

one

Evaluating the Prospects for U.S.-Cuban Energy Policy Cooperation

JONATHAN BENJAMIN-ALVARADO

The last thing American energy companies want is to be trapped on the sidelines . . . while European, Canadian and Latin American rivals are free to develop new oil resources at the doorstep of the United States.

Simon Romero, "Spanish Seek Oil Off Cuba, As Americans Watch Silently,"
New York Times, July 7, 2004

As history shows, national security and economic prosperity are inseparable. The simplest answer—undoubtedly still complicated—is finding and drilling more oil from domestic sources, using less oil overall and importing far less than we do today. This requires a national energy strategy that has never existed, one that shifts U.S. consumption from fossil fuels like oil and coal toward carbon-free solutions like nuclear, wind and solar.

"Security Case for a National Energy Plan,"
Dallas Morning News, editorial, June 19, 2009

These two quotations, dated nearly five years apart, distill the essence of why the United States should be looking carefully to the development of energy resources in Cuba. For the past fifty years, U.S. policy toward Cuba has relied on the application of cold war measures—economic sanctions, technology denial, and political isolation—in an effort to push Cuba over the tipping point of regime collapse and toward the peace and prosperity that would follow from embracing democracy.

This policy, which endures in part to maintain the notion that such measures will foster political change on the island and after nearly half a century

is almost quaint, has caused the United States to overlook many of the tectonic shifts that have taken place in Cuba.¹ Such a singular focus has in some respects blinded U.S. policymakers to broader strategic changes in the region involving issues that can hardly be understood, much less resolved, without a Cuban presence. These policy areas include immigration, trafficking in human beings and narcotics, economic development, and now, energy. These remarks should not be taken as a suggestion to disregard the international community's long-standing demand for the Cuban government to expand personal liberties, support the rule of law, and extend human rights to all inhabitants of the island, but these demands should be balanced against equally important and perhaps more pressing economic and environmental concerns.²

It is relevant to U.S. energy security and geostrategic interests that 77 percent of proven oil reserves globally are held by national oil companies (NOCs) and that 11 percent of proven oil reserves are held by NOCs with equity access, meaning that these firms retain the contractual rights for exploration, extraction, and production of oil drawn from those reserves. Four of the five largest oil exporters to the United States—Saudi Arabia, Mexico, Venezuela, and Nigeria—are NOCs. There is growing concern about the extent to which imports from those countries are assured, given the potential for political conflict, economic instability, and social upheaval in any or all of those states. This means that only 11 percent of proven oil reserves not already held by NOCs are presently open to international oil companies (IOCs), many of which are based in the United States.³ This political and economic reality heightens the potential importance of U.S. cooperation with Cuba on the issue of energy development.

At present Cuba possesses an estimated 4.6 million barrels of oil and 9.3 TFC (total final consumption) of natural gas in North Cuba Basin.⁴ This is approximately half of the estimated 10.4 billion barrels of recoverable crude oil in the Alaska Natural Wildlife Reserve. If viewed in strictly instrumental terms—namely, increasing the pool of potential imports to the U.S. market by accessing Cuban oil and ethanol holdings—Cuba's oil represents little in the way of absolute material gain to the U.S. energy supply. But the possibility of energy cooperation between the United States and Cuba offers significant relative gains connected to the potential for developing production-sharing agreements, promoting the transfer of state-of-the-art technology and foreign direct investment, and increasing opportunities for the development of joint-venture partnerships, and scientific-technical exchanges.

The relative gains from increased commercial and technical cooperation obviously increases Cuba's domestic energy capacity, but it also possesses the potential of enhancing the United States' energy security by deepening its links in the region. The future vitality of energy security requires access to energy export markets but also the diffusion and dispersion of technology, innovation, research and development of enhanced productive capacities, alternative energy technologies, and the effective management of resources across the region. The economist Jeremy Rifkin argues that "distributive energy markets," marked by highly collaborative efforts to integrate diverse energy resources based in various proportions everywhere, will come to replace the prevailing model of the highly concentrated, conventional energy elites—coal, oil, natural gas, uranium—which are now found in limited geographical regions and are finite.⁵

The development of Cuba as an energy partner will not solve America's energy problems. But the potential for improving energy relations and deepening collaborative modalities with other regional partners is enhanced by pursuing energy cooperation with Cuba for two principal reasons.

1. Cuba's increasing leadership role in the Caribbean region and Central America might be used by the United States to promote collectively beneficial efforts to develop a broad range of alternative energy technologies in the Americas. A Cuba-America partnership might also serve as a confidence builder in assuaging the misgivings on the part of regional partners regarding American domination.
2. Cuba's significant human capital resources in the scientific and technological arena have been grossly underused. Cuba possesses the highest ratio of engineers and Ph.D.s to the general population of any country in Latin America, and this can be viewed as a key asset in the challenge of maintaining energy infrastructure across the region. Both Mexico and Venezuela face significant costs in maintaining their sizable energy production, refining, and storage capabilities. The integrity of these two national energy systems is of paramount interest to U.S. energy security concerns because of the potential harm to the economy that would occur if either state were unable to deliver its exports to the American market.

