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Energy and Development in South America: Conflict and Cooperation

*Edited by Cynthia J. Arnson, Claudio Fuentes,
and Francisco Rojas Aravena*

With Jessica Varat



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Front Row L-R- Colombian President Álvaro Uribe, Chilean President Michelle Bachelet,
Bolivian President Evo Morales, Venezuelan President Hugo Chávez,
Brazilian President Luiz Inácio Lula da Silva
Back Row L-R- Uruguayan Vice-President Rodolfo Nin Novoa,
Ecuadorian President Rafael Correa, Guyanan Prime Minister Samuel Hinds

Oil Rig in Stormy Sea © Steve Bloom/Getty



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Introduction

Cynthia J. Arnson and Jessica Varat

Latin America as a region does not always come to mind as a major player on the world energy scene. With oil prices worldwide spiraling to unprecedented levels and the war in Iraq showing little sign of abating, the region that holds that distinction—at least in the public imagination in the United States—is the Middle East. As this report indicates, however, Latin American countries and South America in particular possess some of the largest oil and natural gas reserves in the world. And Mexico and Venezuela have been large oil producers for decades. Nonetheless, despite significant energy cooperation among countries of the region, particularly in the area of electrical energy, energy relationships among countries have become increasingly politicized and conflictive.

Once important source of that conflict is resurgent resource nationalism. At a time of high commodity prices, the drive by governments and populations to assert greater sovereignty over the resources themselves and extract higher rents from the exploitation of those resources has had far-reaching domestic and regional consequences. While the reciprocal needs of energy producers and importers in Latin America could in theory be a force for greater cooperation and regional integration, in practice core asymmetries and nationalist politics have led to discord and insecurity. Consider the following:

- Venezuela currently stands 9th in global oil production. But if untapped reserves in the Orinoco Belt are counted, Venezuelan reserves exceed those of Saudi Arabia.¹ Venezuela also possesses the largest natural gas deposits in South America; in the entire Western Hemisphere, Venezuela's gas reserves are second only to the United States and almost triple those of Canada.² High oil revenues have underwritten vast increases in social spending by the government of President Hugo Chávez as well as the provision of oil on concessionary terms to neighboring countries, particularly in the Caribbean and Central America. But oil production in Venezuela is declining, due to

inefficiency and insufficient investment on the part of the state oil company, *Petróleos de Venezuela* (PdVSA). According to energy analysts, production 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.³

- Brazil is the world's largest producer of sugar cane-based ethanol, and second in total ethanol production only to the United States, which produces ethanol from corn. By 2008, some 90 percent of all automobiles manufactured in Brazil ran on flex fuel.⁴ Technical challenges notwithstanding, new discoveries of oil in the Tupi fields off the coast of Brazil may make it the largest Latin American oil producer by 2012, surpassing Venezuela as well as Mexico, currently the Western Hemisphere's second largest producer.⁵
- Major discoveries of natural gas deposits in Bolivia in 1990 make that country's known gas reserves second only to Venezuela among the countries of Latin America. But in the wake of the re-nationalization of natural gas in 2006 and the vast increase in royalties demanded of foreign companies, overall foreign direct investment in Bolivia dropped by 41 percent in 2007. In early 2008, Bolivian President Evo Morales acknowledged that the country would be unable to meet production levels sufficient to fulfill contracts for the export of gas to Brazil and Argentina, Bolivia's two largest customers.⁶
- Although Latin America is a net oil exporter, three countries—Venezuela, Brazil, and Mexico—account for some 80–90 percent of the region's oil production.⁷ As recently as 2006, Argentina, Colombia, Ecuador, and Trinidad and Tobago were also net energy exporters, but the countries of Central America and the Caribbean as well as several South American nations remain highly dependent on imports of both oil and natural gas. The dramatic rise in energy prices has allowed exporters to accumulate vast reserves and subsidize the below-market price of oil products used domestically while causing moderate to severe economic dislocations in other countries of the region that are net energy importers.
- In 2006 the government of Ecuador dramatically increased the royalties charged to foreign oil companies and took over the holdings of Occidental Petroleum, the largest foreign investor in Ecuador. The government terminated Occidental's contracts after alleging that it had transferred a 40 per-

cent interest in one of its oil fields to a Canadian firm without properly informing the government.⁸ Overall, production by the state oil company, Petroecuador, as well as foreign firms has fallen steadily in recent years. Despite government assertions that foreign investment is still welcome in Ecuador, foreign direct investment declined by 34 percent in 2007.⁹

This report explores the ways that the strategic decisions of petroleum and natural gas producers primarily in the Andean region have affected their energy-dependent neighbors elsewhere in Latin America. It also aims to illustrate how and with what effect many governments in the region use energy resources as an instrument to promote national development, exert sovereignty, and further a broad range of domestic as well as foreign policy goals.

The papers in this report were originally commissioned for a November 28, 2007, conference at the Woodrow Wilson Center co-sponsored by the Latin American Program and the Facultad Latinoamericana de Ciencias Sociales (FLAC-SO). Experts from Latin America and the United States addressed the dynamics of energy politics in individual countries with regard to a common set of questions:

- How are energy resources used as an instrument of development and to further domestic and foreign policy goals?
- What obstacles—political, economic, environmental, international—exist that complicate the use of energy or the availability of energy in pursuit of those goals?
- What policies have contributed to energy cooperation or conflict in the region, and what medium- and long-term policies could enhance regional cooperation?

REGIONAL RELATIONS

In an introductory essay, OAS Secretary General *José Miguel Insulza* emphasizes the close relationship between energy security and development, noting the urgency of providing access to energy for the 15 percent of the region's poor that still lack access to power and electricity. Demand for energy is likely to increase significantly over coming decades, Insulza argues, but the region is inefficient in its use and pays insufficient attention to environmental concerns. The imbalance between producers and importers of energy creates an imperative for greater cooperation and integration, but the politics of short-sighted self-interest typically prevail.

Francisco Rojas of FLACSO highlights numerous examples of energy linkages between and among countries of the region, particularly in joint projects to produce hydroelectric power, integrate electrical grids, and build transnational pipelines for natural gas. Yet the region has no shared strategy or vision for balancing the needs of producers and consumers throughout the continent, and the trust needed to build cooperation is low. Latin America could be self-sufficient in energy, he argues, if it could balance supply and demand, constructing a market that coordinated the production of electricity, gas, oil, biofuels, and other forms of renewable energy.

In the view of *Thomas O'Keefe*, Mercosur Consulting Group, Argentina continues to suffer energy shortages as a result of export restrictions and a price freeze in the gas sector implemented by the government of President Néstor Kirchner (2003–07). Decreased investment resulting from the intervention in market rates has weakened Argentina's ability to exploit its significant natural gas resources and develop new fields.¹⁰ O'Keefe notes that domestic policies for both natural gas production and the provision of electricity have created “bottlenecks” and frequent shortages. With significant reserves of its own, Argentina must nonetheless rely on natural gas imports from Bolivia to meet energy demands in the northern part of the country. Argentina has been one of the two countries most affected by the nationalization policies of the Bolivian government.

Because it has no formal diplomatic ties with Bolivia, Chile suffers from an overdependence on Argentine gas and power exports (much of which Argentina itself imports from Bolivia); Chile has suffered when Argentina has restricted gas exports in order to satisfy its own energy demands. In his discussion of the Chilean case, *Oscar Landarretche* of the Federico Santa María University emphasizes the need for straightforward rules of the game regarding regional integration efforts. He also advocates the establishment and strengthening of mediation bodies to prevent conflict between producer and consumer nations; this body would ideally be entrusted to handle such conflicts as those that have arisen between Chile and Argentina or Argentina and Bolivia. Landarretche also suggests domestic energy development policies to ensure that Chile can sustain economic growth despite an unpredictable energy market. Among the policies he advocates are those to substitute coal or fuel oil for natural gas, develop renewable energy sources, and explore the realm of nuclear power.

As of 2007, Venezuela ranked 7th worldwide in proven oil reserves, with oil reserves (not including the Orinoco belt) measured at approximately 80 billion barrels. Venezuela is the fourth largest supplier of oil to the United States and a major supplier to other countries in the Western Hemisphere; initiatives such as

PetroCaribe, PetroSur, and PetroAndina aim at providing subsidized oil to poorer countries, in pursuit of Venezuelan-led regional energy integration. In her discussion of Venezuela, *RoseAnne Franco* of PFC Energy illustrates how the state national oil company (NOC), *Petróleos de Venezuela, S.A. (PdVSA)*, has sought to engage other foreign, mostly Latin American NOC's as major players in the development of Venezuela's oil rich Orinoco Belt.

But, Franco observes, NOC's all too often respond to political rather than market-based incentives in the development and use of energy resources, and for the most part lack the capacity to meet the technological challenges and capital needs of Venezuela's energy sector. Using energy income and PdVSA itself as a tool for domestic social development, the government of President Hugo Chávez increased spending on social programs from \$240 million to \$13.36 billion between 2003 and 2006. Such spending has come at the expense of much needed new exploration and investment in Venezuela.

Brazil has constructed a diverse energy matrix through an emphasis on research, innovation, and the development of human capital in the petroleum, hydropower, as well as biofuels sector. As *Sergio Trindade* of SE2T International indicates, since the 1930s the Brazilian state was the driving force behind development initiatives, but the past fifteen years have witnessed a transition toward an ever-increasing role for private enterprise in energy development. The country is a world leader in ethanol production, and has concluded agreements throughout Latin America and the developing world to foster biofuels cooperation. In addition, recent discoveries of offshore, deep-water oil and natural gas reserves lead analysts to predict that Brazil will soon become the region's energy powerhouse, challenging Venezuela for this position.¹¹ However, Brazil still must wrestle with its dependence on natural gas from Bolivia (the source of almost half of its natural gas) in light of the new contracts they were forced to negotiate in response to Morales' nationalization decree. Financing energy development is likely to remain a difficult task, Trindade concludes, given the scale and risk involved. Such development will require a diverse portfolio of public and private sources, including national, foreign, and multilateral funding.

Bolivia, in turn, is facing its own demons when it comes to the development of energy resources. *Humberto Vacaflor*, editor of *Siglo 21*, recounts Bolivia's tortured history of natural resource development, beginning in the 16th century with Spanish exploitation of the country's silver deposits. Arguing that Bolivia's link to the international economy is the most ancient in all of South America, Vacaflor traces how past conflicts over resources—with Bolivia's neighbors and with international oil companies—continue to haunt today's energy sector.

When Bolivia lost the War of the Pacific (1879–1884), for example, it lost not only access to the sea but also territory (seized by the Chileans) rich in nitrates, sulfur, and copper. Thus, a proposal in 2003 to export Bolivian liquefied natural gas through Chile sparked riots in Bolivia, contributing to the sequence of events that forced the resignation of President Gonzalo Sánchez de Lozada. President Evo Morales' 2006 nationalization of the hydrocarbons sector affected not only foreign consumers of Bolivian gas—but also deepened political polarization within Bolivia, as regional governors (prefects) vie with the state for control of natural gas revenues. The nationalization has led Brazil and Argentina, which have sustained robust levels of economic growth, to look for substitutes for Bolivian gas.

Walter Spurrier of Grupo Spurrier notes that while oil production makes up 20 percent of Ecuador's Gross Domestic Product, a significant portion is devoted to domestic consumption rather than export. [Ecuador has the fourth largest reserves in Latin America, after Venezuela, Brazil, and Mexico, but relatively speaking, its proven reserves are small: less than half of Mexico's and less than 5 percent of Venezuela's.]¹² Hence, the country may face a time when a decline in production could signify the end of exports. Since the discovery of oil in the 1960s and the beginning of production in 1972, the government has sought to satisfy the public's expectation of an immediate benefit from oil, through subsidies, increases in public sector employment, and wage increases unrelated to improvements in productivity. The result, Spurrier argues, has been a loss of competitiveness for productive activities outside the oil sector. Left- as well as right-wing governments have allowed short-term political interest to prevail with respect to the development of the energy sector, contributing to stagnation and a loss of profitability in the state sector. In addition, the discovery of oil in the eastern Amazonian region of Ecuador has prompted a disorganized process of settlement, as well as conflicts between the central government, local communities, oil companies, and environmental NGO's over control of oil income and the preservation of fragile jungle areas. Spurrier concludes that the existence of oil resources in Ecuador has led to complacency regarding the design of policies conducive to development, a classic example of the so-called "Dutch disease."

David Mares of the University of California, San Diego, concurs that both economic as well as geological factors should lead South American countries toward greater energy integration in support of economic growth. He identifies numerous core challenges, however, to increased energy cooperation. These include the lack of medium- and long-term investment capital, the priority given by some governments to domestic markets over exports, the lack of independent regulatory

regimes, and disputes over the fair distribution of energy rents. Mares also emphasizes the importance of constructing and strengthening institutions to safeguard against corruption and rent-seeking behavior.

ACKNOWLEDGMENTS

We are grateful to Latin American Program interns Sheree Adams, Angela Granum, Jonathan Karver, Smith Monson, and Marisha Peña, and to Josette Altman of FLAC-SO, for their assistance with many aspects of this publication and the conference on which it was based. We are also grateful to our colleague Paulo Sotero, director of the Wilson Center's Brazil Institute, for facilitating our inclusion of the Brazilian case and to consultant Roger Tissot for comments on an initial draft.

NOTES

1. The global oil production figure is from the British Petroleum Statistical Review 2008, "Global Oil Production Table," and refers to barrels per day in 2007. Not including the Orinoco Belt, Venezuela's proven oil reserves at the end of 2007 were more than quadruple those of the United States, and, in the Western Hemisphere, second only to Canada. "Worldwide Look at Reserves and Production," *Oil and Gas Journal*, December 24, 2007, quoted in Mark P. Sullivan, Clare Ribando Seelke, and Rebecca G. Rush, "Latin America: Energy Supply, Political Developments, and U.S. Policy Approaches," Congressional Research Service, Library of Congress, April 23, 2008, p. 3.
2. Mark P. Sullivan et. al, op. cit., p. 3.
3. Danna Harman, "Venezuela's oil model: Is production rising or falling?" *Christian Science Monitor*, May 31, 2006; and Juan Forero, "Venezuela Set to Assume Control of Its Oil Fields," *Washington Post*, May 1, 2007; cited in Mark P. Sullivan and Clare M. Ribando, op. cit., p. 9.
4. The figure is from UNICA, the Brazilian Sugar Cane Industry Association. See Joel Velasco, presentation at the Washington International Renewable Energy Conference (WIREC), "Brazil-U.S. Biofuels Cooperation: One Year Later," Washington, D.C., March 4, 2008.
5. Chris Kraul, "Petrobras' global quest for power," *The Los Angeles Times*, February 11, 2008, p. C1.
6. Oxford Analytica, "Latin America: Summit Fails to Deliver Gas Solutions," February 25, 2008; and Oxford Analytica, "Latin America: Natural Resources Dominate FDI Flows," May 15, 2008.
7. See Francisco Rojas in this volume, p. 13 ; and Mark P. Sullivan, et. al., 2008, op. cit., p. 4.
8. Hal Weitzman, "Ecuador 'was right to revoke Occidental licence,'" *Financial Times*, May 21, 2006.

9. Oxford Analytica, May 15, 2008, op. cit.
10. According to the Energy Information Administration, Argentina boasts the third-largest proven natural gas reserves in South America after Bolivia and Venezuela.
11. Alexei Barrionuevo, "Underwater oil discovery to transform Brazil into a major exporter." *International Herald Tribune*, January 11, 2008.
12. Mark P. Sullivan et. al., op. cit., 2008, p.3. The Venezuela figure does not include reserves in the Orinoco Belt. [Ed.]

Energy and Development in South America

José Miguel Insulza

The discussion of energy in Latin America departs from three basic and shared premises. The first is that energy is a central concern of every country in the world, regardless of its size or importance in global affairs. The second is that energy is an essential component of development. The third is that there has also been a strong relationship between energy and politics, especially oil and politics.

Beginning in the late 1960s, powerful interests in small energy supplying countries began to exert greater control of their energy resources. In the early 1970s, Latin America, along with the rest of the world, experienced the first major increase in oil prices and had the beginning of a discussion about its implications. The issues are not very different today than they were forty years ago. By any measure, the region does not lack energy resources; in fact, an analysis of the Americas as a whole or of Latin America and the Caribbean reveals that energy resources are abundant. Latin America possesses 9.7 percent of the world's proven reserves of oil, and contributes 13.8 percent of world output. At the same time, Latin America consumes only 8.1 percent of world oil production, making the region a net exporter of 3.3 million barrels of oil a day. These figures, of course, are due to increase in light of the recent discoveries of major oil and gas deposits in Brazil's Bacia de Santos (Santos Basin).

