development fund, the development of regulatory frameworks, and research and development.[40]

The Center for Strategic and International Studies (CSIS) also published a book in April 2007, *Energy Cooperation in the Western Hemisphere, Benefits and Impediments*, that examines the current state of energy cooperation among the hemisphere's oil and gas producers and the opportunities for greater cooperation. The study concludes that hemispheric energy cooperation would benefit from, among other things, greater harmonization of regulatory frameworks; improved infrastructure (such as new pipelines and LNG facilities); greater attention to the environmental effects of energy operations; the avoidance of populist measures that provide widespread subsidization of energy consumption; and recognition by the United States that its own energy independence is not viable without taking into account the needs of other countries in the hemisphere.

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[39] U.S. Southern Command, "Long-Term Oil Production: Venezuela, Ecuador, Mexico, and Trinidad and Tobago," internal report, June 2006; Andy Webb-Vidal, "Resource Nationalism Creates Supply Threat, Warns U.S. Military," *Financial Times*, June 26, 2006.

[40] Inter-American Development Bank (IDB), *A Blueprint for Green Energy in the Americas*, April 2007.

Congressional Interest

Over the past two years, there has been ongoing congressional interest in energy security issues. Some of that interest has focused on how to ensure that countries in the Western Hemisphere, which currently supply about half of U.S. imports of crude oil and petroleum products, remain reliable sources of energy for the United States. Another area of interest has been to promote cooperation among Latin American countries, which are divided between net energy exporting and importing nations, to ensure that enough clean, affordable, and reliable energy sources are exploited to support regional growth and development. Members have expressed support for developing a cohesive regional energy security framework, and also have expressed concerns about the effects of political instability, resource nationalism, and the increasing interest in the hemisphere's energy resources by such countries as China and India.

Committees in both houses held several hearings in 2006 focusing on Western Hemisphere energy security issues, while in March 2006, Senator Richard Lugar introduced S. 2435, the Energy Diplomacy and Security Act of 2006, which includes provisions to increase hemispheric cooperation on energy (see legislative section below for details).

Several themes emerged from the congressional hearings. Several Members expressed concerns that recent events in Latin America — particularly in Bolivia and Venezuela — have demonstrated how political events can undermine the reliability of energy producing countries. At a May 16, 2006 hearing, Representative Darrell Issa, Chairman of the House Energy and Resources Subcommittee, said that the United States was at risk of being "boxed in by Iran, Venezuela, Russia, Nigeria, and Bolivia...[such that] we cannot effectively counter the use of energy as a weapon." Representative Stephen F. Lynch expressed concerns about the possibility that President Chávez might take "retaliatory oil-related actions...[against the United States] stemming from his opposition to U.S. policy." While Bush Administration officials tried to allay these congressional concerns, other witnesses, including David Goldwyn, a private energy analyst, pointed out several key threats to U.S. interests that have emerged in Latin America. He described how companies and their shareholders are seeing their asset values cut in half as a result of resource nationalism, oil and gas production is leveling off or declining, and U.S. influence in the region is declining (as Venezuela's power has increased).[41]

Another theme that emerged is the need for improved investment climates in the region in order to increase investment in energy sectors. At a March 2, 2006 hearing of the House Western Hemisphere Subcommittee, Eric Farnsworth of the Council of the Americas, asserted that countries in the region need to improve their investment climates in order to attract foreign investment and boost their competitiveness, echoing the recommendations of the Council's October 2005 report described above.

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[41] House Committee on Government Reform: Subcommittee on Energy and Resources and Subcommittee on National Security, Emerging Threats, and International Relations, Hearing on "Energy as a Weapon: Implications for U.S. Policy," *Federal News Service*, May 16, 2006.