In this light, the impetus for normalization of relations writ large between the United States and Cuba is not oil per se, but enhanced energy cooperation, which could pave the way for technical and commercial exchanges that, given the evolving nature of energy resources and energy security, could

provide an opening of collaborative efforts that could have mutually beneficial effects.

What has the failure to engage Cuba cost the United States in these geostrategic terms? Very little, one could argue. Strategically, Cuba has been a stable entity in the region. Politically, too, it has been a mostly static environment: with the embargo in place, policymakers and elected officials have been able to predict reactions to policy initiatives with relative certainty. U.S. business interests in Cuba since the early 1960s have been negligible, with the exception of a recent increase in humanitarian agricultural and medical sales. But a more central issue is this: In light of growing concerns regarding energy supplies in the United States and demands for domestic and regional exploration to meet American consumption, what is the cost to the United States of maintaining a status quo relationship with Cuba? In economic terms, the cost of the failure to engage Cuba has been considerable.

In its 2008 report, *Rethinking U.S.-Latin American Relations*, the Partnership for the Americas Commission, convened by the Brookings Institution, suggested that the basis for effective partnership between the United States and its Latin American and Caribbean partners is shared common interests. The report states, "Cuba has long been a subject of intense interest in U.S. foreign policy and a stumbling block for U.S. relations with other countries in the hemisphere."⁶ Specifically, the report pinpoints two key challenges facing the region that are directly relevant to the subject of this book: securing sustainable energy supplies and expanding economic development opportunities. The April 2009 report of the Brookings project on U.S. Policy Toward a Cuba in Transition identified both medium- and long-term initiatives related to energy that directly fulfilled an element of the policy objectives recommended in their report.⁷ In order to specifically promote what the report termed "a constructive working relationship with the Cuban government to build confidence and trust in order to resolve disputes, with the long-term objective of fostering a better relationship that serves U.S. interests and values," it recommended a medium-term initiative that "allows licenses for U.S. companies to participate in the development of Cuban offshore oil, gas, and renewable energy resources." The report also recommended that a long-term initiative be undertaken to "provide general licenses for the exportation of additional categories of goods and services that enhance the environment, conserve energy, and provide improved quality of life."⁸

Because of recent developments in Cuba and the growing investments being made there made by regional partners, in particular Venezuela and Brazil, the importance of Cuba's energy development objectives becomes

decidedly more pronounced, in terms of both Cuba's national development priorities and the United States' energy and geostrategic priorities.⁹

One of the recommendations made in *Rethinking U.S.-Latin American Relations* is especially relevant: developing sustainable energy resources. The report recommends that the United States, in partnership with other governments in the hemisphere, establish a "Renewable Energy Laboratory of the Americas" that would promote hemispheric cooperation on developing solar, wind, and cellulosic-biomass technologies; intensify hemispheric cooperation in the peaceful use of nuclear energy; and promote regulatory regimes that are open to private energy investment and trade in energy technology and services.¹⁰

In a special section on U.S.-Cuban relations, *Rethinking U.S.-Latin American Relations* makes two other recommendations: "Promote knowledge and reconciliation by permitting the federal funding of cultural, academic, and sports exchanges; and encourage enhanced official contact and cooperation between U.S. and Cuban diplomats and governments."¹¹ The authors go on to articulate a set of steps or best practices that would serve to foster such a partnership and, more important, provide a set of measures open and flexible enough to account for the complexity and specificity of issues that surround energy development. In closing with a special section on Cuba, the report puts the spotlight on the centrality of the island nation and the effective management and potential leadership that it may offer in the effort to deal with these issues. While expanding the ambit of U.S. geostrategic interests in the region, it is critical that the discussion include the role Cuban energy development will have on the assessment and pursuit of those interests.

Cuba faces daunting policy challenges in the twenty-first century. Chief among them is the task of providing reliable sources of energy for economic development and revitalization in the post-cold war milieu. In light of the discovery of offshore oil and gas reserves, what policy trajectories and alternatives will increase the probability of energy self-sufficiency and sustainability in Cuba in the short and long term?

Perhaps at the time when Cuba diversifies its energy suppliers and develops its offshore resources it will have the economic independence necessary for political and economic evolution. As with many policy issues, Cuban energy policy may or may not conform to objectives that will lead to the successful implementation of the country's energy development objectives. The Cuban energy problem—that it is highly dependent on energy resources for its economic livelihood—is grounded in well-informed assessments, captured by the technical analyses of production capabilities, transmission and

distribution challenges, and growing energy demands. This highly focused body of literature has identified significant shortcomings—high levels of dependency on imported oil, a crumbling energy production capability, and a fragile energy infrastructure—in the analysis of energy policy development and sustainability and in part acknowledges competing approaches toward the resolution of energy problems on the island.¹² But these analyses remain acutely attentive to the following elements of the Cuban reality: Cuba has learned from past experiences and is very much aware of political and economic risks related to imported oil. The collapse of the Soviet Union and the 2003 oil strike in Venezuela taught Cuba two very expensive lessons. President Raúl Castro understands the risks associated with single-source oil dependency; his visits in 2009 to Brazil, Russia, and Angola underscore his concerns. An emerging energy relationship with Brazil would provide a balance to Cuba's current dependency; other energy relationships could bring with them the possibility of corrupt and unsavory business practices.