In other areas of energy production, there is also an abundance of hydroelectric power and natural gas in the region. New gas deposits have been discovered at a high rate in the past few years. Why, then, should Latin America be so concerned about energy? What are the threats and the problems associated with its production and use? Why should the region not simply be satisfied with the surplus it produces? For despite Latin America's apparently advantageous situation with respect to energy, all countries—whether suppliers or consumers—face problems; there is concern throughout the Americas about the inability to supply reliable and affordable energy to meet national and regional needs.

Today there are still around 50 million people in the region—the majority of them poor and living in remote and isolated areas—who do not have reliable or affordable access to electricity. Approximately 85 percent of the population in Latin America has access to electricity; now, however, in addition to the growing demand for energy by the traditional economic powers in society, there is strong pressure to deliver energy to the 15 percent of the poor who have no access. Over the medium term, the region's economies must also find a solution to the projected increase in demand for energy. According to the Inter-American Development Bank, energy demand will have increased 75 percent by the year 2030. The capacity to generate electricity will need to increase by 145 percent in order to satisfy this new demand. But can the region produce that much energy? Doing so requires increased investment and improvements in quality, capacity, training, and efficiency in energy production.

Latin America's demand for energy is very high relative to the region's rate of growth, meaning that the region is not efficient in its use of energy. Production in Europe uses only half as much energy as in Latin America. What this means is that one unit of production uses twice as much energy in Latin America as it does in Europe. This demonstrates the lack of efficient energy use in the region.¹

There is a serious imbalance between countries that produce and countries that import energy resources. Countries live in different circumstances and at times in completely opposite ways vis-à-vis world energy markets. This is especially true concerning the effects of energy price increases and price volatility. Only three or four countries in Latin America are significant oil producers, and rising prices for oil create problems among Latin American countries.

On the other hand, more than 80 percent of global oil resources are publicly owned. Companies produce and profit from oil, but the countries themselves own the resource; hence, governments are able to manipulate public policy, not only regarding oil but also natural gas. Furthermore, energy producers can use times of abundance to exert political pressure on importing countries, seeking to create an area of influence or to obtain concessions, with the predictable result that intraregional political tensions are generated. The relationship between oil and politics cannot be avoided.

An additional political issue concerns the environment. The provision and use of energy must go hand-in-hand with a search for ways to diminish the environmental impact of energy consumption. This point cannot be overstated, as there is broad recognition that the principal source of air pollution—with sulfur dioxide, carbon, mercury, and other substances—is the energy sector. The sector's contribution to global warming is also no longer in doubt. Recent

reports by the United Nations establish with certainty not only the existence of global warming but also the energy sector's contribution to it. The burning of fossil fuels is the principal source of greenhouse gases. One-fourth of the global emission of greenhouse gases comes from the generation of energy and heating used by buildings and industries. Global warming is thus another constraint to increases in energy production; future production must be much cleaner.

The agenda for dealing with this complex energy situation has at least four aspects. First is the promotion of rational and efficient use of conventional energy sources, principally hydrocarbons. Second is to take advantage of mechanisms for emissions trading, such as those envisioned in the Kyoto Protocol, in order to attract the investment and technology necessary for "clean" industrial production in the countries of the region. Third is the diversification of the energy matrix, in order to obtain an adequate equilibrium among different sources, thereby enhancing energy security and eliminating the possibility that resources will be used for political ends. Fourth, there should be incentives for using alternative and renewable energy sources which have minimal environmental impact (for example, bio-fuels, geothermal energy, wind power, and solar and nuclear energy).

The first two items on this agenda are self-explanatory. With respect to the third, the diversification of the energy matrix, the cases of Brazil and Chile are interesting to consider. The two countries are the largest consumers of gas in the region and have opted to broaden their energy matrix by incorporating liquefied natural gas (LNG), which can be imported from many sources internal and external to the region.

Regarding the use of alternative and renewable energy sources, it is important to remember that Latin America is endowed with a great diversity of renewable natural resources: solar, wind, geothermal, biomass, oceanic, etc. These can be converted into clean energy in the form of electricity or liquid fuels such as ethanol and bio-diesel. The use of renewable energy is not new to the hemisphere, and the search for diversification of the energy matrix does not represent a great risk or adventure. One need only mention hydroelectric power, which has been part of the energy matrix of the region for many years and supplies approximately 90 percent of the total electricity needs for a country as important as Brazil.

As I have insisted on previous occasions, nuclear energy constitutes an important option. Our peoples have the right to research, develop, and produce nuclear energy for peaceful ends, and to have access to nuclear fuels at reasonable prices to supply reactors destined for civilian use and particularly for the generation of electricity. The electricity generated by nuclear plants does not

produce emissions laden with sulfur or mercury, nor do such plants emit gases that contribute to global warming, particularly carbon dioxide. Considering the current prices for solid fuels, it is very possible that energy from nuclear plants would be cheaper than energy produced by oil, natural gas, and even renewable sources such as solar, wind, and bio-mass. Nuclear energy constitutes an option available to countries that do not have sufficient sources of energy and are not likely to have them in the future. Nuclear energy can lead to energy self-sufficiency for medium and large countries and foster integration in smaller countries, such as those of the Central American region.

Without energy security there can be no security for development. Energy security, in turn, is associated with the diversification of the energy matrix and especially the use of renewable energy. In pursuing energy security in Latin America, there is no substitute for cooperation and integration. While some leaders in Latin America and the Caribbean seek integration and the complementarities of their energy matrices, there is also ample discussion of the notion of self-sufficiency. But self-sufficiency and integration are, to a certain extent, contradictory, and at some point countries must choose between these two paths. The tools to advance energy cooperation and integration are well known. They include developing interconnectedness among countries to deliver energy resources and electricity.

Finally, I must say that the integration schemes themselves must be plausible. One does not start, for example, by proposing a pipeline that will take at least fifteen years to build or by making promises that are impossible to keep. The success of integration requires taking all the necessary steps, starting with the initial yet fundamental ones, including investments and the harmonization of policies, codes, and standards, that would make Latin America more competitive in world energy markets.

NOTES

1. The United States is not efficient either: Europe has more or less the same economic output as the United States, but a unit of production in Europe requires less than 75 percent of the energy used in the United States.

Energy Integration in Latin America: Limits and Possibilities

Francisco Rojas Aravena

Strategic natural resources such as energy in all of its forms have always been central to a nation's foreign policy design and its insertion in the international arena. Energy can make an essential contribution to the development of cooperative policies, just as it can constitute a crucial element of conflict. In Latin America over the last decade, energy has served both as the impetus for integration initiatives and as a source of tension and conflict. As in no other region, energy in Latin America is inseparable from politics. In the words of European parliamentarian and president of the European Energy Foundation Rolf Linkohr, "energy nationalism, together with long-standing territorial conflicts and the lack of investment, creates difficulties for what should be a long-term objective—the strengthening a common energy market. Some alliances exist, but much remains to be done."¹

Latin America accounts for 12 percent of world production of natural gas, and the largest reserves are concentrated in the Andean nations of Bolivia, Peru, and Venezuela. The region is a net exporter of oil and energy in general, but the distribution of resources is highly unequal: Venezuela (PDVSA), Brazil (Petrobrás), and Mexico (PEMEX) together account for 90 percent of oil reserves in the region. Developing energy resources requires long-term strategies; for such long-term strategies to be viable, trust is an intangible and decisive asset.

Energy projects require investments of great magnitude in such areas as prospecting, production, transport, and storage. Both the state and markets play essential roles in defining viable long-term energy strategies that contribute to national development and foster mutually-beneficial international cooperation. In Latin America there is no shared regional energy strategy. There are linkages, but no shared vision or a mutually-beneficial collaborative plan. For such a thing to exist would require a strategic political plan that identifies integration as way to leverage national and regional growth and development.

In the absence of regional coordination on energy, there are various initiatives that are not connected one to the other. None of the initiatives being promoted as part of Plan Puebla Panamá, Petrocaribe, or the design of “energy rings”² takes into consideration what is happening in other arenas; thus, each initiative appears to be competing with the others. This lack of inter-connectedness increases uncertainty and reduces trust among various actors, at the same time limiting opportunities for shared benefits.

To create complementary or integrated systems, and for participants to engage in the process of creating them, all must obtain an economic or other significant benefit. In the case of energy, “the movement towards integration... implies complex strategic and political coordination and commitments by the participating countries. It is not enough to pay attention to geo-economic considerations alone; geopolitics and the strategic interests of the leading participants are of paramount importance.”³

The Western hemisphere is a region of sharp contrasts regarding energy cooperation. There is wide-ranging cooperation as well as complementarities between the United States and Canada. In contrast, there is scant cooperation among the South American countries. It should be noted that government policy varies from case to case regarding the roles assigned to the state and private enterprise.

Cross-border cooperation in all areas, including in energy of various forms, brings about important savings and cost reductions. Conflict, by contrast, increases costs across the board. The use of energy as an instrument of foreign policy is extremely sensitive and requires highly-skilled management of both politics and diplomacy. Miscalculation creates major opportunities for conflict and impacts the level of trust among different actors. Recovering trust is a lengthy and difficult process, at times more costly than the energy itself, given that the impacts of energy policy are global and extend beyond a particular country, region, or sub-region.

There have been different kinds of linkages on energy matters in Latin America. Initial projects were associated with tapping the surpluses generated in one country to cover deficits in other nations. This was the rationale underlying major investments and the construction of large-scale hydroelectric projects in shared river basins. Examples include Itaipu between Brazil and Paraguay; Salto Grande between Argentina and Uruguay; and Yacyretá between Argentina and Paraguay. More recently, other types of linkages—between Colombia and Venezuela, Ecuador and Colombia, and Bolivia and Argentina—have been established for the sharing of both electricity and natural gas.⁴

The models of energy integration in Latin America put into practice over the last 15 years have varied with respect to their components, objectives, and expected scope. Despite such efforts, however, there has been little progress toward establishing and implementing an effective plan for energy cooperation and integration in the region. There have been limited advances, with ups and downs on a binational basis, but there is no comprehensive proposal.

At present, the region is experiencing the effect of the high prices for hydrocarbons, something that is positive for producers but highly negative for importing countries. High prices have led to a renewed awareness of the impact of energy on the region as a whole. Latin America could be self-sufficient in energy if it were to combine and construct an energy market based on regional reserves and a scheme of investment in infrastructure for transport and storage, using appropriate technologies that allow both for greater yields and environmental protection. This would mean coordinating the production of electricity with that of gas, oil, biofuels, and other forms of renewable energy, all of which generate a market for production, supply, consumption, and demand within the region.

Nonetheless, there are no energy integration policies in Latin America and the Caribbean. There are only “connections.” The great political challenge is to transform the energy needs of both producers and consumers into an instrument that fosters integration. For this to be possible requires high levels of trust among political, military, business, and civil society actors to guarantee supply and investment, reduce uncertainties, and establish an interdependent market. Interdependence is essential, as dependency gives rise to areas of tension. Interdependence contributes to agreements for mutual benefit; dependency opens up spaces for energy nationalism.

Energy demand will continue to increase in the world, including in Latin America and the Caribbean. If economic development continues at its current pace, and especially if growth increases and becomes more stable, the demand for energy will only go up. This means it is necessary to increase the levels of investment in the energy sector; such investment must necessarily have worldwide demand as a reference point.

The International Energy Agency (IEA) estimates that Latin America will need \$1.3 billion in new investment in the energy sector before the year 2030 in order to meet new demand. The regional outlook has changed in important ways in recent years. Brazil has discovered major oil and gas reserves that will make the country not only self-sufficient, but capable of exporting energy as well. The consequence will be that over time Brazil will have less of a need to import gas from Bolivia. Argentina is facing a major gas shortage which, at least initially, could be

resolved based through investments that make the exploitation of resources more efficient. A large part of Peru's reserves are already committed for both domestic use and export to Mexico and the United States. Ecuador, an oil-exporting country, is in the process of defining and establishing the rules of the game in a Constitutional Assembly that will set out the course that the country takes. Meanwhile, the war in Colombia continues turning oil pipelines into military targets.

Trust is essential to these energy integration processes, as much to build markets (for both supply and demand) as to establish the necessary complementarities that make networks of energy interdependence possible. Such networks govern, for example, the relationship between electricity and gas, or electricity and biofuels, or electricity, biofuels, and oil. Trust makes it possible to imagine and design new forms of complementarities, generating certainty, reliability, and confidence in the integration process itself.

Energy is also linked to questions of democratic governance in Latin America and the Caribbean. Energy issues contributed to the inability of two Bolivian presidents to complete their mandates and served as a major source of tension as Ecuador's Constitutional Assembly was inaugurated. Oil has conferred on the Venezuelan government vast economic resources to carry out its domestic policies, as well as to undertake significant international initiatives such as Petrocaribe. Throughout the region, energy crises have immediate political repercussions.

Two issues are particularly weighty for Latin America in the near future: biofuels and nuclear energy. Biofuels derived from sugar cane constitute one of the pillars of Brazil's energy program, in contrast to the United States, where biofuels are corn-based. There are major concerns over the impact of biofuels production on areas such as food production and deforestation. The increased production of corn, sugar cane, and sorghum displaces the production of other food crops, creating scarcity and pushing prices up. Other impacts are felt through changes in land use, including the clearing of forests for agricultural purposes. Some analysts believe that biofuels can have devastating effects on the price of basic foodstuffs. This is especially true for "those countries that suffer food shortages and import oil"—precisely the situation for the world's poorest countries.⁵

Nuclear energy stands out more and more as a possible alternative for addressing energy deficits worldwide. Europe is in the process of evaluating the renovation and construction of new nuclear power plants. Experience accumulated in Latin America over the years might permit the expansion of nuclear energy. It is much "cleaner" than oil and has less of an impact on global warming. However, the specter of Chernobyl hovers over all those who make policy decisions, especially in countries with a major potential for seismic activity.

The challenge for Latin America is to establish a shared strategic plan that would facilitate the region's greater insertion into the international system for the benefit of the population as a whole. Building a strategic political project of integration is an ever more pressing need. Constructing a shared vision is the starting point for overcoming the obstacles that processes of integration currently face.

Opening a path to greater integration requires putting forward a vision of cooperation and coordination that would allow various governmental, private, and civil society actors to agree on joint courses of action. This task presupposes establishing a specific agenda that makes it possible to overcome conflict, reduce asymmetries, and establish opportunities for negotiation toward the realization of shared goals. The coordination of policies will make it possible to reduce uncertainties and advance along a shared path to mutual benefit.

Energy has become a key issue on the Latin American agenda. It has inspired and spurred a variety of initiatives and proposals. If these initiatives and proposals can be structured into a coordinated project that brings together producers and consumers, then it will be possible to make a qualitative leap in the direction of greater cooperation and regional interdependence and, hence, strategic integration.

NOTES

1. Rolf Linkohr, "La política energética latinoamericana: entre el Estado y el mercado," in *Nueva Sociedad*, No. 204, July–August 2006, pp. 90–103.
2. "Energy rings" refer to a variety of initiatives to increase natural gas exports to consumer countries in the region, as well as explore opportunities for natural gas liquification. [Eds.]
3. Ricardo Sennes and Paula Pedroti, "Integración energética regional: viabilidad económica y desafíos políticos," in *Foreign Affairs en Español*, Vol. VII, No. 3, July–September 2007, pp. 31–46.
4. One initiative advanced by Venezuelan President Hugo Chávez is the building of the *Gran Gasoducto del Sur* (Great South American Gas Pipeline) to transport gas from Venezuela to Argentina, passing through Brazil, Bolivia, and Uruguay. [Conceived of as a contribution to the integration of the countries of MERCOSUR with those of the Andean region, the project has widely been considered to be unworkable. Eds.]
5. C. Ford Runge and Benjamin Senauer. "Cómo los biocombustibles pueden matar de hambre a los pobres," in *Foreign Affairs en Español*, Volume VII, No. 3, July–September 2007, pp. 75–90.