Department of Energy Assistant Secretary for Policy and International Affairs Karen Harbert warned about the negative effects of unpredictable and non-transparent legal and regulatory frameworks, resource nationalism, and a lack of investment in exploration and maintenance on regional energy markets.[42] At a June 22, 2006 hearing by the Senate Foreign Relations Committee, Luis Giusti, former chairman of PdVSA and currently an adviser with the Center for Strategic and International Studies, asserted that unless investment climates across Latin America improve dramatically, foreign investment will continue to move to other regional energy markets.[43]

A third theme that emerged from the hearings focused on identifying obstacles and generating possible solutions to improve hemispheric cooperation on energy-related issues. At a June 22, 2006 hearing of the Senate Foreign Relations Committee, Senator Richard Lugar asserted that his proposed Energy Diplomacy and Security Act would stimulate energy partnerships among energy producers and consumers. Senator Ken Salazar testified that our shared interests with countries in the Western Hemisphere "should be obvious, but too often they are obscured by politicized rhetoric, mis-perceptions, and old grievances." Another witness suggested that U.S. energy diplomacy, which thus far has been focused on engaging Canada and Mexico, should be expanded, focusing on finding common ground with energy producing and consuming nations across the region.[44]

Legislative Initiatives

Two legislative initiatives in the 110th Congress would increase hemispheric cooperation on energy. Although global in scope, S. 193 (Lugar), the Energy Diplomacy and Security Act of 2007, calls for the establishment of a Western Hemisphere energy crisis response mechanism and a regional-based ministerial forum known as the Hemisphere Energy Cooperation Forum that would be involved in responding to temporary energy supply disruption, fostering long-term supply security, and promoting energy access for undeveloped areas. The bill also calls for the establishment of a Hemisphere Energy Industry Group to increase public-private partnerships, foster private investment, and enable countries to devise energy agendas that are compatible with industry capacity and cognizant of industry goals. The Senate Foreign Relations favorably reported the bill on April 12, 2007 without amendment (S.Rept. 110-54).[45]

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[42] U.S. Congress, 109th Congress, Second Session. House Committee on International Relations Committee, Subcommittee on the Western Hemisphere. Hearing on "Western Hemisphere Energy Security," Serial No. 109-204, March 2, 2006.

[43] Testimony by Luis Giusti before Senate Foreign Relations Committee, Hearing on "Energy Security in Latin America," *CQ Congressional Testimony*, June 22, 2006.

[44] U.S. Senate Committee on Foreign Relations, Hearing on "Energy Security in Latin America," June 22, 2006.

[45] A previous version of the bill was introduced in the 109th Congress as S. 2435 (Lugar), and the Senate Foreign Relations Committee held several hearings on energy security in the 109th Congress,

Another initiative, S. 1007 (Lugar), the United States-Brazil Energy Cooperation Pact of 2007, calls for the same cooperation groups in S. 193 and also directs the Secretary of State to work with Brazil and other Western Hemisphere countries to develop partnerships to accelerate the development of biofuels production, research, and infrastructure. The bill was introduced March 28, 2007, and referred to the Senate Foreign Relations Committee.

In addition to legislation calling for greater hemispheric cooperation on energy security issues, there has been some debate within Congress concerning whether or not to lift existing taxes and tariffs on foreign ethanol imports. The United States currently allows duty-free access on sugar-based ethanol imports from many countries through the Caribbean Basin Initiative, Central American Free Trade Agreement, and the Andean Trade Preferences Act, among others.[46] Brazil is currently the world's largest consumer and producer of ethanol from sugarcane. Some Brazilian ethanol is processed at plants in the Caribbean for duty-free entry into the United States, but exports arriving directly from Brazil are currently subject to a 54-cent-per-gallon tax, plus a 2.5% tariff. Some Members of Congress favor an elimination of taxes on inexpensive imported ethanol in order to help displace gasoline consumption and contend with rising fuel prices, while other Members who support the U.S. ethanol industry oppose such action.

[46] For more information, see CRS Report RS21930, *Ethanol Imports and the Caribbean Basin Initiative*, by Brent D. Yacobucci.