Since the 1970s, energy development schemes in Cuba have included dedicated attempts to link such development to the material well-being of Cuban society overall. Thus, energy policy has been infused with policy initiatives in higher education, science and technological advancement, and increasing domestic human capital resources.¹³ The centrality of this linkage was heightened by the significant loss of foreign assistance with the dissolution of the Soviet bloc. One could argue that this event inadvertently made Cuba independent for the first time in its history. The result of this forced independence has been the development of policy initiatives that rely on both imaginative and instrumental steps to meet the most pressing public policy needs. This includes the development of creative initiatives to enhance energy conservation, sustainability, and efficiency in organic agriculture; ecotourism; the development of energy cogeneration capabilities; and increasing offshore and onshore oil and gas production. These measures are linked to enhancing the political and economic status of the state in relation to its ability to meet the immediate basic needs of Cuban society while simultaneously pursuing economic initiatives that link Cuba to the region over the long term. Such analyses reveal how these gaps present opportunities for the United States to ameliorate bilateral relations and opportunities for the Cuban regime to grow its regional presence. However, few of these works link these evaluations to broader strategic imperatives as they apply to Cuba, the United States, and the region. Does Cuban oil hold the key to improving U.S.-Cuba relations and to facilitating rapprochement? The need to provide an answer to that question is the central premise of this book, and doing so is its objective.

Using a set of focused case study analyses of various elements of Cuba's energy sector, we explore the existing base of petroleum resources, in terms of Cuba's productive capacity and the Cuban policymakers' response to the sea change that is the discovery of offshore oil reserves.

We focus particularly on understanding the relationship of energy security, sustainability, and regime transition and continuity to energy policy and regime stability, and how they relate to a reconsideration of U.S. geo-strategic interests. Cuba's ability to successfully manage its energy concerns will play a large role in the future development on the island. Speculation has been widespread as to the course the Cuban regime under Raúl Castro might pursue, and it might deviate from the policy priorities of the fifteen years from 1992 to 2007 under the leadership of Fidel Castro. The successful implementation of energy development policy in Cuba in this new policy environment can be seen as a bulwark against the political instability, crippling poverty, and economic stagnation that plague many developing states.

Regardless of how the regime evolves, the United States will be obliged to respond to these developments because of its own broader domestic commercial and energy-security interests. The success or failure of Cuba's future energy policy potentially has direct implications for policymakers in the United States because of proximity, history, and the continuing strategic importance to the United States of a stable Cuban regime and of energy security in the Caribbean region. The last factor is of course largely shaped by Cuba's strong relationship with Venezuela and its growing role in the Petrocaribe oil consortium. The contributors to this volume have conducted numerous interviews with economic, energy, and planning officials and experts in both Cuba and the United States, and have undertaken an ongoing public dissemination of the information they have gathered from this line of inquiry. As a result, the material brought together in this book can inform the policymaking and academic communities concerning the evolution and changes in energy development policy in Cuba that are directly relevant to the United States. We posited eight research questions, which fall into two groupings. The first four questions are about placing Cuban energy policy in proper context:

1. What are the best conditions for creating strong, responsive, and sustainable energy development policies in Cuba?
2. What needs must be met for Cuba to achieve a sustainable energy development policy?

3. In the post–cold war era, is a successful energy development policy in Cuba specifically tied to a particular form of government or economic development approach?
4. What explains the uneven performance (success or failure) in Cuba’s energy development policy from 1992 to the present? How can these lessons be applied to the ongoing effort to develop Cuban energy resources?

The second four questions are about the U.S. foreign policy and national security dimensions of this inquiry:

1. What are the elements of a strategic energy policy? To what extent does the development of Cuban energy resources play a role in that policy? Is it positive or negative?
2. How does Cuba play into U.S. strategic energy policy, and will commercial relations (such as the trade embargo) need to be revised to achieve geostrategic and energy-security objectives?
3. How are the risks of balancing the twin objectives of U.S. energy security and satisfying U.S. energy needs best calculated, controlled, and accepted in the near and long term?
4. What is the best “timing” of U.S. policy implementation to advance the nation’s strategic energy interests? Is this best done now or at a later juncture (such as after the passing of Fidel Castro or during some subsequent transfer of leadership)?

Both sets of questions are intended to help distill understanding of U.S. strategic energy policy under shifting political and economic environmental conditions in Cuba and the implications of U.S. energy policy for U.S. foreign policy in the near and long term. Because both energy policy and other policy areas can be considered “works in progress,” an understanding of possible outcomes is important for future policy considerations and changes in the policymaking milieu.