The Crisis in the Argentine Energy Sector and Its Regional Impact

Thomas Andrew O'Keefe

INTRODUCTION

Argentina's current energy crisis is primarily the result of internal political dynamics. In response to the fury of the Argentine people towards their entire political class following the implosion of the economy in 2001 and 2002, the transition governments that followed adopted populist measures and put the burden of "paying" for the collapse of the Convertibility Plan—which had tied the Argentine *peso* in a one-to-one parity with the U.S. dollar for a decade—on foreign investors. In May 2003, Néstor Kirchner assumed the presidency by default with only 22 percent of the vote after Carlos Menem, who knew he would be defeated by a landslide, pulled out of the second round. Kirchner's initially weak position provided him with little maneuvering space to dismantle the anti-market policies in the energy sector that he had inherited from his predecessors. Although the eventual recovery of the Argentine economy gave Kirchner the opportunity to dismantle these measures, which by 2004 were producing bottlenecks in the entire energy sector, he chose not to. Instead, he prioritized his personal ambitions and consolidated his political base so as to facilitate the election of his wife to the presidency in October 2007.

NATURAL GAS

The state-owned *Gas del Estado* was established in 1946 to transport and distribute natural gas to end-users. Natural gas production, however, was the monopoly of the state petroleum company *Yacimientos Petrolíferos del Estado* or YPF. In 1993 *Gas del Estado* was replaced by two private sector transport firms (*i.e.*, *Transportadores de Gas del Norte* or TGN and *Transportadores de Gas del Sur* or TGS) and eight private sector regional distributors. YPF was also privatized in 1993 and concessions to explore and extract natural gas were opened up to private sector competition.

Law 24.076 of May 1992 established the general regulatory framework for the transport and distribution of natural gas by private firms. Production of natural gas, however, remained subject to Argentina's 1967 Hydrocarbons law (Law 17.319). The Secretariat of Energy was given jurisdiction over the exploration and production of natural gas and the authority to determine conditions for the export or importation of natural gas. The *Ente Nacional Regulador del Gas* or ENARGAS was entrusted with regulatory oversight of the transport and distribution of natural gas and the approval of rate changes.

Until 2002, rates for natural gas were based on its wellhead market price as well as a fee for transport and distribution services. The charge for transport and distribution services was set by ENARGAS for five-year periods in U.S. dollars and adjusted every six months for inflation based on the U.S. Consumer Price Index. Any increases in federal, provincial, or municipal taxes were automatically passed on to the consumer. In addition, transport and distribution firms could petition ENARGAS for increases within five-year periods based on unforeseen circumstances. Increases in the market price of natural gas at the source could only be "passed through" to the end-user if authorized by ENARGAS following a public hearing.

In January 2002 the federal government used the recently approved Economic Emergency Law to convert rates for natural gas into Argentine pesos on a one-to-one basis (even though the real rate of exchange was closer to three pesos for every dollar) and froze them at 2001 levels. Legally, the freeze did not cover the price of natural gas charged by producers, which could still be sold at market rates (albeit in pesos). The failure of ENARGAS to approve any pass-through of price increases to end-users, however, meant that natural gas prices for domestic sales (where the bulk of Argentine production was directed) became frozen as well. This situation created an important incentive to export, although this was tempered by a 20 percent export or retention tax introduced in 2002 (increased to 45 percent on exports to Chile in July 2006). Furthermore, in 2004 the Secretariat of Energy began restricting natural gas exports until national demand was satisfied. Given severe shortages in Argentine gas supplies since 2004, exports to Chile have frequently been interrupted during the winter months, forcing Chilean companies to shut down production. During the winter of 2007 in the Southern Hemisphere, supplies to residential users in Chile were also affected for the first time.

In mid-2004 the federal government negotiated a schedule of increases on the wellhead price for natural gas sold to larger industrial and commercial users. As of July 2005 businesses have been paying the full market price for natural gas.

The federal government is still negotiating, however, increases in transport and distribution rates for larger industrial and business customers. Negotiations have been complicated by government demands that the private sector firms first drop their international arbitration claims against Argentina for losses sustained in the 2002 following the forced conversion of utility charges into pesos at an artificial rate of exchange and price freezes. Some see this negotiating stance as a ploy to force frustrated foreign firms to sell their assets to politically well-connected Argentine firms at bargain basement prices. In mid-2005 and again in January 2007, the Kirchner administration imposed a hefty special tax over the transport rate for natural gas purchased by businesses in order to pay for pipeline improvements. Natural gas rates for residential users were to remain frozen until after the December 10, 2007, inauguration of the new president, Cristina Fernández de Kirchner, but this has yet to occur.

Given that the bulk of Argentine natural gas is consumed domestically, the federal government's 2002 intervention in the market mechanism for determining prices undermined any incentive for producers to explore and expand natural gas reserves. It also destroyed any incentive for transporters to increase capacity, although constraints in transport capacity were already a problem throughout the 1990s. Furthermore, artificially low natural gas prices induced a surge in demand that eventually outstripped supply. All of these factors have contributed to severe gas shortages since 2004 and have required that the federal government restrict natural gas exports as well as import natural gas and substitute fuels to run power plants.¹ The irony is that the federal government has "subsidized" the purchase of these foreign fuel substitutes with general revenue collected from taxpayers, while refusing to allow natural gas producers in Argentina to pass on the true cost of their fuel to this same group of Argentines. The federal government prefers to exercise control over this revenue flow rather than allow it to go directly from consumers to the private sector producers. The federal government has also used tax revenue to overcome pipeline constraints and developed an electronic spot market for natural gas, thereby allowing large customers to negotiate contracts directly with producers.

It would be unfair to lay the entire blame for the current problems affecting Argentina's natural gas sector solely on the 2002 intervention in market rates. Since the late 1990s, no new gas fields were developed in Argentina. This was, in part, the result of the recession that engulfed Argentina beginning in 1998. But some observers also attribute this to the 1999 sale of YPF (responsible for 60 percent of Argentine natural gas production) to the Spanish firm REPSOL. Soon after acquiring YPF, REPSOL was said to have been more interested in

paying down the massive debt it incurred in purchasing YPF rather than investing in the exploration of new fields or in increasing yields from existing reserves through the use of expensive new technology. In addition, the company owned cheaper-to-operate gas fields in neighboring Bolivia. It was only after polls indicated that Evo Morales was likely to become President of Bolivia in the December 2005 elections and he threatened to re-nationalize the Bolivian hydrocarbons sector if elected (coupled with concurrent Argentine threats to revoke underinvested concessions) that REPSOL-YPF was finally pushed to announce new investments in Argentina in late 2005. Little of this investment, however, actually materialized.

ELECTRICITY

In December 1991, the Argentine Congress ratified Law 24.065, which split the Argentine electricity sector into three separate components: (1) generation;

(2) transmission; and (3) distribution. This law authorized the Secretariat of Energy to set overall electricity policy and establish rules on investment and network access. Approval of rate changes and the issuance and enforcement of regulations governing the transmission and distribution of electricity was the responsibility of the newly created *Ente Nacional Regulador de la Electricidad* (ENRE). Law 24.065 also established a not-for-profit entity, which later became the *Compañía Administradora del Mercado Mayorista Eléctrico* (CAMMESA), to oversee administration of a wholesale spot market for electricity sold to distributors or directly to large users.

Under the 1991 Argentine electricity legislation, generation (which involves the actual production of electricity from different energy sources) was completely deregulated and prices were based on actual production costs. Electricity was generally sold through a competitive wholesale spot market administered by CAMMESA. The law, however, also recognized the right of large users to enter into fixed-rate contracts directly with the owners of generators and to have nondiscriminatory access to the transmission networks. Transmission and distribution companies were given monopolies within designated territories and their prices were regulated by ENRE.

Before January 2002, end-user rates for the transmission and distribution of electricity were based on ENRE-approved five-year tariff schedules in U.S. dollars. Within the five-year period, transmission and distribution rates were subject to automatic twice-a-year adjustments for inflation (based on the U.S.

Consumer Price Index) as well as any increases in federal, provincial, and municipal government taxes. In addition, unforeseen costs could also lead to higher end-user rates if authorized by ENRE following a public hearing. When the distributor bought electricity on the spot market, buyers were sheltered from seasonal price gyrations by a CAMMESA Stabilization Fund. The basic concept behind this fund was that distributors would deposit the excess collected from end-users when wholesale spot market charges fell below the tariff rate on file with ENRE. Conversely, distributors would be compensated for unexpected increases due to seasonal factors that could not be passed on to users by taking money out of the Stabilization Fund.

As occurred with the natural gas sector, the Argentine government used the economic emergency law passed by Congress in January 2002 to convert end-user charges for electricity into Argentine pesos at a one-to-one parity that did not reflect the actual market rate of exchange of at least three pesos to one U.S. dollar. The same legislation also froze rates that transmission and distribution companies could charge consumers at 2001 levels. Owners of generators were technically still allowed to charge market prices for producing electricity, albeit tempered by various formulas for calculating “real” costs. Rather than pass on any increases to consumers, however, the federal government forced the CAMMESA Stabilization Fund to pay for them. Given its grossly expanded new mandate, the Stabilization Fund ran out of cash by mid-2003. After this point, CAMMESA began “paying” the privately owned generators with Argentine government bonds.

In mid-2004, the federal government authorized a partial pass-through of higher generation costs to larger industrial and commercial users. As was the case for natural gas rates, however, tariff hikes for transmission and distribution services were delayed by the Kirchner administration’s insistence that the private firms first drop their international arbitration claims. These claims are based on alleged breaches by the Argentine government of bilateral investment treaties when it forcibly converted utility tariffs into pesos and froze them in 2002. Meanwhile, electricity rates for all residential users—albeit not the taxes in their bills—remain frozen.

The Kirchner administration initially claimed in mid-2004 that increased revenue collected from higher electricity generation prices paid by larger industrial and commercial users would replenish the CAMMESA Stabilization Fund and allow redemption of the bonds issued to generator owners. Despite this promise, the private generator owners have yet to see their outstanding bonds redeemed. Instead, the Secretariat of Energy in July 2004 came up with a new

scheme that required generator owners to deposit 65 percent of their bonds in a trust fund called the *Fondo de Inversión en el Mercado Eléctrico Mayorista* (FONIVEMEM). The bonds are supposed to be redeemed for cash to build two new thermal plants in Buenos Aires and Rosario. In return for this forced investment, the generator owners will receive shares in the new plants. Because it was unclear at the time where the natural gas to supply the new plants was supposed to come from, many generator owners initially balked at handing over their bonds. In response, the Secretariat of Energy in February 2005 announced that it would forcibly require these recalcitrant firms to direct 100 percent of their bonds to FONIVEMEM or risk never being able to redeem them.

The strong-arm tactics used to get private-sector generator owners to contribute to FONIVEMEM illustrate the Kirchner administration's antagonistic relationship with foreign utility firms. At the same time, they also indicate a grudging acknowledgment of the financial and technological constraints that prevent outright re-nationalization of the electricity sector and its return to the public sector. Instead, the Kirchner administration appeared to be trying to establish a system whereby the discretionary powers of private firms are circumscribed and the government assumes a preponderant role in directing investment decisions.

Given that throughout the 1990s the reliance on natural gas to generate electricity in Argentina increased so dramatically, it is no surprise that the electricity sector has also been negatively impacted by the increasing shortages in natural gas in the country since 2004. In addition to importing natural gas and substitute fuels, the Argentine government has also been forced to use the conversion plant located in Garabí (just over the Argentine border in the southern Brazilian state of Rio Grande do Sul) that connects the Argentine and Brazilian grids to import electricity from Brazil. This is a particularly ironic turn of events given that Garabí was built in 2000 primarily to support Brazil's hydro-dependent electricity grid with what was then thought to be cheaper, more abundant, and more reliable Argentine natural gas-generated electricity.

CONCLUSION

President Néstor Kirchner's failure to fully restore the market mechanism for setting prices for energy consumption in Argentina may have facilitated his wife's election as president, but it now means that the burden for restoring price equilibrium will fall squarely on her shoulders. Given energy shortages in the

winter of 2007 that forced halts in production and are already eating away at Argentina's recent impressive gains in GDP, Cristina Fernández de Kirchner will have no choice but to act early on in her administration, particularly if winter in 2008 is as cold as it was in 2007 and the drought in the Southern Cone persists. Adding to the need to take immediate action is the fact that Bolivia halved the amount of natural gas it committed itself to export to Argentina in 2007 and faces even greater supply constraints in 2008. The political calculation is that she will act early in her term so as to permit enough time for memories of the pain of the restructuring to dim before she or her husband decide to announce a decision to run again in 2011. One thing that may help President Fernández de Kirchner is the fact that the biggest beneficiaries of pesification and the price freeze on energy rates have been the middle class. This is the same group that has also benefited from the economic recovery that the country has experienced since 2003. Presumably their pocket books are now fuller and bank accounts replenished, so they are less likely to take to the streets if energy prices suddenly increase. In addition, if domestic supplies begin to increase as a result of restored market based incentives to invest, the government could compensate for the higher electricity prices by lowering the hefty taxes it currently charges through utility bills.² Up to now, the revenue raised from those taxes has been used to finance the purchase of imported natural gas, electricity, as well as substitute fuel oil. Interestingly, the poor in Argentina—the presumed base of the Kirchners' *Justicialista* party—primarily use liquefied petroleum gas (LPG) that comes in metal containers, and prices for LPG were never frozen.

NOTES

1. In October 2006 Argentine President Néstor Kirchner and Bolivian President Evo Morales signed a new agreement under which Bolivia guaranteed to provide Argentina with 22.7 million cubic meters of natural gas per day for the next 20 years. In return, Argentina agreed to pay a higher charge than it had previously been accustomed to of five U.S. dollars per million BTU's, although this price was to be adjusted every six months based on comparative prices for diesel and fuel oil. Since 2004, Argentina has also used *Petróleos de Venezuela SA* as a broker-financier to import fuel oil in order to operate older thermal plants in coastal Argentina or the newer dual combination thermal plants that can operate on either natural gas or fuel oil.
2. It is estimated that in 2003 some 33 percent of the average residential end user's bill in Buenos Aires represented taxes, while in the case of Entre Rios more than 60 percent of the electricity bill was made up of taxes. Overall, Argentine taxes on electric

utility bills are reputed to be among the highest in Latin America, averaging 30 percent versus 11 percent in Chile or 1 percent in Venezuela. See, Fundación para el Desarrollo Eléctrico, *Informe Sobre la Demanda del Consumo Eléctrico Argentino* (Buenos Aires: FUNDELEC, 2003), Annex I.

Chile's Choices: Maintaining Growth and Securing Supply

Oscar Landerretche

INTRODUCTION

The politics of oil and gas has two sides, which are often complementary. One is the use of influence and force by powerful countries in order to secure and control energy resources. The other is the use of oil and gas resources as a source of international power for the countries that control them.¹ Small countries like Chile are dependent on energy imports, and as such cannot seek anything other than free trade, adequate rules of the game, and strong international institutions in order to secure its access to international energy markets.

The Chilean economy has experienced rapid economic expansion since 1986 at an annual average rate of 5.8 percent,² increasing not only its demand for energy but also its dependence on energy imports. While total Gross Domestic Product grew at an annual average rate of 5.6 percent between 1990 and 2006, primary energy demand grew at an annual rate of 4.8 percent and the demand for electricity grew at an annual rate of 7 percent. Meanwhile, imports of primary energy increased from 45.1 percent of the total supply in 1990 to 66.9 percent in 2006, with natural gas and coal registering the highest growth (see Table I). Chile's growing reliance on energy imports, particularly on natural gas, has not been without consequences. In April 2004, Argentina began restricting natural gas exports to Chile. In 2008 Argentine supplies to Chile have decreased to an amount that satisfies only one-third of Chile's residential demand, with no supply for industry or power generation: restrictions reached levels above 90% of total requirements by mid-2007 and have remained above that figure most of the time throughout the first semester of 2008.³

Chile has been forced to reconsider its energy policy, which—before Argentina's export restrictions—was based on increasing natural gas and power imports from Argentina. Some policy changes include incentives for using non-traditional renewable sources as well as the construction of liquefied natural gas

Table I. CHILE: DEPENDENCE ON PRIMARY ENERGY IMPORTS
IMPORTS / TOTAL SUPPLY

	1991	2006	2006: TOTAL SUPPLY STRUCTURE
CRUDE OIL	87.6%	98.7%	38.9%
NATURAL GAS	0.0%	72.3%	24.8%
COAL	40.3%	92.0%	11.5%
HYDROELECTRICITY	0.0%	0.0%	9.0%
FIREWOOD AND OTHER	0.0%	0.0%	15.8%
TOTAL	45.1%	66.9%	100.0%

SOURCE: NATIONAL ENERGY COMMISSION - CHILE (CNE)

(LNG) import facilities and new hydroelectric power plants. To generate power, the country has also substituted coal and fuel for natural gas.

Also worth noting are the lost investment and lost development opportunities, both in Chile and Bolivia, due to short-sighted and ultimately counterproductive policies towards foreign investors and potential joint ventures with Chile, implemented by President Evo Morales's government. In the long run, Chile and Bolivia will not be the only countries to lose out.

Recent trends in energy issues in the region show a revival of obsolete policies and bring old cleavages once again to the fore. It seems absurd to try to unite Latin America around "dirigiste"⁴ or statist policies which lead to inefficiency and stagnation. Even if surpluses provided by high energy prices could allow some governments to believe that foreign capital from outside the region is no longer necessary, it is doubtful that regional integration could take place based on recycling local extraordinary profits within the region, an outcome that Venezuelan President Chávez seems to think possible. As history shows, these surpluses will likely be short-lived. It is unlikely that populism and exacerbated nationalism will help us achieve the levels of development that are within our potential.

However, it is important to recognize that some of these ill-advised policies spring from the flawed implementation of policies of liberalization and privatization. The reaction against such policies has provided the socio-political basis for the resurgence of resource nationalism. Instead of improving and integrating their regulatory frameworks and trying to strengthen regional regulatory integration,⁵ some governments have returned to interventionist policies; these are causing, as in the past, numerous kinds of inefficiencies and imbalances.

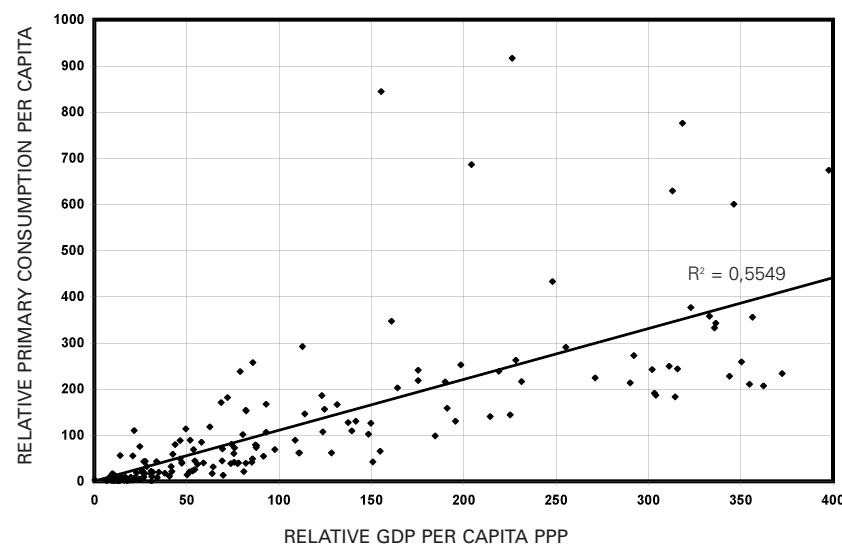
ENERGY AND DEVELOPMENT

Some environmentalists argue that the efficient use and production of energy could curb the demand for energy products. Some also argue that economic growth can be reduced without affecting economic and social development. However, history and cross section analyses show that economic growth is a necessary, but not sufficient condition to attain economic and social development. In addition, a high level of per capita energy consumption is also a necessary but not sufficient condition for economic and social development.

Energy consumption (primary) and Gross Domestic Product (GDP), both in per capita terms, are positively and significantly correlated (Figure 1):

Figure 1. 2005: RELATIVE PRIMARY ENERGY CONSUMPTION (PER CAPITA) and GDP (PER CAPITA)

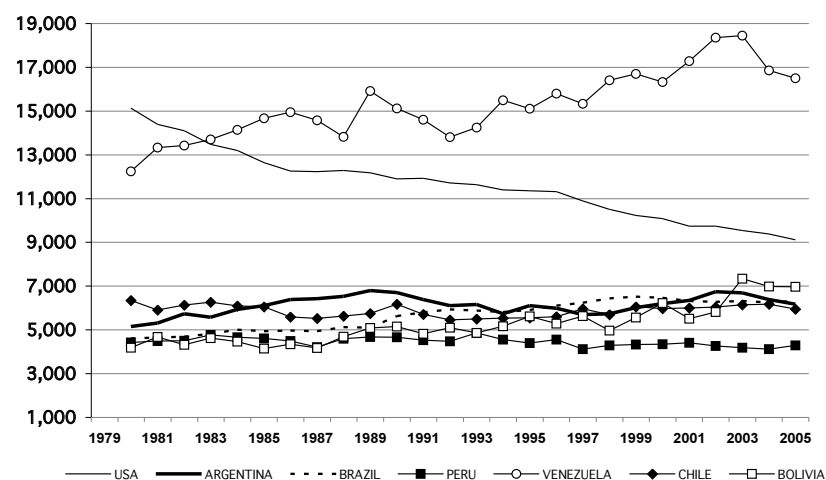
WORLD AVERAGES (175 COUNTRIES) = 100
GDP PPP (IMF OCT 2007) MILLION BTU (US EIA OCT 2007)



Efficiency can reduce the energy requirements, but history shows that energy intensity⁶ falls only after significant levels of growth and development have been achieved. Energy intensity increases during the first decades of a country's economic take off and starts falling (increasing energy efficiency) only after an economic development threshold of some sort has been reached, as seems to have been the case of the United Kingdom around 1880, the United States and Germany around 1920, France in the 1930's and Japan in the 1950's, while developing countries were not reducing their energy intensity by the end of the 20th century.

Figure 2. ENERGY INTENSITY

BTU PER 2000 US DOLLARS PPP (US EIA October 2007)



Most Latin American countries are not making any progress in terms of improving energy efficiency in the last decades. Some energy producers, such as Bolivia and Venezuela, have even increased energy intensity considerably over the last years (see Figure 2). Therefore, a country such as Chile that is fast-growing and dependent on energy imports is expected to become very vulnerable unless pragmatic measures are adopted to diversify energy sources, increase efficiency, and develop domestic energy production.

In fact, since most Latin American Nations have been experiencing less growth than is needed to catch up to developed countries, their energy needs have not grown as rapidly as they could (Table II). Only four countries (Chile, Dominican Republic, Costa Rica and Panama) are among the top 50 in terms of economic growth over the last twenty years and several Latin American countries are not even among the top 100, Brazil, the largest one by far, being one of them.

Latin America's energy challenges reflect its development challenges. Outmoded policy views are spreading over some parts of the region; they have a great impact on energy markets as well as on the production of oil and natural gas in the near future. Economic policies have changed radically, for example, in both Bolivia and Argentina, departing from principles of liberalization and modernization and in the process making a casualty of energy markets.

REGIONAL INTEGRATION

Geography also makes Latin American integration difficult. Nonetheless, there has been some progress in recent years, reflected in the area of electricity (binational hydroelectric power plants such as Salto Grande, Itaipu and Yacretá) and natural gas.

Table 2. ECONOMIC GROWTH 1987-2007

GDP PC (NATIONAL CURRENCY AT CONSTANT PRICES), IMF WEO April 2008

Equatorial Guinea	14.8%	Burkina Faso	2.4%
China	8.6%	Pakistan	2.4%
Bhutan	6.6%	Samoa	2.4%
Vietnam	5.7%	Uruguay	2.3%
Korea	5.2%	Albania	2.3%
Ireland	5.2%	Norway	2.3%
Botswana	5.2%	Finland	2.3%
Myanmar	5.2%	Ghana	2.3%
Mozambique	4.9%	Morocco	2.2%
Taiwan Province of China	4.9%	Lesotho	2.2%
Thailand	4.7%	Angola	2.2%
Trinidad and Tobago	4.6%	Sudan	2.2%
Singapore	4.5%	Guyana	2.2%
India	4.4%	Mali	2.2%
Chile	4.3%	United Kingdom	2.2%
Cambodia	4.3%	Egypt	2.1%
Mauritius	4.2%	Netherlands	2.1%
Malaysia	4.2%	Australia	2.1%
St. Vincent and the Grenadines	4.0%	Tanzania	2.1%
Luxembourg	3.8%	St. Lucia	2.0%
Cape Verde	3.8%	Belgium	2.0%
Maldives	3.8%	Austria	2.0%
Lao People's Democratic Rep.	3.7%	Czech Republic	1.9%
Sri Lanka	3.6%	Sweden	1.9%
Belize	3.6%	Hungary	1.9%
Indonesia	3.4%	Philippines	1.8%
St. Kitts and Nevis	3.3%	United States	1.8%
Hong Kong SAR	3.2%	Japan	1.8%
Fiji	3.2%	El Salvador	1.7%
Poland	3.2%	Germany	1.7%
Dominican Republic	3.2%	Dominica	1.7%
Bahrain	3.0%	Argentina	1.7%
Tunisia	3.0%	Denmark	1.7%
Bangladesh	2.9%	Israel	1.7%
Nepal	2.8%	France	1.6%
Antigua and Barbuda	2.8%	Qatar	1.6%
Oman	2.8%	Iceland	1.6%
Nigeria	2.7%	Canada	1.6%
Uganda	2.7%	Mexico	1.6%
Costa Rica	2.7%	Colombia	1.6%
Turkey	2.6%	Kiribati	1.5%
Grenada	2.6%	Ecuador	1.5%
Spain	2.6%	Syrian Arab Republic	1.5%
Chad	2.6%	Italy	1.5%
Iran, Islamic Republic of	2.5%	New Zealand	1.4%
Panama	2.5%	Ethiopia	1.4%
Greece	2.5%	Suriname	1.3%
Portugal	2.5%	Bolivia	1.2%
Cyprus	2.5%	Swaziland	1.2%
Seychelles	2.5%	Honduras	1.2%

Chile and MERCOSUR were making progress towards achieving a higher degree of integration in the field of natural gas, even though the institutional framework is weak and national markets have not been integrated,⁷ until Argentina unilaterally reduced its natural gas supplies to Chile. One of the key weaknesses is the lack of mechanisms to mediate conflict. Another weakness concerns the lack of rules to cope with crises affecting the availability of specific resources, such as the one affecting Argentina supplies to Chile.

It is unlikely that the increasing politicization of energy integration initiatives, witnessed in recent years, would render regional improvements in this field. I see more conflict than cooperation as a result of the resurgence of populism and exacerbated nationalism in our region.

That is why I am not optimistic about the prospects coming from the Energy Summit held in Venezuela on Isla Margarita in April 2007 and promoted by Venezuela, Ecuador, Bolivia, and Argentina. For example, the Great South American Natural Gas Pipeline seems too large, too uneconomical and too controversial to be built, and some of the early supporters are having second thoughts about it.

Controversies over the promotion of ethanol, a biofuel that can be blended with gasoline to reduce countries' dependence on foreign oil, has become not only a new source of conflict between the United States and the Venezuelan government, but also a source of disagreement among South American countries, because some oil exporters look at it as a potential threat to their international oil-based policies. Meanwhile, bilateral relations between Bolivia and Brazil deteriorated severely after the nationalization of hydrocarbons decreed in May 2006, affecting Petrobrás' investment.

President Néstor Kirchner's statist policies affected investment in the energy sector so severely that domestic shortages have become a major problem, affecting supplies to Argentine consumers and neighboring Chile. Argentina's new president, Cristina Fernández de Kirchner, put former Minister for Federal Planning Julio de Vido in charge, among other areas, of energy matters. Not surprisingly, policies towards neighboring Chile have remained much the same.

Under these circumstances, Chile has no other viable alternative than to 1) substitute coal and fuel oil for natural gas in order to generate power; 2) promote Liquefied Natural Gas projects (LNG) for the northern and central regions; 3) develop hydroelectric capacity and non-traditional sources of renewable energy, including biofuels; and 4) move forward in the consideration of nuclear energy. This latter issue is very controversial, but the idea has gained greater acceptance in light of the generalized perception that the country is vulnerable from the standpoint of energy.

Sound economic policies and political stability have created the environment for Chile's sound economic performance; such performance, in turn, provides the country with the resources it needs to pay for energy in international markets. No regional integration in the foreseeable future will provide energy at prices below international levels. Thus, Chile has turned to globalized commodity markets as a more secure source of energy products. The country still has a long way to go in reducing its vulnerability, but it certainly will not opt for dependency on specific countries.

Chileans, in short, are not optimistic about future developments in the area of regional integration, but we remain optimistic about the long-term performance of the region. We expect common sense to prevail in the sphere of economic policy, provided that extreme nationalism and populism are neither promoted nor provoked by misguided foreign policies on the part of major world powers. In the meantime, we continue to prepare the institutional and technical foundations for regional energy integration, making the most of the regional organizations and institutions we have built over the years.⁸

CONCLUSION

In the Chilean case, it is unrealistic to expect a very significant reduction in energy intensity, in part because the country has not yet reached a high level of development and in part because mining remains very important to the economy as a whole. Chile is dependent on energy imports and must diversify its sources—both in terms of products and countries of origin—including the use of domestic non-traditional sources. It seems overly optimistic to assume that increasing energy efficiency would alone be sufficient to meet Chile's energy needs.

In Latin America, integration requires market-oriented policies. "Open regionalism" constitutes a non-protectionist approach which promotes integration. In the case of energy, non-protectionist policies not only promote integration but also increase competition in the markets. Development needs energy and both require appropriate government policies, information, and confidence in order to foster and coordinate long-term investment. Current manifestations of populism and exaggerated nationalism, in some cases a reaction to misguided or ill-conceived liberalization and privatization measures, will not help integration at all.

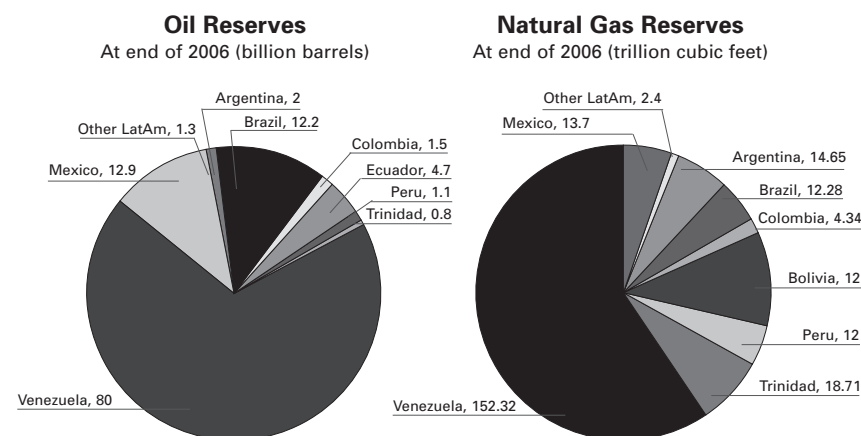
NOTES

1. Genaro Arriagada, "Petróleo y gas en América Latina. Un análisis político de relaciones internacionales a partir de la política venezolana," DT N° 20/2006, September 19, 2006, Real Instituto Elcano, <http://www.realinstitutoelcano.org/>

- wps/portal/rielcano/contenido?WCM_GLOBAL_CONTEXT=/Elcano_es/Zonas_es/America+Latina/DT20-2006.
- Total Gross domestic Product (GDP) measured at constant 2003 prices. Source: Central Bank of Chile.
 - Source: http://www.cne.cl/archivos_bajar/restricciones_gas/grafico_restricciones_2004-2008.pdf
 - In the 1950s and 1960s, “dirigiste” or statist economic policies referred to widespread state intervention in the economy.
 - See, for example, María de la Cruz Bayá C., de la Universidad San Simón de Cochabamba, “Integración Energética: Una incertidumbre Regulatoria,” *Dikaion*, año 20, N°15, Universidad de la Sabana, Chia, Colombia, noviembre 2006.
 - Energy intensity at the macro level means the amount of energy *per* unit of GDP (measured in purchasing power parity [PPP] international dollars).
 - Ruiz-Caro provides significant information and analyses about energy integration efforts through the end of 2005. See Ariela Ruiz-Caro “Cooperación e Integración Energética en América Latina y el Caribe” (“Energy Cooperation and Integration in Latin America and the Caribbean”), CEPAL (ECLA), *Serie Recursos Naturales e Infraestructura*, 106, abril de 2006.
 - These include such organizations as OLADE, CIER, ARPEL, MERCOSUR, the Comunidad Andina de Naciones, the Sistema Económico Centroamericano, etc.

Venezuela: Energy, the Tool of Choice

RoseAnne Franco



It is impossible to discuss energy in Latin American without addressing Venezuela. The country houses the largest hydrocarbon reserves in the region, registering some 80 billion barrels of proven oil reserves and 152 trillion cubic feet (tcf) of natural gas. So it is not surprising that the administration of President Hugo Chávez has decided to tap these vast hydrocarbon assets to move his ambitious regional energy integration and social development agendas forward.