Until now, little if any useful analysis has existed to aid policymakers in the design and implementation of a constructive engagement with Cuba regarding energy development. This book seeks to fill that hole by identifying, defining, and discussing the conditions under which such an engagement might occur. We will begin by setting the context of the analysis via a broad exploration of the geostrategic environment and assessing especially relevant Caribbean-based opportunities for and obstacles to energy security. This assessment includes an overview of the ongoing evolution of interstate relations in the region and the development of new modalities of international

engagement by the Cuban regime under the leadership of President Raúl Castro. We also seek to identify developing opportunities for engagement and potential cleavages that may hinder the development of trade and cooperation in energy resource development.

The Geostrategic Environment of U.S. Energy Security

Those involved in managing the security interests of the United States need to understand the geostrategic implications of interstate relations in the region in terms of energy security, and the extent to which they affect cooperation between the United States and Cuba. This includes an assessment of the medium- to long-term evolution of energy cooperation between Cuba and Venezuela; of the broader relations between states aligned with the Bolivarian Alternative for the Americas (Alternativa Bolivariana para las Americas, or ALBA) and Petrocaribe consortiums; and of the growing influence of China in the region.¹⁴ Also discussed in this volume is the extent to which the diversification and dispersion of energy resources in Cuba might be a buffer against disruptions in U.S. energy production and distribution that could result from natural disasters or market disruptions.

Before analyzing U.S. energy security in a geostrategic context, it is necessary to define “energy security” and “strategic energy policy.” Energy security is the capacity to avoid disruptions caused by natural, accidental, or intentional events affecting energy and utility supply and distribution systems. Energy security is said to prevail when fuel, power production and distribution systems, and end-user devices possess the five so-called “S” characteristics, as outlined by Drexel Kleber, the director of the Strategic Operations Power Surety Task Force, in the Office of the Secretary of Defense:¹⁵

—*Surety*. Access to energy and fuel sources is assured.

—*Survivability*. Energy and fuel sources are resilient and durable in the face of potential damage.

—*Supply*. There is an identified available source of energy—traditional fossil fuels, alternative energy (nuclear, clean coal, biomass, landfill gas, municipal solid waste, hydrogen), or renewable energy (hydropower, geothermal pressure, wind, tidal, and solar).

—*Sufficiency*. There is an adequate quantity of power and fuel from a variety of sources.

—*Sustainability*. Operating practices can be perpetuated by limiting demand, reducing waste, and effectively exploiting alternative energy and renewable resources to the fullest extent possible.

The five “S” energy security and conservation objectives, though initially intended as a guide for the U.S. Department of Defense, have a much broader applicability; not least, they serve as value parameters for energy policy decisionmaking. As Kleber has noted, “Expenditures on energy conservation measures are viewed as ‘investments’ with long-term rewards and dividends which are paid in commodities beyond money—national security, soldiers’ lives, improved manpower utilization, military to civilian transfers, and increased foreign policy options for elected officials, to name a few.”¹⁶

What, then, would an ideal strategic energy policy look like for the United States—or any other country, for that matter? Mahmoud Amin El-Gamal and Amy Myers Jaffe have set out a detailed analysis of the objectives of a strategic energy policy, including the following:

1. To assure that markets operate efficiently so as to develop the infrastructure necessary to meet growing energy demand
2. To ensure the well-being of the human habitat and ecosystem
3. To ensure that mechanisms are in place for preventing and, if necessary, managing disruptions to energy supply.¹⁷

Articulating these objectives doesn’t mean that fulfilling them is simple for policymakers for the following reasons. First, there are no overnight solutions to the energy supply and infrastructure bottlenecks facing the global markets. The trade-offs between energy-security considerations and national (non-energy) goals across the board must be continuously reviewed. States must adopt an integrated energy policy balancing foreign policy, trade policy, and national security imperatives. In this way, strategic energy policy has the ability to play a significant role in diplomatic discourse, especially where bilateral relations with major oil producers are concerned. For El-Gamal and Jaffe this is a critical consideration, for three principal reasons:

1. U.S. energy independence is not attainable.
2. The policy instruments available to deal with energy supply disruptions are increasingly inadequate.
3. The United States needs to articulate a new vision for optimal management of international energy interdependence.¹⁸

Thus, the questions and issues surrounding energy security become existential in a manner that has hardly been discussed heretofore, but clearly resonates in the face of ongoing changes in access to secure energy sources, persistent energy dependency, and the seemingly insatiable demand for

petroleum products to fuel the American way of life. These concerns immediately raise three important questions relevant to our discussion of possible engagement with Cuba in the energy sphere:

1. How will the ongoing development and evolution of Unión Cubapetróleo S.A. (Cupet), Cuba's state oil company, limit or obstruct U.S. efforts to meet its strategic objectives?
2. What role can international oil companies play in the short- and long-term development of energy resources and infrastructure in Cuba?
3. How will the specter of competition with Brazil, Russia, China, and India over scarce petroleum resources affect U.S. energy-security policy, especially in light of the recent energy-development agreements between Brazil and Cuba, and Russia and Cuba, and the Chinese incursion into Latin American energy markets?