On the energy front, Chávez's vision has both domestic and international aspects. First, the Venezuelan president is eager to assert Venezuela's national sovereignty within the domestic energy industry, which was evident in the promulgation of the 2001 Hydrocarbon Law.¹ Second, he has tasked Petróleos de Venezuela (PdVSA) with social and industrial development initiatives at home and abroad. Moreover, Chávez is committed to reducing Venezuela's economic dependence on the United States and diversifying PdVSA's client base.

Finally, Chávez seeks to facilitate energy integration in the Caribbean and Central and South America and to engage with other regional powers (e.g., Russia) to counterbalance U.S. global influence.

With respect to the government's energy agenda, the activist regional role being pursued by Caracas is nothing new. Historically, Venezuela appears to assume a leading role following periods of high oil prices, which create windfalls. For example, in 1980 Venezuela, along with Mexico, signed the San José Accord, which continues to provide crude oil and refined products to eleven Central American and Caribbean nations on favorable terms. The cooperative agreement was reached shortly after oil prices had reached record levels triggered by tensions between the United States and Iran. In other words, Caracas assumes a more activist role on the continent whenever it can afford to do so.

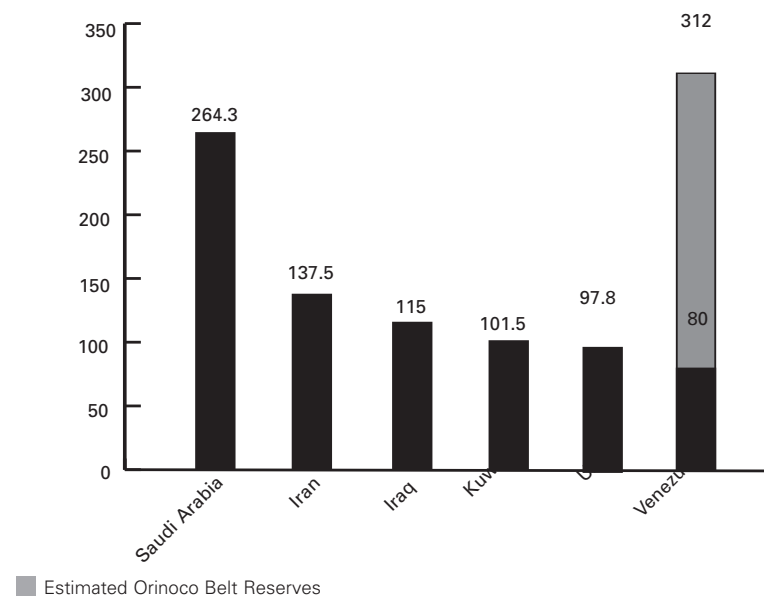
Therefore, it is consistent with the behavior of previous Venezuelan governments that Chávez has been pursuing a new wave of regional energy efforts since 2002, fueled by steadily rising oil prices. Among the government's high profile projects are PetroCaribe, PetroAndina, and PetroSur. To varying degrees, these energy agreements seek to integrate Latin American countries' energy sectors and, in particular, to foster cooperation between PdVSA and other National Oil Companies (NOCs). Another important component of Chávez's regional energy integration strategy is the development of the Orinoco Oil Belt. While its reserves are still undergoing certification, the area is estimated to hold some 233 billion barrels, which when coupled with existing oil assets, would place Venezuela ahead of Saudi Arabia in terms of overall petroleum reserves. Accordingly, Chávez would like the Orinoco Belt Reserves to be viewed as a reliable energy source for the continent. To mitigate the technical difficulties and costs related to refining Orinoco's extra heavy crude, Chávez has proposed the expansion and upgrading of numerous existing refineries around Latin America. The development of the Orinoco Belt provides an opportunity for regional NOC-NOC cooperation. It is divided into 27 blocks and five Latin American NOCs—Brazil's Petrobrás, Argentina's Energía Argentina S.A. (ENARSA), Uruguay's Administración Nacional de Combustibles, Alcohol y Portland (ANCAP), Ecuador's Petroecuador, and Chile's Empresa Nacional de Petróleo (ENAP)—have committed to work alongside PdVSA in the development of the acreage. An additional nine NOCs, including Russia's Lukoil and India's Oil and Natural Gas Company, Ltd. (ONGC), have also signed on to the project.

Nonetheless, there are clear challenges to Chávez's ambitious energy integration efforts. His PetroAmérica plan yields a mixed bag as PetroCaribe is the most advanced of the energy arrangements, while PetroAndina is the least developed. The energy needs of partner countries and their political sympathies (or lack

thereof) with President Chávez tend to influence the level of integration. With regard to Chávez's downstream commitments to reconfigure and expand the region's refineries, he appears to have overcommitted, as a number of his refining projects have yet to move beyond the planning stages. Another challenge to Caracas' regional integration efforts is its reliance on NOCs. All state oil companies are not alike and yet the Venezuelan government has made the NOC its partner of choice, with little regard for the individual companies' technical and organizational competencies or financial capacity. It is unlikely that these NOCs—many of which are fledgling—can meet the increasing technological challenges and capital needs of Venezuela's energy sector.

OIL RESERVES

At end of 2006 (billion barrels)



A closer look at Chávez's numerous energy project proposals calls their viability into question. Those that have come to fruition tend to meet the risk criteria established for private sector energy projects of the same size. In other words, ideology aside, those projects that move forward must meet certain thresholds with regard to political support, geology, economics, environment, and security. For example, it is not surprising that one of Chávez's most ambitious energy proposals—the 'Gas Pipeline of the South'—has stalled. While the project faces no political opposition and little security risk, there are concerns

about the size of Venezuela's natural gas reserves relative to the project's export needs, the economical viability of the project, and the extent of the proposal's environmental costs due to the pipeline's projected proximity to the Brazilian rainforest. On the other hand, the Venezuela-Colombia natural gas pipeline, completed in May 2007, successfully meets much of the project risk criteria. It benefits from active political support from the countries' respective governments, lower environmental impacts, and greater economic feasibility; in addition, the Colombian government has developed targeted security plans to mitigate the project's greatest above-ground risk—facility and personnel violence.

Hand in hand with regional energy integration, Chávez is also using his country's energy wealth as a vehicle to promote social development. When Chávez entered office in 1999, some 43 percent of all Venezuelan households were living below the poverty line. To address the nation's social needs and in an effort to bring Venezuela's NOC closer to 'the people,' the Chávez government explicitly tasked PdVSA with providing funding and fostering social development. As a result, PdVSA's social spending increased from \$249 million in 2003 to \$13.26 billion in 2006, with the government channeling revenues to the Economic and Social Development Fund (Fondespa) and the National Development Fund (Fonden) and neighborhood-based *misiones* (missions) becoming the most visible example of Chávez's social welfare plan. Today some twenty-two social missions provide targeted care to local communities. To foment more economic development Chávez has also proposed co-ops (Social Production Companies—EPS's) to 'democratize' access to business opportunities within Venezuela's oil industry and strengthen the domestic oil services sector. Nonetheless, like Chávez's regional integration agenda, energy as a mechanism for social development has its limits. The EPS program has been hampered by limited local expertise and allegations of corruption. While the government's missions provide fast and targeted delivery of social services, they have also been criticized for their lack of transparency and poor accountability, their negative impact on existing social programs and institutions, and the degree to which they make social welfare programs directly vulnerable to oil price fluctuations. All this is in addition to the growing concern that PdVSA's social development funding is coming at the expense of much needed investment in oil exploration and production.

Other segments of the hydrocarbon industry that Chávez has tasked with development initiatives are natural gas and refining. The CIGMA industrial complex is designed to use local natural gas for petrochemicals and stimulate local industrialization. Implicit in Venezuela's gas policy is a priority on domes-

tic consumption, which increasingly takes liquefied natural gas (LNG) exports off the table. The construction of new refineries also has socioeconomic and strategic functions, as Chávez has determined refinery locations so as to generate new employment and encourage migration to less populated parts of the country. In particular, Chávez seeks to support industrial activity and better integrate the center and southern regions of the country, also known as the Orinoco-Apure Axis. Historically, Venezuela has prioritized the economic development of coastal/north areas in response to the U.S. Gulf coast market.

Not surprisingly, regional energy integration and social development were the foci of the first South American Energy Summit, convened by Chávez in April 2007. However, despite its good intentions, the summit yielded few concrete measures and Venezuela's energy agenda fell flat. Chávez's opposition to bio-fuels in response to recent U.S.-Brazil cooperation on ethanol and his proposed Gas OPEC ('Oppegasur') failed to gain much traction. The summit also did not revive momentum for construction of the Pipeline of the South. The lone initiative that appears to have survived, albeit barely, is the Bank of the South, which has been proposed as a regional alternative to existing multilateral banks. Perhaps more telling, the summit revealed that any regional energy agenda must take into account the interests of the continent's other major energy producer—Brazil. On the whole, energy has proven to be an uneven tool for regional integration and social development for Venezuela. The government's energy goals are quite ambitious, and while social development projects at home may continue to move forward, they divert resources from investment in the upkeep and modernization of the energy sector itself. In addition, regional energy integration efforts are long-term in nature and thus subject to more scrutiny, halting the advancement of all but the most pragmatic of his proposals.

NOTES

1. The law increased royalty rates to 30 percent and mandated majority state participation in all upstream oil projects. Initially unaffected, operating service agreements were forced to migrate to the new law in 2005 and the Orinoco Belt heavy oil strategic associations followed suit in 2007.

Diversifying the Energy Matrix: The Case of Brazil

Sergio C. Trindade

This essay reflects my own experience with energy, development, technology, and environment issues in Brazil and elsewhere, with specific reference to Brazil's development and the role of energy services.

THE ENERGY-DEVELOPMENT NEXUS

The word energy is synonymous with development, and it is also one of the main economic factors of production. Developing societies are constantly increasing their energy use, and there is a clear correlation between Gross Domestic Product (GDP) and energy consumption. Interestingly, it takes twice the amount of energy to produce a unit of GDP in the United States than in the European Union, areas with similar levels of development.¹ This suggests that one way a country can expand its access to energy resources is by using them more efficiently. Energy access can also be expanded through the integration of the electricity, oil, and gas infrastructures. Although there are elements of energy integration in South America, much work remains to be done. Another dimension of the energy-development nexus is the opportunity provided by a growing energy industry for increasing the country's knowledge base and improving the quality of its human capital.

As a child in Brazil spending summers on the remote farm of my maternal grandfather in Abaeté, Minas Gerais, I found that all gasoline was imported from the United States and sold in 5-gallon or smaller cans to fuel the commonly-used old Model-T cars. Lighting was provided by kerosene lamps and firewood was the fuel for cooking. Corn was ground with energy from a water wheel. As a teenager I would visit my grandfather's new farm, which was still off the grid. Fortunately, there was a small Pelton-wheel generator, which provided some lighting from the running water that was dammed during the day and allowed to run in the early hours of the evening.

When visiting my paternal grandmother's urban house in Ouro Preto, Minas Gerais, a warm bath was available only if the charcoal-fired stove was on, since the hot water pipe ran through the oven. Since Ouro Preto can be chilly in July, the oven had to be lit almost all day long to cope with warm baths for the whole family. I also remember how our fuel system arrived at the house—on a group of charcoal laden mules. A few years later, this same house had been converted to Liquefied Petroleum Gas, delivered in 13-liter containers on the back of a pickup.

Today, these same areas that had such limited access to energy services—transportation, lighting, heating, cooling and rotary motion—are all grid-connected and served by a liquid fuels infrastructure. They are now generating a much higher GDP than in the past. It took vision, leadership, and political will to arrive at the place that we are today in Brazil. This was often achieved by using each and every energy development opportunity to absorb knowledge for future energy initiatives.

In the 1950s, an assessment of hydropower resources—the so-called Canambra project—was carried out in part by Brazilian engineers.² The knowledge and expertise they gained was disseminated and multiplied through education, training, and hands-on experience and coaching. This core group was behind the development of Centrais Elétricas de Minas Gerais (CEMIG), the electrical utility company of Minas Gerais, in many ways a model utility provider in Brazil. They were later responsible for the development of the Furnas power system, another model of well-run utilities in Brazil.³ Additionally, they and their disciples were critical to the implementation of the Itaipu dam project and power generation system on the Brazilian-Paraguayan border, currently the largest hydropower complex in the world, though it will soon be overtaken by the Three Gorges system in China.

Parallel developments took place in other parts of Brazil, resulting in a large and integrated electrical grid that today serves the majority of the population. Human capital developed to such a high degree that Brazilian companies have been engaged in electricity grid design and construction in a number of other countries. An electricity research and development center—Centro de Pesquisas Elétricas (CEPEL)—was developed by the state power company Eletrobrás and has provided knowledge and services to equipment manufacturers and utilities in Brazil and elsewhere.

Brazil has also progressed in the area of liquid fuels for transportation and industry. Five decades ago foreign geologists concluded that there was no economically recoverable oil in Brazil. Now the country is self-sufficient in oil and possesses the world's top deep offshore oil exploration and exploitation technologies. Again, the country seized opportunities to learn and knowledge was generated via experience, research, development, and technology transfer. Petrobrás established a petroleum research and development center—Centro de Pesquisas e Desenvolvimento

Leopoldo Américo Miguez de Mello (CENPES)—which played a crucial role in developing the technology that allowed the discovery of immense oil deposits off the Brazilian coast in 2007. Similarly, Brazil has become, together with the United States, a leader in the production and use of biofuels, especially ethanol. In Brazil, ethanol is made from sugarcane and is currently the cleanest commercially available fuel. It has achieved the highest displacement level of gasoline of any biofuel in the world today (50 percent). Consequently, Brazilian ethanol mitigates greenhouse gas emissions and improves local air quality. Once again, a technology center—Centro de Tecnologia Canavieira (CTC)—was established by the private sector to generate and disseminate knowledge via experience, research, development, and technology transfer that resulted in Brazil becoming the most cost-efficient bio-ethanol producer in the world. Brazilian companies are consulting for, designing, and building ethanol plants in Brazil and elsewhere. In Brazil, food and fuel crops are growing simultaneously, and sugar cane workers are the second best paid agricultural workers.

Still, some 10–15 million Brazilians are off the grid in remote—and some not so remote—areas where the low population density does not justify extending the grid. This situation has allowed for creative solutions, such as public and private programs to provide modern energy services to settlers on land reform projects in the remote northern region of Mato Grosso. One type of arrangement, described as a Regional Market Management Organization (RMMO), served family plots of approximately 50 hectares. The RMMOs surveyed the areas and, together with the settlers 1) defined what energy services were needed to add value to local production; 2) established what local natural resources could provide energy (biomass, solar, wind, and small scale hydro); and 3) developed business plans that allowed suppliers of energy conversion equipment to see the disparate universe of potential buyers in a focused and aggregated way. The approach was fully integrated, guided by the demand for energy services and included financing schemes appropriate to the settlers' ability to receive loans.

BARRIERS TO THE AVAILABILITY AND USE OF ENERGY TO PROMOTE DEVELOPMENT

Since governments play a role in development—either by creating an enabling environment for private capital to invest in energy development or by assuming such a role themselves—vision, leadership, and political will are all necessary to assign national priority to energy among the multitude of development goals a society may have.

Up until the 1960s the environment—air, water, and soil—was not really a meaningful consideration for development in Brazil. In the 1930s, the Getúlio Vargas administration began a process of systematic development, which was increased in the 1950s during the administration of Juscelino Kubitschek and further expanded during the period of military rule (1964–1985). Thus, irrespective of the political regime—civilian dictatorship, democratic rule, or military dictatorship—there was continuity of political will in Brazil to build up the infrastructure necessary for development, namely electric power, liquid fuels, roads, ports, and telecommunications.

During most of this time, the Brazilian state was the driving force behind development initiatives. But over the past fifteen years there has been a transition toward an ever-increasing role for private enterprise in the Brazilian energy sector. Funding for these endeavors came from the financing of multilateral banks, international private lending, and the Brazilian government's equity and debt financing. Yet these funding packages often faced obstacles due to poor credit ratings, a history of defaulting on sovereign debt, and other risks. The severe inflation that afflicted Brazil for some forty years starting in the mid-1950s added to the difficulties the country had to overcome. These problems were gradually resolved as the country improved its infrastructure and generally honored its loan repayment commitments.

Once basic rules and contracts were developed, including the establishment of independent regulatory agencies, the increased private investment overcame the bottlenecks in the energy and other types of infrastructure. There is, however, uncertainty about the future role of the government and the regulatory agencies, which could make private capital hesitant to invest in energy and infrastructure in general. As a result, there are concerns about the availability of power in the decades ahead if the needed investments do not occur in a timely fashion. Financing energy development is likely to remain a difficult task and, given the scale and level of risk involved, will require a diverse portfolio of public and private sources, including national, foreign, and multilateral funding.