These questions deserve consideration, particularly in light of the growing presence of these external actors in Latin American energy markets. How might they increase competition and cooperation over scarce energy resources?

In assessing the development of Cupet and its impact on U.S. geostrategic imperatives, it is essential to evaluate how the United States might promote its interest in a global and regional energy market shaped and influenced by the activities of national oil companies, especially their influence on developments in Cuba. Including Mexico's *Petróleos Mexicanos S.A.* (Pemex) and Venezuela's state oil firm, *Petróleos de Venezuela S.A.* (PDVSA)—both of them NOCs—in this evaluation is critically important for ensuring an acceptable strategic context to U.S. interests.¹⁹ The objective of this highly path-dependent development is the transformation of Cupet into a stable NOC that exhibits high technical competency culminating in upstream oilfield production and downstream refining and marketing capabilities. It is path-dependent because the set of decisions undertaken to achieve the objective (energy self-sufficiency) is limited by the decisions made in the past by Cuban policymakers, even though past circumstances may no longer be relevant. Prior to 2005, the energy policy objective was clearly centered on the revitalization of existing energy infrastructure and the expansion of domestic production, as limited as that may have been. Now there is a big change in Cuba's circumstances: the growing importance of tapping the offshore reserves.

An NOC, to be successful, must balance national social and political objectives with commercial objectives. Consequently, U.S. strategic policy

must balance the promotion of broader U.S. interests with those of the NOC if there is to be cooperation.²⁰ In light of the recent resurgence of oil nationalism, future cooperation depends largely on the extent to which observers can identify and articulate the common energy-policy interests of NOCs and the United States. In Venezuela, high oil prices have encouraged the Chávez government to undertake bold social policy initiatives.²¹ Some suggest these decisions have come at the expense of critical energy infrastructure needs, thereby increasing the likelihood of energy supply disruptions in the future. Because the United States relies on Venezuela for nearly 1 million barrels of oil daily, the policy decision to prioritize social spending over energy infrastructure revitalization by the Chávez regime could have a significant impact in the United States, if it were to result in diminished capacity in Venezuela to produce and export oil to the United States.²² In Mexico, state control of the NOC Pemex has had the “stultifying impact” of prolonged bureaucratic stagnation, resulting in a decline in production and insufficient funding for reinvestment in new exploration and production. This is highly problematic for Mexico because the government derives 40 percent of its revenue from Pemex.²³ It also has raised concerns about the possibility of energy supply disruptions for the United States. In fact, in the first quarter of 2010 Mexico’s oil exports to the United States fell by over 8 percent, as compared to 2009.²⁴

Concerns over the ability of major oil-producing countries and their NOCs to meet future global demand is compounded by insufficient levels of reinvestment and the looming specter of interstate instability. But it is becoming abundantly clear that Venezuela’s growing investment in Cuba’s energy infrastructure creates the basis for a longer-term relationship that will enable Cuba to expand its productive, storage, and refining capacity, as it simultaneously strengthens the Venezuelan position in the region as a supplier of both crude and refined petroleum products for its Petrocaribe and ALBA partners.

There is also growing consternation that NOCs may be “used as instruments of state policy inimical to U.S. national interests.”²⁵ In particular, China’s growing presence in Latin America is being interpreted as a sign of intensifying competition over energy resources. Flynt Leverett and Jeffrey Bader suggest that this competition could easily be the cause of international conflict in the coming years, as energy demands place a rising premium on the ability of China—already the world’s third-largest crude oil importer, after the United States and Japan—to access oil and gas resources.²⁶

But Leverett and Bader also warn against an overdeterministic view of an inevitable “clash of the titans” over energy resources. Instead they argue that the impact of China on U.S. energy-security interests is a largely unexplored arena. Furthermore, one could view the Chinese search for access to oil, leading it to engage in exploration and production-sharing agreements in remote and difficult locales such as Sudan and the tar sands of Canada, as expanding the global supply of petroleum.

Developing an Analytical Framework of Cuban Energy

Our analysis in this book is based on a number of assumptions.

Assumption 1: Cuba’s Energy Potential

First, we accept the U.S. Geological Survey’s estimate of Cuban energy potential, as presented in its analysis of oil reserves in the Exclusive Economic Zone (EEZ), located off the north coast of Cuba. These reserves are estimated to hold 4.6 billion barrels of oil and 9.8 trillion cubic feet of liquid natural gas.²⁷ In assessing Cuban energy capabilities we offer a sectoral data analysis of energy production capabilities (actual and potential), including the following: upstream oil, upstream and midstream natural gas, petroleum supply and demand balance, oil marketing and convenience retailing, petrochemicals, electric power, sugarcane ethanol, and alternative energy resource potentials.

Assumption 2: Two Alternate Scenarios for Cuba

Second, we analyze the power sector in the context of two scenarios, the Business as Usual/Muddling Through Scenario and the Full Marketization Scenario. The Business as Usual/Muddling Through Scenario assumes that the essential conditions under which the Cuban economy presently functions will change little over the next decade. Under this scenario,

—Cuba will continue to receive subsidized petroleum imports from Venezuela (approximately 50 percent of the total national demand).

—The Cuban economy will rely highly on tourism for the generation of hard currency reserves.

—Cuba will continue to pursue foreign direct investment for the replacement and development of critical infrastructure but with the highly restrictive joint-venture terms under which it presently operates.

The Full Marketization Scenario assumes that Cuba will open its energy sector completely to global markets. Under this scenario, Cuba policymakers will:

- Allow foreign enterprises (international oil companies and their subsidiaries) to purchase majority shares of ownership in joint-venture projects.

- “Dollarize” its energy sector sufficiently to allow international oil and energy enterprises to buy and sell products and services inside of the Cuban economy.

- Create conditions and terms of trade that are conducive to the successful resolution of disputes over contracts such as over the rate of return on investments, penalties for early termination, and so forth.

Such steps do not imply that the Cuban economy will become completely capitalist, as Cuba may retain special prerogatives relevant to the designation of oil and gas reserves as elements of its “national patrimony.” International oil companies are not averse to these types of nationalist prerogatives, which are typical of oil and gas contracts internationally.

In our analysis of the Cuban electric power sector we look at the following issues:

- Comparison with selected countries in Latin America
- Energy trends in Cuba
- Energy flows within the sector
- Financial and economic aspects of the sector
- Sector reform during a transition
- Relevant conclusions including foreign investment demands and technology transfer requirements

In chapter 2, Jorge Piñón presents an analysis of the oil and gas production resources and the capacity of the Cuban regime to successfully exploit those resources. In his power-sector analysis in chapter 3, Juan Belt employs the MARKAL/TIMES energy systems model, which generates estimates for industrial, commercial, residential, and transportation demands for energy services over the next several decades. Belt then determines whether the sources of energy will be domestic or imported by analyzing the available technologies that transform primary energy into final energy that is consumed by end-users. In chapter 4, Ron Soligo and Amy Myers Jaffe provide an energy-balance analysis for Cuba under various scenarios, including present trade and production rates, the development of offshore reserves, the development of ethanol production capabilities, and the partial and complete loss of Venezuelan oil imports. They also analyze the potential for Cuban ethanol development, including estimates of the productive capability of ethanol pro-

duction, land-use and investment requirements, the potential for ethanol to offset the demand for transportation fuels, and the introduction of flex-fuel and hybrid vehicles to public and private fleets.

Assumption 3: Cuba's Projected Demand Curves

The third common assumption is based on the calculation of production and demand curves taken at three points; one in the middle term, 2015, and two in the long term, 2020 and 2025. Additionally, it estimates that the per capita GDP growth rates will be about 2, 3, and 5 percent, respectively, by means of scenarios for each year. All scenarios avoid making assumptions regarding the form or structure on the Cuban regime other than to consider the economic modalities that might accompany a general set of governing structures not limited to but including maintenance of the status quo, and perhaps a transition to a new set of leaders not including Fidel or Raúl Castro.

Applying the Analytical Framework

Using these three assumptions we divide our substantive analysis of Cuba's energy sector into four sections:

1. Cuban oil and gas characteristics
2. Cuban electric power sector requirements
3. The Cuban energy balance
4. The development of Cuban ethanol resources

In chapter 5, we summarize the findings and outline a set of recommendations for U.S. policymakers regarding the advancement of energy development cooperation, in terms of both geostrategic and economic interests.

Recommendations

Chapter 5 includes a discussion of the conditions under which the promotion of cooperative engagement between the United States and Cuba may occur, and provides an assessment of existing and perhaps new possibilities for energy cooperation in production-sharing agreements, energy resource development, technology transfer, and other mutually beneficial outcomes for the United States and Cuba in the energy sector. Following on the discussion of promoting cooperative engagement between the United States, this section will consider a set of relevant recommendations in the following thematic arenas:

Develop Confidence-Building Measures and Engagement

Despite the standoff of the past fifty years, the installation of new administrations in both Cuba and the United States creates an opportunity for the consideration of new modes of engagement that are initially symbolic and highly instrumental in nature, such as in agriculture and medical sales. Energy and infrastructure cooperation may be further areas for this type of engagement.

Create Opportunities for Leveraging Cuba's Human Capital Resources

Cuba's highly trained cadres of engineers and technicians are largely underemployed. Engaging Cuba in the areas of energy and infrastructure development may provide opportunities to employ these people and also possibly to leverage their considerable skills and abilities for cooperative projects across the region.

Transfer Energy Technology

The potential of Cuba's offshore oil reserves may only be accessible when Cuba and its partners are able to employ first-generation American deep-water exploration technology. At present, U.S. export controls limit access to this technology. Under conditions favoring resource development and production-sharing scenarios, the United States may begin to roll back these export control restrictions.