Beginning in the 1970s, environmental rules and regulations gradually began to play an increasing role in energy investment in Brazil. These are sometimes seen by investors as unnecessary barriers that consume time and resources for little benefit. The environmental authorities, however, have different views. Hydropower development, for example, requires the flooding of extensive areas, which can cause the destruction of habitats and other ecological damage; consequently, environmental permits are quickly becoming harder to obtain. In addition, sugar cane harvesting in Brazil is traditionally preceded by a controlled

burn of the fields to facilitate manual cutting, an activity that employs a large number of people. This operation emits soot particles into the air and can be a cause of public health concerns. In the state of São Paulo, such burning will be phased out gradually over the next fifteen or so years, which will expedite the mechanization of sugar cane harvesting and lead to the loss of hundreds of thousands of jobs. Obviously, environmental requirements introduce a level of uncertainty that may make potential investors think twice before committing resources to a project. But overall, environmental requirements help guide the design and implementation of sound, sustainable projects.

PUBLIC POLICIES AND ENERGY COOPERATION OR CONFLICT IN THE MEDIUM- AND LONG-TERM

Energy-related development projects that occur in areas that are shared by two or more countries might raise their own types of problems, based on the state of relations between the interested countries. When Brazil began planning the Itaipu hydropower project—which involved a large dam—it could have, in theory, been built entirely in Brazil. Nevertheless, the decision was made to build it on the border with Paraguay. This required the negotiation of a bilateral treaty between two countries of considerably different sizes, making the process of negotiation difficult. Paraguay's total consumption of electricity at the time of these discussions was equivalent to one half the output of one of the eighteen turbines that were eventually installed. Thus, the bulk of the electricity generated at Itaipu would be, and is, consumed by Brazil. However, the treaty gave both countries the same number of turbines. There was also a disparity between the electricity frequency used by each country. Paraguay insisted that all of its nine turbines should generate power at fifty cycles. Brazil countered with a proposal to convert the whole country of Paraguay to sixty cycles, with Brazil paying for the conversion. But the Paraguayans were adamant about their position. Ultimately Brazil yielded and used the opportunity to build—learning in the process—a High Voltage Direct Current System (HVDC). This allowed for the electricity generated by the Paraguayan turbines at fifty cycles to be purchased by Brazil, as agreed upon in the treaty, converted to direct current, transported 1,000 kilometers to São Paulo and reconverted there to sixty cycle electricity. Similar cooperation schemes were devised by Brazil and Argentina and Brazil and Uruguay, allowing for the exchange of electricity between the existing grids in the three countries.

Another cooperation scheme that has recently been tested concerns oil and gas cooperation between Brazil and Bolivia. A natural gas pipeline was con-

structed to transport Bolivian gas to Brazil, and it became operational while Petrobrás, the Brazilian state-owned oil company, managed the Bolivian gas fields. Upon assuming power, President Evo Morales of Bolivia decided to change the government's relationship with Brazil and change the framework for energy investment, with the aim of regaining national ownership of oil and gas assets. Petrobrás had been operating most of the refining capacity of Bolivia, in accordance with a contract that Bolivia revoked. The decision to change the existing policy, and the contracts derived from it, in order to maintain national ownership of energy assets will certainly discourage future foreign investment in energy in Bolivia.

In another effort to foster cooperation, the Latin American Energy Organization (OLADE) hired me in 1992, at the behest of the Group of Three,⁴ to help Colombia and Venezuela negotiate a gas interconnection between the two countries, at that time governed by Presidents César Gaviria and Carlos Andrés Pérez, respectively. Originally, gas was to flow from Venezuela to Colombia, with the flow to be reversed at some point in the future. A methodological framework was offered for the two countries to engage into negotiations. The deal ultimately fell through because President Pérez was forced from office in Venezuela in 1993 and President Gaviria became too preoccupied with the guerrillas in Colombia. The pipeline was eventually built—work was completed by 2007—but given the current state of relations between President Hugo Chávez of Venezuela and President Álvaro Uribe of Colombia, it may be some time before gas flows in either direction.

Brazil's prominence in biofuels, especially ethanol, and the policies of its foreign ministry have led to a number of bilateral agreements between Brazil and its neighbors as well as between Brazil and countries in Africa and Asia, to support the development of domestic ethanol markets. Brazil has also attempted to negotiate a plan with Venezuela to develop ethanol production, to promote agricultural growth and job creation in rural areas of Venezuela and to begin introducing ethanol-gasoline blends into the Venezuela domestic market. However, the deal eventually fell through due to a change of heart on the part of the Venezuelan government. It was influenced by Fidel Castro's position on biofuels, which condemns the notion of competing with food crops by converting agricultural commodities to fuel.

The Brazilian foreign ministry (Itamaraty) has promoted ethanol cooperation agreements with other countries in the Western hemisphere, especially in Central America and the Caribbean, most notably with Haiti and the Dominican Republic. However, the most interesting initiative stems from the

author's July 26, 2001, recommendation to President Fernando Henrique Cardoso that Brazil and the United States promote domestic biofuel development, especially ethanol, in third markets throughout the world. This Memorandum of Understanding was signed in March 2007 by Presidents Lula and Bush and is being implemented gradually, beginning with four countries: the Dominican Republic, Haiti, El Salvador and St. Kitts and Nevis.

The U.S. sugar quota can be a barrier to promoting sugar cane-based ethanol production cane in countries that benefit from the quota. As an instrument of U.S. foreign policy, the sugar quota allows select countries to sell sugar in the U.S. market at the U.S. domestic price, which can be two or three times the price of sugar on international markets. Those groups that have access to the U.S. market and control scarce land and other inputs for sugar cane production may feel little inclination to switch to ethanol. Ethanol, after all, has to compete with gasoline in price. If sugar producers can continue to enjoy the high profit margins offered by the U.S. quota, even producers with high costs have little incentive to shift to ethanol.

CONCLUSION

Wars over sovereignty are ultimately wars over natural resources, including energy resources, as well as political and economic power. Brazil shares borders with all but two countries in South America—Chile and Ecuador. Brazil settled its 16 thousand kilometers (ten thousand miles) of shared borders through diplomatic negotiations. Throughout its history as an independent country, the only real war between Brazil and a neighboring country was the Paraguayan War of the nineteenth century (1864–1870). Reacting to a Brazilian incursion into Uruguay, Paraguayan leader Francisco Solano López attacked Brazil in 1864 and Argentina in 1865. Brazil was joined by Argentina and Uruguay in defeating Paraguay.⁵

The Brazilian experience is one of transforming conflict into cooperation via diplomatic action. The development of hydropower from shared river basins such as the basins of the Uruguay, Paraguay, and Paraná rivers in Argentina, Uruguay, and Paraguay is a concrete example of the Brazilian approach. Conflicts with Bolivia over the commercial deals between Petrobrás and the Bolivian government concerning oil and natural gas resources did not result in warfare. Rather, the disputes were handled with patience and diplomacy. The Paraguayan desire to extract more rent from Itaipu will be addressed through diplomatic channels. The zigzagging relationship with Chávez's Venezuela on

oil, gas, and ethanol matters is again being handled with patience and diplomacy. Brazil's experience demonstrates that when a country is significantly larger than its many neighbors, sustainable peace and cooperation in exploring resources of joint interest is best achieved via diplomatic negotiation.

NOTES

1. See José Miguel Insulza, "Energy and Development in South America," in this volume.
2. Canambra Engineering Consultants Limited is a consortium of international engineering companies whose experts were tasked with carrying out a survey of energy resources in Brazil in the 1950s. [Eds.]
3. Furnas is the largest power utility company in Brazil.
4. The Group of Three (G-3) is a Free Trade Agreement involving Mexico, Colombia and Venezuela, signed on June 13, 1994, which entered into force on January 1, 1995.
5. To understand this episode, one must recall that there were long-standing disputes between these four countries over their boundaries and navigation rights on the large rivers of the region and mutual interference into the internal affairs of each other, and that Solano López had great ambitions to extend power and influence in the region.

Energy and Bad Luck in Bolivia

Humberto Vacaflor

INTRODUCTION

In the Jiangsu province of China, there is a city with an odd name. It is called Wuxi, which means "without tin." As a young journalist coming from Bolivia—a country with many tin mines, tin miners, and tin cities—I was surprised to hear that 3,000 years ago, people living in Wuxi were sure that bad luck reigns anywhere that there is tin. The idea in that part of China appears to have been that in every place where one found tin or any raw material, people had the money to buy everything they needed and therefore forgot to work the land or to produce food. Therefore, the name Wuxi became something of an amulet to ward off bad luck.

In Bolivia, miners used to link not only tin but any metal to the devil. In 1946, Augusto Céspedes, a Bolivian writer, wrote a historical novel about the corrosive influence of tin—the country was once a global leader in tin production—in Bolivian economic and political life. The title of the novel is *El metal del diablo*, or *The Devil's Metal*. I would like Bolivia to become a Wuxi country. That is, a country that is not plagued by the deindustrialization, instability and overall bad luck that accompanies an abundance of natural resources such as tin.¹

A BRIEF HISTORY OF NATURAL RESOURCES IN BOLIVIA

Bolivia's history is replete with disasters related to minerals. The last two international wars fought by Bolivia broke out because our neighbors, the Chileans, decided to appropriate Bolivian territory rich in raw materials. In the first of these wars, which took place between 1879–1884, Chile wanted to exploit the sulfur and nitrate deposits found in the former Bolivian province of Atacama. At the time, sulfur and nitrates were used for explosives and fertilizer. When sulfur lost its value, Bolivians thought that the territory would be returned to

Bolivia. It is, after all, located in the driest desert in the world. But Chile's leaders decided to retain the territory, due to the presence of copper deposits, ultimately found to be some of the largest in the world. As a result, Bolivia lost all hope of recovering the territories and to this day, copper is still being exploited there. That territory was also Bolivia's only connection to the sea.

Raw materials or natural resources, when exploited correctly, do not necessarily spell bad luck for all countries. Yet it is unclear whether Chile, the country that took control of Bolivian territory and its access to the sea, has handled this mineral trophy well. Today, sales of copper account for almost 60 percent of all Chilean export earnings.² Is this a case of "Dutch disease?"* Is the copper still surrounded by bad luck?

The second war, known as the Chaco War of 1932–35, was fought between Bolivia and Paraguay over the oil deposits in another area of desert, the southeast of Bolivia. As a result of that war, Paraguay kept the desert but Bolivia retained the oil deposits. Who really won the Chaco War? Bear in mind Wuxi. The political problems Bolivia has faced since 2003—the year in which the Bolivian government proposed to export liquefied natural gas through Chile—are in no small way related to the fact that there are large deposits of natural gas in the region it controlled after the Chaco war.

The natural gas boom in this region of Bolivia turned into a political nightmare when a consortium of oil companies started to study a project to export liquefied natural gas to the United States. The project envisioned using a seaport controlled by Chilean authorities, in the area seized by Chile in the War of the Pacific. When news of this scheme seeped out, Bolivians reacted with protests and riots. They believed Chile was about to benefit not only from the natural gas that would potentially go there to be liquefied, but also from billion dollar investments. Bolivians were furious about a project that would benefit the very neighbor responsible for the fact that Bolivia is a landlocked country. As popular anger triggered by that protest grew in the fall of 2003, President Gonzalo Sánchez de Lozada was deposed and forced to flee the country. I wrote at the time that this was the first example of an issue of international trade being decided in the streets.

* "Dutch Disease" refers to the effect of natural resource wealth on a country's economy, referring specifically to the deindustrialization that occurs as a result of high currency value and increased imports. The term was originally used to describe the phenomena that took place in the Dutch economy after the discovery of natural gas in the North Sea. [Eds.]

NATIONALIZATION I

Historically, contact with the oil industry was a shocking experience for Bolivians. The encounter first began when the Standard Oil Company split up into seven pieces in 1911. One of the pieces ended up in Bolivia, putting Bolivia for the first time on the oil industry's world map. Standard Oil, however, had many faults. When it exported Bolivian oil to Argentina, it forgot to report its revenues to the Bolivian government. Many equated the birth of the oil industry in Bolivia with the exploitation of the country's resources by a foreign company.

During the Chaco War of 1932–35, the same company that forgot to pay taxes or inform Bolivian officials about oil exports to Argentina refused to sell gasoline to Bolivian warplanes. When the war came to an end, the Bolivian government decided to nationalize Standard Oil of New Jersey. The company that ignored its obligations to the Bolivian state and refused to supply gasoline to Bolivian warplanes received an indemnification of \$1.7 million, a huge sum at the time. The nationalization resulted in the creation of a new state-owned oil company, *Yacimientos Petrolíferos Fiscales Bolivianos*, or YPFB. What followed was an arduous legal case between the Bolivian state and Standard Oil of New Jersey. This legacy has influenced the Bolivian attitude towards the oil industry ever since.

If the first nationalization of the oil industry in Bolivia came after an international war (1937), the second one followed an internal guerrilla war (1967) involving the famous Che Guevara. In 1969, coincidentally two years after that guerrilla war, YPFB took control of the Bolivian Gulf Oil Company, paying \$120 million for its assets.

Shortly thereafter, in 1972, Bolivia began exporting natural gas through a long-term contract with Argentina that would last until 1992. Over this twenty year period, Argentina significantly increased its own capacity to produce and distribute natural gas domestically, severely reducing its need for Bolivian gas and thereby disrupting long-term agreements between the two nations. Even with YPFB's discovery in 1990 of the San Alberto field, Bolivia's most important natural gas deposit, Argentina initially showed no interest in renewing the twenty year agreement. When that original contract ended, and through 1999, short-term deals governed the flow of Bolivian natural gas to Argentina.³

Bolivians were at first disappointed with the news about YPFB's discovery of new gas deposits because the company was supposed to be looking for oil. There appeared to be no market for an increased supply of natural gas in the region and Argentina had informed Bolivia that it would not renew its long-term natural gas contract. Enter Brazil, the largest country and market in South America.

Brazil decided to buy Bolivian natural gas, but said it would only do so through a joint venture between YPBF and the Brazilian national oil company, Petrobrás. In 1993, under the privatization policies of President Sánchez de Lozada's first term in office, Petrobrás and YPFB combined efforts to establish San Alberto as a major gas field. Petrobrás and YPFB started the project of building a pipeline, the longest one in South America. The Brazilian government announced its willingness to finance the pipeline even within Bolivian territory, as an advanced payment for the natural gas it would import.

The process by which President Sánchez de Lozada carved up the company and sold its parts to international oil companies was called "capitalization" because the companies were invited to invest as partners of the Bolivian state. Even the ownership of the pipeline that was financed by Petrobrás went to an international company—Enron—only a few years before it collapsed in the most spectacular and corrupt bankruptcy in capitalist history.

NATIONALIZATION II

One should not conclude that all of Bolivia's problems have been created by foreigners or its covetous neighbors. Bolivians are perfectly capable of creating a disaster all on their own, as we have seen from recent government actions. The tensions that erupted in Bolivia in the fall of 2006 were caused by the decision of President Evo Morales to take control of all natural gas revenues, instead of redistributing them to the governors with whom he has an extremely tense relationship. Morales appeared not to realize that the riots that erupted that November in response to his decisions worsened Bolivia's already poor reputation among foreign investors.

Bolivia faces a major challenge in attracting sufficient investment to develop its natural gas deposits. Risk analysts concur that Bolivia is a bad place in which to invest. Bolivia has lost its reputation as a reliable supplier, and as a result, Brazil and Argentina are looking to find an alternative to Bolivian natural gas. Argentina is particularly at risk due to its domestic energy crisis and heavy dependence on Bolivian gas imports, which resurfaced in 2004. Leaders of these two countries do not admit that they are trying to find substitutes for Bolivian gas, but they are taking serious steps towards this goal. It is difficult to blame them: in 2007 there were attempts by protesters from southern Bolivia to stop the normal flow of natural gas going to Brazil and Argentina.

As a result of the May 2006 nationalization, Bolivian natural gas production has fallen to such a degree that output is insufficient to meet domestic demand. Exports to Cuiabá—a major Brazilian destination for Bolivian natural gas—were

halted and exports to Argentina were cut in half. An integrated and stable energy sector in Latin America requires reliable partners in the arrangements between sellers and buyers. Given the government's actions, it will be very difficult for the region to count on Bolivian natural gas and incorporate it into serious economic policy.