Transfer Project Management Capacity

One of the most critical findings from the analysis of Cuba's effort to develop a nuclear energy capability was the absence or notable lack of project management capacity during the design, implementation, and construction of the nuclear reactor site at Juragua.²⁸ Subsequent discussions with senior Cuban government officials have revealed that the development of this capacity is a high priority for Cuba as it considers the challenges it faces for future infrastructure and large construction projects. This is an area in which U.S. firms can and should play a vital role as a model and partner for Cuba. Cubans have openly expressed the desire to work side by side with American partners in this critical area of development.

Encourage Energy-Sector Trade and Cooperation

The United States and Cuba can and should cooperate in numerous areas, such as exploration, upstream production, downstream processing and distribution, transportation, and auxiliary services.

Encourage Investment and Development

There has been no lack of interest on the part of American international oil firms in developing a Cuban market for joint-venture projects and technology transfer and production-sharing agreements in the energy sector. The prevailing Cuban model of joint-venture investment and cooperation has proved to be attractive internationally, and Cuba offers American firms numerous opportunities of this type. There will have to be significant changes to the Cuban embargo before this type of engagement can occur, but recent history shows that Cuba possesses the potential to be a strong regional trade partner in the area of energy and infrastructure development. The numerous joint-venture projects presently under way in energy development and infrastructure (oil refineries, pipelines, and port facilities) between Cuba and a growing list of foreign partners is a positive indicator of that potential.

Diversify Regional Energy Resources

Creative partnerships in terms of refining, storage, and engineering services will allow the regional partners to diversify their respective portfolios, in addition to dispersing resources across the region to take advantage of location, and perhaps mitigate the potential of market disruptions owing to weather and other natural disasters.

Establish a Cuban Energy Distribution Center

A long-term prospect for Cuba may be the development of energy-related resources that will be strategically positioned to serve the region's needs for oil refining and storage, oil and gas production (exploration and infrastructure), and auxiliary services. Such a distribution and services center could be a boon to Cuban, American, and regional economic development interests. This is especially relevant in light of growing concerns about the region's energy infrastructure—in particular, the oil and gas industries of Mexico and Venezuela, where there is growing evidence that policy priorities in both countries might be hindering their capacity to deliver on their contractual obligations to export oil to the U.S. market.

Drawing Conclusions

The final component of the analysis will draw conclusions from the previous sections, in addition to the contributions of the research team, and will provide concrete policy recommendations on the challenges and opportunities facing American policymakers hoping to engage Cuba in terms of energy

and infrastructure investment, development, and revitalization. This analysis will allow us to discuss the following questions germane to the discussions of Cuba's energy future and the related U.S. need to articulate a new vision of how to manage international energy interdependence most effectively. Cuba's centrality to that discussion led us to ask the following questions:

—In what way will the ongoing development and evolution of Cupet, Cuba's state oil company, limit or obstruct U.S. efforts to meet its strategic objectives? This includes the relationship between Cupet and Petr6leos de Venezuela, as well as the Venezuelan state.

—What role can international oil companies play in the development of energy resources and infrastructure in Cuba in both the near and long term? Cuba is seeking to develop the production capability of its North Coast Reserves, and national oil companies (NOCs) from nine different countries have signed lease agreements with the Cuban regime for offshore tracts.

—What impact will competition from Brazil, Russia, India, and China over scarce petroleum resources have on U.S. energy security? Recently Russia and Cuba have signed an energy-development agreement, and the Chinese have made incursions into Latin American energy markets.

Answering these questions will allow us to develop a refined set of policy recommendations that enhance the prospects for cooperation and perhaps for the amelioration of relations between these neighbors.

Notes

1. Russell Blinch, "Cuba's Offshore Oil Hopes Rise, U.S. Role Uncertain," Reuters News Service, June 15, 2009 (www.reuters.com/article/globalNews/idUSTRE55E67520090615).

2. Carlos Pascual, "The Geopolitics of Energy: From Security to Survival," (Brookings Institution, January 2008) (www.brookings.edu/papers/2008/01_energy_pascual.aspx).

3. Amy Myers Jaffe, "The Changing Role of National Oil Companies in International Energy Markets—Introduction and Summary Conclusions," PowerPoint presentation, March 1, 2007, p. 6 (www.rice.edu/energy/publications/docs/NOCs/Presentations/Hou-Jaffe-KeyFindings.pdf).

4. U.S. Geological Survey, "Assessment of Undiscovered Oil and Gas Reserves of the North Cuba Basin, Cuba, 2004," Fact Sheet 2005-3009 (Washington: USGS, February 2005), p. 2.

5. Jeremy Rifkin, *The Empathic Civilization: The Race to Global Consciousness in a World in Crisis* (New York: Penguin Books, 2009), pp. 518–19, 553.

6. Partnership for the Americas Commission, *Rethinking U.S.-Latin American Relations*, final report (Washington, D.C.: Brookings Institution, November 2008), p. 28.

7. Brookings Project on U.S. Policy toward a Cuba in Transition, *Cuba: A New Policy of Critical and Constructive Engagement* (Washington, D.C.: Brookings Institution, April 2009), pp. 3–4, 15.