Bolivia is now in the middle of yet another revolution—called by its leaders "a nationalist stand." Leaders of the *Movimiento al Socialismo* (MAS), headed by Morales, have proposed dividing the Bolivian state into 36 separate entities as a way to empower indigenous peoples with decision-making capacity. Revenues collected from foreign companies are to be redistributed to the indigenous "nations." However, even the government has been shocked by the indigenous peoples' immediate response to these offers. For example, there are currently 264 mines under control of the *ayllus*[†] from the highlands. The government didn't suspect that these groups would react so quickly to their invitation to take economic power. And now the government is trying to control them because they realize that the Bolivian state will be left with little to do if everything is in the hands of originary communities. Now the government is backtracking and attempting to recentralize some of the opportunities offered to indigenous peoples. Yet reestablishing state authority in Bolivia will be difficult, particularly in the wake of the May 2008 autonomy referendum in the department of Santa Cruz.

CONCLUSION

There is a special alliance of metals and natural resources in Bolivia that further demonstrates how these natural resources foment bad luck. Bolivia's link to the international economy is the most ancient in all of South America.⁵ It boasts the largest silver deposit in the world, Potosí. The Spaniards began exploiting Potosí's silver deposits in 1545, deciding at the time to also use coca leaves to overcome some glitches in the system of production. Miners, for example, were forced to remain inside the mines for six days at a time, from Monday to Saturday. To find the necessary stamina and offset hunger and fatigue, workers began chewing coca leaves. They were thus able to forget about eating, drinking water, resting, and even sleeping.

[†] The *ayllu* is most commonly known as a form of indigenous local government used by the Incas and is still a model in the modern-day Andean region.

Coca became one of Spain's allies. To this day, miners chew coca leaves while working. In the colonial era, coca production grew apace with the production of silver. Then, in 1860, cocaine was discovered and the innocent leaf that served as the miners' companion became the new star of Bolivia's economy. Today, Bolivia's president is the leader of the coca growers union. Did the exploitation of silver, which created the coca boom, turn into a time bomb? Coca leaves are now responsible for Bolivia's doom.

The conflicts in Bolivia today are intrinsically linked to the way in which natural resources have been exploited throughout the country's history. If these conflicts are not properly addressed, cooperation within Bolivia will not be possible, and this will be an obstacle to energy solutions for the region.

NOTES

1. Richard M. Auty, *Sustaining Development in Mineral Economies: The Resource Curse Thesis* (London: Routledge, 1993).
2. Banco Central de Chile, "Exportaciones de régimen general por sector económico," *Estadísticas Económicas*. Santiago, 1996-2008.
3. Peter DeShazo, "Bolivia," in Sidney Weintraub, ed., *Energy Cooperation in the Western Hemisphere: Benefits and Impediments* (Washington, D.C.: Center for Strategic and International Studies, 2007), p. 347.
4. "Morales Sets Bolivia Recall Date," May 12, 2008, <http://news.bbc.co.uk/2/hi/americas/7396809.stm>
5. The Potosí silver mine in Bolivia was first exploited by Spaniards in 1545, as part of the Viceroyalty of Perú. [Eds.]

Oil and the Transformation of the Ecuadorian State

Walter Spurrier Baquerizo

ECUADOR'S ENERGY RESOURCES

Ecuador's two main resources are oil and hydroelectricity. Oil was discovered in the late 1960s, and production began in August 1972. Production was initially 250,000 barrels per day, and today has increased to over 500,000 bpd. Oil production as a share of GDP peaked in 1974 (34 percent), and today makes up 20 percent of Ecuador's GDP.

Ecuador, like Mexico, is a country with considerable yet, relatively speaking, limited oil reserves. A significant portion of its production is allocated to domestic consumption. The country must anticipate that in a not-so-distant future, a decline in production could mean the end of exports. This fact distinguishes Ecuador from Venezuela; in the Venezuelan case, the economy is expected to revolve around oil exports so long as oil continues to be one of the principal energy sources in the world economy.

Crude oil for export by Petroecuador (the national oil company)—both the company's own production and the crude extracted by contractors—is sold by means of short-term contracts, destined for refineries in the Caribbean principally via intermediary trading companies.¹ Peru and Chile are regional customers, and oil has also been exported to South Korea in the recent past.

Hydroelectric power comes from the rivers that come down the Andes and which either form part of the Amazon basin or flow into the Pacific.

ENERGY AND EXPECTATIONS

Ecuador's key objective over the past 35 years has been to direct oil revenues towards the country's development. The main obstacle to realizing this goal has been the public's expectation of obtaining an immediate benefit from oil income,

coupled with the willingness of politicians to offer such benefits. The principal ways of addressing these immediate expectations have been through subsidies for fuel and other energy sources, increased public-sector employment, and wage increases unaccompanied by improvements in productivity, resulting in the loss of competitiveness for productive activities outside the oil sector.

As a result, there has not been a sustained increase in investment in relation to the size of the economy, or even a stabilization of the relationship between investment and the size of the economy. The peak periods of investment relative to the size of the economy were in the early 1970s (tied to the construction of the first oil pipeline), in 1987 (to reconstruct the oil pipeline destroyed by the earthquake that year), and 2001–02 (the construction of a second oil pipeline for heavy crude).

ENERGY INVESTMENT

With the discovery of oil, investment in the energy sector became a priority. Accordingly, the first oil revenues that came in were used to build a new refinery in Esmeraldas province alongside the terminal of the trans-Andean oil pipeline, and planning got underway for a large hydroelectric plant in the Amazon region. Although these projects were realized, problems persist. The refinery has not been properly maintained, new facilities have not been built, and today Ecuador is a net importer of fuel.² As for hydroelectricity, Paute—the large plant built with the first oil revenues—was constructed without sufficient attention to the other projects that would have halted sedimentation. As a result, Ecuador today imports hydroelectricity from neighboring countries. In large measure this is because neither the refinery nor the hydroelectric plant is profitable, due to the aforementioned subsidies.

DEVELOPMENT STRATEGIES

Between 1972 and 1982, the first period of Ecuador's development of its energy sector, the country adhered to the import substitution strategy then prevalent in Latin America. The result was a highly-protected industry, of little national value added. All oil revenues were squandered, along with available private financing. This model collapsed with the 1982 debt crisis.

From 1982 to 2007, policies proposed under the so-called “Washington Consensus” were only partially implemented. Short-term political interests prevailed at every moment: the 1992 elections resulted in large majorities for right-wing parties, yet they did not seek a readjustment of the policy program. It was a period of economic stagnation.

In 2007, the government of Rafael Correa formally abandoned the policies dictated by the Washington Consensus, proposing instead a new kind of socialism emphasizing the empowerment of the poorest social groups. In contrast to “historical” socialism of the Soviet kind, which transferred ownership of the hitherto private means of production to the state, the socialism of President Correa proposes to gradually increase ownership of the means of production by unions, cooperatives, and communes.

This declaration of independence vis-à-vis the international community coincides with the return of oil to its price at the time of the 1982 crisis, when the strategy of economic opening was adopted.

OIL AND CONFLICT

Oil was found just east of the Andes where the Amazon jungle begins. At the time, the area was sparsely populated; the inhabitants were mostly indigenous communities with different levels of contact with the dominant culture. For that reason, there was no conflict between the local population and the central government over access to the resources generated by oil exploitation.

The discovery of oil witnessed the beginning of a disorganized process of settlement not very different from the settlement of the West in the United States. Institutions as well as the law arrived late relative to the growth of the population. While the population density in the area is low, settlers increasingly resorted to violence to obtain what they wanted both from the government and the companies. This has taken the form of occupying facilities (particularly in the oil regulation center in Lago Agrio as well as pumping stations); staging incursions in oil fields, often taking equipment; and sabotaging the pipeline. At times the settlers are suspected of committing acts of sabotage to collect compensation from Petroecuador.

Ever more, funds are pre-allocated to the Amazonian provinces. Yet it would appear that optimal use is not made of the funds; on occasion, there are suspicions of embezzlement. In addition, the funds tend to remain in the provincial capitals, and the communities near the oil fields do not consider themselves to be beneficiaries.

There is considerable opposition to oil activities by environmental NGOs. At this time, efforts are focused on halting the expansion of the oil frontier eastward. These NGOs work with the communities, trying to persuade them to oppose the oil companies. For their part, the oil companies also work with the communities, to get them to support economic programs. The government assumes a position that is essentially passive. The result is conflict among the communities.

The relationship of the state to the private oil companies has been conflictive. The discovery of crude in the late 1960s took Ecuador by surprise; a new Law on Hydrocarbons was adopted and a state oil company established only a few months before the crude began to flow in the early 1970s. Immediately thereafter, the oil contracts were renegotiated. That conflictive relationship coincided with the first oil shock.

Midway through the current decade, when oil prices were once again on the rise, the conflict was played out again with the private oil operators. The Ecuadorian government believed that its share of the new oil revenues was insufficient. Ecuador adopted a law by which the state can determine what percentage of the revenues from the price increase will accrue to the state and what share will go to the private companies. This has led various oil companies, most importantly Repsol, to seek international arbitration.

At the same time, in 2006 the state determined that a transaction between Occidental Petroleum and the Canadian company EnCana³ constituted a sale of rights that, under Ecuadorian law, cannot take place without prior authorization. (Along with Repsol, Occidental is the largest of all the private producers in Ecuador.) Accordingly, the Ecuadorian government declared that Occidental's rights to its concession had lapsed (prematurely expired) and therefore that its holdings reverted to the state, without compensation. Occidental has filed a complaint before the International Center for Settlement of Investment Disputes (ICSID) of the World Bank. Currently, Ecuadorian authorities are investigating whether a similar transaction between Petrobrás and the Japanese firm Teikoku also might result in a finding that Petrobrás' rights had also "lapsed."

REGIONAL ENERGY INTEGRATION

There has not been integration with respect to oil. The only exception worth noting is that when Ecuador lacked sufficient capacity to transport crude, it used the oil pipeline in southern Colombia. The first ambitious oil integration projects are those that have been announced by Presidents Correa and Chávez involving the construction of a new refinery that would process Venezuelan crude for export to Asia.

As for electrical energy, Ecuador is currently connected to the electrical grids of Colombia and Peru and buys electricity in the spot market. To generate electricity Ecuador also buys gas from a foreign-owned, offshore concession in Northern Peru.

CONCLUSION

Oil has transformed Ecuador in a number of ways. First, the import-substitution model in place from the 1950s until 1982 succeeded in attracting investment only when the discovery of oil augured the expansion of the domestic market. Second, the existence of oil prompted the settlement of the Amazon region as infrastructure for oil exploitation was built. Third, oil made it possible for the state to grow in size without having to adopt policies for the redistribution of national income. Fourth, oil caused social conflict, but the extent of conflict in Ecuador compared to the conflicts in other oil-producing countries is something to be studied comparatively. At first glance it would seem that Ecuador has suffered less conflict than, for example, Bolivia, which is rich in natural gas, or various other oil-producing countries of Africa and the Middle East. Finally, the existence of oil resources appears to have generated complacency regarding the need to design economic policies conducive to development. This phenomenon is known as "Dutch disease."

NOTES

1. A crude shipment may be sold two or three times before reaching port, so there is no certainty as to its final destination.
2. If one includes crude oil in this calculation, Ecuador is a net exporter.
3. EnCana is a private oil and gas company based in Calgary, Alberta. [Eds.]

Energy, Development, and Regional Integration

David Mares

This paper provides an overview of three general themes: 1) the relationship among energy, development and institutions; 2) the history of energy cooperation and integration in Latin America; and 3) the major obstacles to further energy cooperation and integration in the region. A key variable that emerges in each of these subject areas is the institutional context within which energy policy is made. This institutional context is a key determinant of whether or not energy policy contributes to development and promotes stable regional integration.

ENERGY, DEVELOPMENT, AND INSTITUTIONS

Abundant and competitively priced energy is a key infrastructural element which attracts industry and a modern service sector and facilitates further natural resource extraction. While promoting economic development, the energy sector itself is very capital intensive and not a major generator of employment. Energy is a fundamental component for any improvement in social welfare and health. Energy promotes education by facilitating studying after dark and making it possible for children to attend school rather than gather water or wood for fuel. The contributions of energy to health are multiple: cooking indoors with cleaner burning LPG or natural gas produces fewer respiratory diseases than traditional fuels and makes it more likely that water will be boiled, thus reducing water borne illnesses; electricity permits health clinics and hospitals to function around the clock and access the internet to expand the diagnostic capabilities of local doctors; public health information for disease prevention and treatment can be disseminated more broadly through radio and television.

Table I, indicating access to electricity in 2005, demonstrates that the level of access to electricity shows quite a bit of variation among Latin American populations, closely coinciding with social and economic situations. In Argentina, 95 percent of the population has access to electricity, but in Bolivia, only 64 per-

TABLE 1. ELECTRICITY ACCESS IN 2005: LATIN AMERICA

At end of 2006 (billion barrels)

	Electrification Rate	Population without electricity million	Population with electricity million	Source
Argentina	95.4%	1.8	37.1	GNESD (2004), ECLAC (2002)
Bolivia	64.4%	3.3	5.9	ECLAC (2003), OLADE (2002)
Brazil	96.5%	6.5	179.7	ECLAC (2003)
Chile	98.6%	0.2	16.1	APEREC, ECLAC (2003)
Colombia	86.1%	6.3	39.2	ECLAC (2003)
Costa Rica	98.5%	0.1	4.2	ECLAC (2002)
Cuba	95.8%	0.5	10.9	OLADE (2002)
Dominican Republic	92.5%	0.7	8.2	DHS (2002), OLADE (2002)
Ecuador	90.3%	1.3	11.9	ECLAC (2002)
El Salvador	79.5%	1.4	5.5	GNESD (2004), ECLAC (2004)
Guatemala	78.6%	2.7	9.8	ESMAP (1988/1999), DHS, OLADE (2002)
Haiti	36.0%	5.5	3.1	DHS (2000), Engineers Without Borders (2004)
Honduras	61.9%	2.7	4.4	ECLAC (2003)
Jamaica	87.3%	0.3	2.3	OLADE (2002)
Netherlands Antilles	99.6%	0.0	0.2	IEA estimate
Nicaragua	69.3%	1.7	3.8	ECLAC (2002), DHS (2001), Global Environment Facility (2001)
Panama	85.2%	0.5	2.7	OLADE (2000)
Paraguay	85.8%	0.9	5.2	OLADE (2002)
Peru	72.3%	7.7	20.2	ECLAC (2004)
Trinidad and Tobago	99.1%	0.0	1.3	OLADE (1997)
Uruguay	95.4%	0.2	3.3	US Commercial Service (2005)
Venezuela	98.6%	0.4	26.1	ECLAC (2003)
Other Latin America	87.3%	0.4	2.9	IEA estimate
Latin America	90.0%	44.9	404.3	

cent and in Honduras, 62 percent have access. The rates drop as one moves further down the development ladder. In Haiti, the poorest country in the hemisphere, a mere 36 percent of the population has electricity.

Institutions affect the broader societal and governmental context within which oil and gas markets function. For producing countries, the most prominent development issues revolve around the “resource curse.” This term describes a country that is richly endowed with valuable natural resources and still remains a poor country. Why? The abundance of valuable natural resources creates incentives for rent-seeking behavior and corruption on the part of government, the private sector, and even consumers, thereby disrupting the ability of a government to function efficiently and effectively. But—as the experiences of Norway, Great Britain and the United States demonstrate—the resource curse is not inevitable. What determines whether or not a country falls victim to the “resource curse” is institutional. Transparent and accountable institutions of government minimize both rent-seeking behavior and corruption.

The politics of developing useful institutions must be analyzed at the domestic, regional, and global levels. The institutional context within which energy is developed nationally and traded regionally is a fundamental determinant of the relative prices of distinct energy sources; the institutional context therefore affects demand for and investment in specific sources of energy. It is important to keep in mind that oil and gas have competitors in the market place. One of the factors that affects the use of natural gas—even though it is a cleaner fuel than its chief competitors for power generation (diesel and coal) or for home heating (wood)—is its ability to compete in terms of price with those alternative sources of energy. In a country like Brazil, the availability of hydroelectric power is a major determinant of the demand for natural gas, because the consumer price of electricity generated from hydroelectric power is so cheap. If nuclear power plant construction proceeds in Brazil, Argentina, and Chile, and if the energy produced does not reflect the real cost of construction and disposal, then the demand for natural gas and petroleum in the Southern Cone will also be affected.

REGIONAL ENERGY COOPERATION AND INTEGRATION

The issue of energy integration in the region arises because there are geological and economic factors that should lead to greater integration of Latin America’s energy sectors. Geology and nature have given different parts of the region an abundance of natural endowments that can be used to produce energy: rivers for hydroelectric power, petroleum and natural gas deposits, biomass, and even

coal. Coal is not often part of the discussion, even though coal is in the background as a major energy source for the region. Colombia is a world power in terms of coal and there is technological development in the area of 'clean coal'. When Chile became concerned about the cutoff of gas supply from Argentina, one of the alternatives was to turn its power plants into coal-fired plants.

The major economic factor stimulating efforts to promote energy integration is not efficiency (as it might be in the case of the United States and Canada) but rather, disparities in levels of economic development. Many of the largest and fastest growing economies in the region (Brazil, Chile, and now Argentina) have lacked domestic sources of energy to fuel continued growth. However, many of the countries with high levels of poverty (Bolivia, Ecuador, Peru and Venezuela) have a surplus of easily accessible energy resources. It seems natural to expect that it would be to the mutual advantage of all parties to develop a regional energy market. Perhaps once these economic development drivers create a regional market, efficiency considerations may modify the way that market functions, but the current driver is definitely the search for economic growth.

Despite the availability of resources, however, the region is unlikely to be self-sufficient in energy. The trajectory for economic and population growth indicates that the regional demand for energy will continue to grow. But the disparities in access to energy and the domestic institutional context within which energy policy is made suggest that regional production will not be sufficient to meet that demand.

Because there has been energy cooperation across the region, integration does not start from ground zero. Venezuela has made concessionary sales of petroleum to the Caribbean and Central America, as has Mexico to Central America. There are cross-border investments in the energy industry as well, as reflected, for example, in Venezuela's investment in an oil refinery in Nicaragua. Countries are also cooperating in developing the infrastructure to deliver energy. The *Plan Pueblo-Panama* from Mexico to Panama is a treaty with some component parts that have already been implemented. An initial phase linking the Guatemalan and Mexican electrical grids is already under construction, with the Mexican side completed and the Guatemalan scheduled to come on line in late 2008.

Table II presents data on power imports and exports, revealing that some energy integration has already taken place. In 2002, Argentina was already exporting power to Brazil, Chile, and Uruguay; Colombia to Ecuador and Venezuela; Paraguay to Argentina and Brazil; Uruguay to Argentina; Venezuela to Brazil. Power is a very important component of energy integration because energy is useful to the extent that it is turned into power that can be used. If a country can export power, it is generating value-added to its primary resource.

TABLE 2. SOUTH AMERICAN POWER IMPORTS AND EXPORTS 2002 (GWh)

FROM	Argentina	Bolivia	Brazil	Chile	Colombia	Ecuador	Paraguay	Peru	Uruguay	Venezuela	Total Imports
Argentina							6143		1908		8015
Bolivia											0
Brazil	751						35443			416	36609
Chile	1768										1768
Colombia											8
Ecuador						56					56
Paraguay											0
Peru											0
Uruguay	559										559
Venezuela						549					556
Total Exports	5299	0	0	0	618	74	42336	0	1909	423	

Source: Business News Americas, "Energy Integration in Latin America"
 Note: Differences between totals and individual figures are from rounding figures off.

Integrating electricity markets is much more challenging than integrating raw materials. Consider, for example, the case of Chile. When Argentina began reducing its natural gas exports to Chile in 2004, the Chileans had an adjustment problem: they had to figure out how to run their power plants without natural gas from Argentina. More expensive and more contaminating options existed; diesel, coal, etc. But consider what would have happened in Chile if, rather than importing gas from Argentina via pipeline to run power plants in Chile, the power plants themselves were located in Argentina and the transmission lines came from Argentina into Chile. If, because of domestic considerations and priorities, the Argentines decided not to fuel the power plants that sent electricity to Chile, Chile would have had a much more difficult time substituting for imported power. Consequently, power integration is a much more delicate, intimate, and deeper level of integration. It is thus more problematic, particularly when countries have a variety of options at their disposal.

South America is crisscrossed by natural gas pipelines. The first transnational pipeline was from Bolivia to Argentina in the early 1970s, a point at which Bolivia sold large volumes of natural gas to Argentina. In the 1980s, however, Argentina deregulated its domestic market, attracted capital into the sector, and discovered that it had significant amounts of natural gas. Consequently, Argentina did not need any natural gas from Bolivia. Partly as a result of countries' search for self-sufficiency, and partly as a result of the political instability of exporters of energy, markets have been experiencing a great deal of fluctuation.

The new situation in the 1980s created tensions between Bolivia and Argentina. First came price revisions, as the Argentines insisted that Bolivia lower its prices to levels prevailing in the deregulated Argentine market. Disputes then erupted over volume when Argentine production not only supplied the domestic market but also produced a surplus for export. Rather than understanding that the market for natural gas had undergone a dramatic shift, Bolivians felt exploited by their neighbor.

The progress of regional energy integration has slowed since 2004. Amid great fanfare, the *Gran Gasoducto del Sur* linking Venezuela with Argentina, with touted benefits for all countries in between, was proclaimed to be a major step forward in energy integration. The project was never economically viable, and in 2007 Venezuelan President Hugo Chávez, the principal force behind the project, announced that he understood that it would not go forward.

The failure to move ahead on the Gran Gasoducto is illustrative of the on-and-off energy relationship between Brazil and Venezuela. There has been a great deal of discussion about the two countries working together, spurred on

by President Chávez and Brazilian President Lula da Silva. Initially, the two countries were going to collaborate on a re-gasification plant and a refinery in Brazil, and Brazil was going to invest in the Mariscal Sucre gas field in Venezuela. But Brazil has commenced work on the re-gasification plant and refinery without Venezuelan participation, and Petrobrás has announced that it will not be investing in the Venezuelan gas field.

Bolivia and Brazil have also experienced a great deal of uncertainty in their energy relationship. In 2006, Bolivia nationalized its natural gas fields and dramatically increased its share of the royalties from non-Bolivian companies operating in Bolivia—both national oil companies (NOCs) and private international oil companies (IOC's). State-owned NOCs are thus not immune from the effects of changing contracts, and have many of the same kinds of concerns as IOCs do with respect to foreign investments.

Brazil's developing gas market at home, some deregulation of its energy sector, and Bolivian nationalization of the oil and gas fields and refineries stimulated new investments in Brazil's oil and gas sector. The result is that Brazilian hydrocarbon discoveries have been constant and large, investment in alternative fuels has grown, and the country is developing a capacity to import liquefied natural gas (LNG) from other countries in the region (Trinidad and Tobago, possibly Venezuela) and beyond (West Africa, the Middle East, and Southern Asia). This evolving energy picture affects the Bolivian-Brazilian energy relationship: Petrobras has gone from being a major investor in Bolivia, to freezing investments, to re-entering the Bolivian market in order to relieve short-term supply problems.

Two more problematic energy relationships are those of Argentina-Chile and Bolivia-Argentina. In the end, Argentina was unable to meet its contractual obligations to Chile and violated a state-to-state treaty between the two countries that guaranteed the Chilean market national treatment (that is, the Chilean market would be treated as if it were the Argentine market). Bolivia also is unable to meet its contractual obligations to supply gas to Argentina. Bolivia does not produce enough gas to honor its contractual obligations with both Argentina and Brazil. And despite the fact that Argentina pays a higher price for Bolivian gas, Bolivian authorities opted to drastically cut exports to Argentina in order to fulfill the entire volume stipulated in the contract with Brazil. These Argentine and Bolivian decisions send one more signal to the marketplace that the credibility of contracts in the region is very low. The questions today for the governments and private investors of consuming countries are not whether the resources are in the ground, or not even whether price will direct the flows, but whether those resources will get into the market according to contractual obligations.

CHALLENGES TO CONTINUED COOPERATION AND GREATER INTEGRATION

The chief challenges to expanded regional energy cooperation arise in the areas of investment, the distribution of economic rents, the relationship between the export and domestic markets, regulatory regimes, and the use of energy as a foreign policy tool.

Investment capital today, both public and private, is available and interested in the region's natural resources, but that availability and interest are unlikely to persist in the medium to long term. As the U.S. economy begins to decline, it will have a negative impact on the global economy, which in turn will have a negative impact on the availability of capital for developing countries. A U.S. recession will also drive down energy prices, thereby reducing the ability of energy producing countries to invest at home, including in their own energy sectors.

In the short term, there is a window of opportunity in terms of the availability of capital for expanding energy resources. The question concerns the mobilization of that capital for the sustainable long term development of the region's resources and development.

What is the fair *distribution of the economic rents* associated with the production of energy? Analysts, governments, and citizens in the region used to ask whether those rents would go to a Latin American government or to an international company. In the current context of increased regional trade, the distribution question affects not only IOCs and privately owned Latin American companies but also internationally active NOCs, that is, Latin American governments buying and selling to each other. The issue of rent distribution also affects the vulnerability of supply: if a country is demanding a distribution of rents that is out of sync with what the markets suggest is an appropriate distribution, then that country is not going to attract the investment necessary for exploration, production, and transportation of that energy. If a country is not able to attract investment, it ends up not being able to supply its contracts (e.g., Argentina and Bolivia).

A related export issue is whether natural gas rich countries will export the raw material (the gas itself) or value-added products. This is an important question in Bolivia. For decades, Bolivians have been talking about "industrializing" the gas (turning it into petrochemicals, electricity, etc). The problem is that other Latin American countries do not want to pay Bolivia the price of value-added products. They would rather add that value in their own countries. In addition and as highlighted earlier, the vulnerabilities are greater if a country imports a value-added product such as electricity rather than the resource, such as gas, itself.

The relationship between the export and domestic markets is another key issue for regional integration. Energy exporters seek to use their energy to generate revenues in order to develop their economies. However, energy exporting countries frequently find themselves debating whether it is better to export the resource and then use the resulting income, or to guarantee a particular level of supply for domestic use and only export the surplus. Giving the domestic market priority over exports creates a situation in which Latin American importers become vulnerable to the domestic energy policy decisions of Latin American exporters. Price can be the driver of giving priority to domestic supply. In Argentina, low domestic prices have decreased exploration and production, producing supply shortages. The Argentine government has thus cut supplies to Chile in order to mitigate the impact of shortages at home.

An undeveloped market at home can also be a factor behind giving priority to domestic consumption. Bolivia's *altiplano*, where the majority of the indigenous population lives, receives little natural gas. To remedy this situation, the government has sought to build a gas infrastructure, offsetting costs by guaranteeing a flow of gas supplies. But in the current context of inadequate exploration and production investment, political decisions to develop the domestic market clash with Bolivia's commitments to supply energy to its Latin American neighbors. As noted above, Bolivia is behind in meeting its contractual obligations to Argentina, even though Argentina pays the highest prices for gas.

Emphasizing domestic priorities over regional markets is rooted in an historical sense of exploitation. For example, Venezuela was an energy giant in the 1970s and '80s, but most of the Venezuelan population failed to benefit. Whether due to the "resource curse" or not, the reality is that there are enormous numbers of very poor people in Bolivia, Ecuador, and Venezuela. It is thus understandable that in new periods of democracy, citizens say that they want these resources to be used for domestic development first. That, then, raises a challenge: how can resource nationalism be harnessed in support of regional energy cooperation?

A key issue for regional integration and cooperation concerns the reliability of supply. If a supplier decides to emphasize and give priority to the domestic market, the importing country loses control over how much energy will be available for purchase. Suddenly, the importing country is faced with a situation in which it gets what is leftover. If nothing is leftover, the importer gets nothing, regardless of any contract that might exist.

Regulatory regimes affect investment; therefore they affect the security and volume of supply. Appropriate regulatory regimes give the regulator a degree of auton-

omy from the demands of vested interests and governments. That independence provides confidence to all parties that the basic supply and price terms of the energy contracts will be respected. Unfortunately, in many producing countries of the region the regulatory function is underdeveloped and often in the hands of Ministries of Energy or Finance and thus subject to political pressures and manipulation. The consequent uncertainty discourages investors, thereby slowing the development of a regional market.

Regulatory regimes also affect contracts directly, often by unilaterally altering the terms under which private investments were permitted. The concern for investors is not whether the contracts will be subject to renegotiation: when there is a dramatic fluctuation—either an increase or a decline—in price, companies (whether they are NOCs, international oil companies, or local private companies) know that the old contracts are not sustainable. What NOCs and international oil companies do not want is to renegotiate a contract and then thirty days later have to renegotiate it again, and six months later have to renegotiate yet again. That is simply too much uncertainty around investments that are, after all, enormous. It is also too much uncertainty for governments, whether they are exporters depending on the generation of income, or importers needing to generate power. Massive uncertainty is deeply corrosive to the energy trade. Regional energy integration thus requires the development of better and stronger regulatory regimes.

Using energy as a foreign policy tool constitutes another obstacle to regional energy integration. This issue relates not only to the non-market terms on which energy may be sold, but also to the non-market terms for gaining access to supply an energy market. When access to energy exports and energy markets are linked to specific behavior by governments, governments are forced to consider not only the cost of that specific energy resource but also the cost of changing the country's foreign policy. If we assume that governments adopt foreign policies that best meet the needs of the political coalitions supporting the government, then any changes to those policies will require costly political adjustments at home. This added political cost could make imported energy less competitive with alternative sources and thus slow regional integration.

CONCLUSION

Whither energy cooperation and integration in Latin America? Security of supply is not an issue only affecting the United States. Latin American countries also have concerns about the security of their imported supply, and have turned increasingly

to domestic exploration, extra-regional LNG imports, and potentially, nuclear energy. Assuring energy security in Latin America means that energy integration will be global, not just regional in scope.

Latin American energy importers are unlikely to pay more for energy imports simply because they come from a poor neighbor. It is desirable to make concessionary sales an element of the regional dynamic, but an energy integration scheme cannot be built around the idea that through energy, governments and consumers will be providing aid. A central question concerns whether or not Latin American energy exporters will be competitive in an increasingly globally integrated energy market. Bolivia, for example, may actually lose some of the great advantages it had five years ago in the region.

The global integration of energy markets also raises challenges to countries like Ecuador and Venezuela. They will be competing for regional energy markets with international suppliers who offer more stability. When energy security is a concern, stability is something for which consumers are willing to pay.

The fundamental energy question confronting the region today is whether regional energy integration in Latin America will be driven primarily by political agreements or by market relationships. Each of these drivers generates its own problems. If energy integration is driven by political agreement, then the challenge for both investors and importing countries is the credibility of those political agreements in a context of economic or political volatility. For example, in 2001–2002, the problem in Argentina regarding the security of exports was not initially one of political will, but rather the collapse of the Argentine economy. That set into motion a number of political and economic reactions that neither Chile nor Argentina had foreseen when they signed the treaties in the 1990s that ostensibly provided Chile with guaranteed access to Argentine gas. In cases such as Ecuador and Bolivia, where over the last decade multiple presidents have been forced out of office by demonstrations in the streets, the credibility of political agreements will be low. How can an importing country confidently develop its energy policies based on the promised future behavior of the Bolivian and Ecuadoran governments? Energy integration affects the entire energy matrix and energy infrastructure, all of which entail large investments and big gambles. The reliability of political agreements is thus crucial.

Market relationships generate their own challenges. If energy integration is based on a regional market, the implication is that countries will not give priority to their domestic market. The market of a neighboring country will have the same priority as the domestic market because both countries are part of a regional market and energy flows across national borders.

But the marketplace does not meet demand; it meets *effective* demand,¹ and many people in Latin America do not have effective demand for energy. Thanks to democracy in its various forms across the region, those without effective market demand have effective political demand. Thus, it comes as no surprise that the region's energy exporters are seeking to rapidly and dramatically increase access to the benefits of energy (power, employment, social welfare, and wealth). Market relationships as a result need to adjust.

Who will pay the cost of delivering access to the benefits of energy to disadvantaged social sectors? Do consumers in Latin America's importing countries foot the bill via ever higher prices? This increases the likelihood that importing countries will substitute energy sources and diversify their energy matrix, thereby diminishing the long-term wealth to be generated from the exporting country's energy supplies. Or do the resources for improving access come from a reassessment of the budget priorities of the exporting country, which in turn means that some domestic programs and sectors will see their relative share of the budget decline? Put simply, the question is whether the resources to expand market access to disadvantaged sectors will come from selling energy to neighboring countries at a higher price, or whether the resources will come from the national government using money from its own treasury—wealth that has been earned through energy exports—for domestic investment. The answers are neither easy nor self-evident.

NOTES

1. Effective demand refers to the idea that one must have money or other assets (purchasing power) or some product to sell in order to make demand *effective*. [Ed.]

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