8. Ibid.

9. Jeff Franks, “Cuba Oil Claims Raise Eyebrows in Energy World,” Reuters, October 24, 2008 (www.reuters.com/article/internalReutersGenNews/idUSN2347317820081024). See also CubaNews, “Petrobras Inks E&P Deal with Cuba,” October 31, 2008 (www.rigzone/news/article.asp?a_id=68675).

10. Partnership for the Americas Commission, *Rethinking U.S.-Latin American Relations*, p. 29.

11. Ibid., p. 29.

12. See Juan A. B. Belt, “Power Sector Reforms in Market and Transition Economies: Lessons for Cuba,” paper presented at the sixteenth annual meeting of the Association for the Study of the Cuban Economy, Miami (August 3, 2006), *Cuba in Transition* 17 (2008): 75–89 (http://pdf.usaid.gov/pdf_docs/PNADG827.pdf); Jonathan Benjamin-Alvarado, “Commentary on ‘Cuba’s Energy Challenge: A Second Look,’ by Piñón-Cervera,” *Cuba in Transition* 15 (2006): 124–26; Jorge Hernandez Fonseca, “El Programa Brasileña de Etanol: Lecciones para Cuba” [The Brazilian ethanol program: Lessons for Cuba], *Cuba in Transition* 17 (2008): 206–11; Jorge R. Piñón-Cervera, “Cuba’s Energy Challenge: A Second Look,” *Cuba in Transition* 15 (2006): 110–23.

13. Fidel Castro Diaz-Balart, *Energía Nuclear: ¿Peligro Ambiental o Solucion para el Siglo XXI?* [Nuclear energy: Environmental danger or solution for the 21st century?] (Turin, Italy: Ediciones Mec Grafic, 1997); Juan Jardón, *Energía y Medio Ambiente: Una Perspectiva Económico-Social* [Energy and the environment: A socioeconomic perspective] (Mexico City: Plaza y Valdes Editores, 1995); Tirso Saenz and Emilio G. Capote, *Ciencia y Tecnología en Cuba* [Science and technology in Cuba] (Havana: Editorial de Ciencias Sociales, 1989).

14. Alternativa Bolivariana para las Americas is a Latin American trade association designed as an alternative to the Free Trade of the Americas Agreement. Petrocaribe S.A. is a Caribbean oil alliance of Cuba and fourteen other Caribbean states with Venezuela, launched in June 2005 to purchase oil on conditions of preferential payment. The payment system allows for a few nations to buy oil on favorable terms: they pay market value but only a certain amount of money is needed up-front; they can pay the remainder through a twenty-five-year financing agreement at 1 percent interest.

15. Drexel Kleber, “The U.S. Department of Defense: Valuing Energy Security,” *Journal of Energy Security* (June 2009): 3 (www.ensec.org).

16. Ibid., p. 4.

17. Mahmoud Amin El-Gamal and Amy Myers Jaffe, “Energy, Financial Contagion, and the Dollar,” Working Paper Series, The Global Energy Market: Comprehensive Strategies to Meet Geopolitical and Financial Risks (Houston: Rice University, James A. Baker III Institute for Public Policy, 2008), p. 26.

18. Ibid., pp. 28–29.

19. Mexico's Pemex and Venezuela's PDVSA are two of the largest suppliers of oil to the United States, after Canada and Saudi Arabia. Mexico is third, with 1,433,000 barrels per day, and Venezuela is fourth, with 1,162,000 barrels per day.

20. See Joe Barnes and Matthew E. Chen, "NOCs and U.S. Foreign Policy," paper (Houston: James A. Baker III Institute for Public Policy and the Japan Petroleum Center, Rice University, 2007), p. 4 (www.rice.edu/energy/publications/docs/NOCs/Papers/NOC_US-ForeignPolicy_Barnes-Chen-revised.pdf).

21. Simon Romero, "Venezuela Suspends Heating Aid to the U.S.," *New York Times*, January 6, 2009.

22. U.S. Energy Information Administration, "Crude Oil and Total Petroleum Imports, Top 15 Countries," April 29, 2010 (www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/company_level_imports/current/import.html).

23. Jaffe, "Changing Role of National Oil Companies," p. 6. See also Amy Myers Jaffe and Ronald Soligo, "The International Oil Companies," paper (Houston: Rice University, James A. Baker III Institute for Public Policy, 2007), p. 6.

24. U.S. Energy Information Administration, "Crude Oil and Total Petroleum Imports, Top 15 Countries."

25. *Ibid.*, p. 10.

26. Flynt Leverett and Jeffrey Bader, "Managing China-U.S. Energy Competition in the Middle East," *Washington Quarterly* 29 (Winter 2005–06): 197.

27. U.S. Geological Survey, "Assessment of Undiscovered Oil and Gas Resources of the North Cuba Basin, Cuba, 2004," World Assessment of Oil and Gas Fact Sheet (http://pubs.usgs.gov/fs/2005/3009/pdf/fs2005_3009.pdf).

28. See Jonathan Benjamin-Alvarado, *Power to the People: Energy and the Cuban Nuclear Program* (New York: Routledge, 2000).