



**WESTERN HEMISPHERE
SECURITY ANALYSIS CENTER**

**Out of Challenge, Opportunity:
Central America's Electric Sector & Key
Issues and Recommendations for Enhanced
Regional Electric Integration**

Jeremy M. Martin
Director, Energy Program
Institute of the Americas

September 2011

APPLIED RESEARCH CENTER

FLORIDA INTERNATIONAL UNIVERSITY

THE WESTERN HEMISPHERIC SECURITY ANALYSIS CENTER

WHEMSAC brings together a versatile and important Latin American network of traditional and non-traditional security experts from academia, business sectors, government ministries and private organizations. Its research capabilities provide Western Hemispheric leaders with a unique, real-time research and analysis on current issues. WHEMSAC is an innovative institutional model for conducting professional qualitative and quantitative research throughout the Americas at the national, regional and international levels within an open, independent, multi-disciplinary, and collaborative academic environment. The fusion of open source political, economic, and social expertise allows WHEMSAC to provide an exceptional, qualified approach to regional security insight with traditional intra-governmental analysis.

WESTERN HEMISPHERIC SECURITY ANALYSIS CENTER SPONSORS

The **Applied Research Center** advances the research and academic mission of Florida International University. ARC's focus is to solve real-world problems through multi-disciplinary research collaborations within the University's increasingly talented applied and basic research units. It is uniquely structured and staffed to allow for free-flowing exchange of ideas between the University's applied researchers, academia, government, private sector and industry partners. The ARC's vision is to be the leading international university-based applied research institution providing value-driven, real-world solutions, which will enable FIU to acquire, manage, and execute educationally relevant and economically sound research programs. That vision is based on the Center's core values of respect for the environment, health and safety of all individuals, creativity and innovation, service excellence, and leadership and accountability. The Applied Research Center is organized into three core research units: Environment; Energy, and Security and Development. Under the leadership of its Executive Director, the Center reports to FIU's Office of Sponsored Research Administration. An External Advisory Board, encompassing leaders from the private and public sectors, participates actively in the Center's growth and development. The Florida International University Applied Research Council, a team of University deans, executives and faculty guide the development of the Center's programs.

Florida International University is Miami's first and only four-year public research university with a student body of more than 40,000. It is one of the 25 largest universities in the nation. FIU's colleges and schools offer nearly 200 bachelor's, master's and doctoral programs in fields such as international relations, law and engineering. As one of South Florida's anchor institutions, FIU has been locally and globally engaged for more than four decades finding solutions to the most challenging problems of our time. FIU emphasizes research as a major component of its mission. The opening of the Herbert Wertheim College of Medicine in August 2009 has enhanced the university's ability to create lasting change through its research initiatives. Overall, sponsored research funding for the university (grants and contracts) from external sources for the year 2008-2009 totaled approximately \$101 million.

The **United States Southern Command** (USSOUTHCOM) is one of ten unified Combatant Commands (COCOMs) in the Department of Defense. It is responsible for providing contingency planning, operations, and security cooperation for Central and South America, the Caribbean, and their territorial waters; as well as for the force protection of U.S. military resources at these locations.

The **National Defense Center for Energy and the Environment** (NDCEE) provides reliable and sustainable solutions to the US Department of Defense in areas ranging from contingency operations to global climate change and greenhouse gas reduction to safety and occupational health. These solutions increase mission readiness and improve the health and safety of our Armed Forces both at home and abroad. The NDCEE provides project management and technical support to the WHEMSAC Program.

The views expressed in this research paper are those of the author and do not necessarily reflect the official policy or position of the US Government, Department of Defense, US Southern Command or Florida International University.

Table of Contents

Executive Summary	6
Introduction	7
Energy Overview, Regional Electric Integration & SIEPAC	9
<i>Central America Energy Overview</i>	9
<i>SIEPAC Background & Regional Electric Treaty</i>	13
<i>SIEPAC Update</i>	15
Key Issues for Central America’s Electric Sector & SIEPAC	18
<i>Energy Security & Geopolitics in Central America</i>	18
<i>Interpretations of Regionalism and Electric Integration in Central America</i>	19
<i>Central America’s Electric Market Differences</i>	20
<i>Security Concerns</i>	21
<i>Local Conflicts</i>	22
<i>Additional Electric Interconnection Projects</i>	23
<i>Mexico-Guatemala Interconnection</i>	23
<i>Colombia-Panama Interconnection</i>	24

Recommendations for Central America’s Electric System and Regional Integration Efforts	24
<i>What about energy conservation and efficiency in Central America?</i>	25
<i>Fostering Regional Cooperation, Understanding, and Electric Integration in Central America</i>	26
<i>Integrating Resource Planning and Strengthening Regional Energy Planning</i>	27
Conclusions	29
Works Cited	32
About the Authors	34
WHEMSAC Publications	35

Executive Summary

Taken together, the six nations of Central America count a population of roughly 40 million people and an energy market equal in size to that of Colombia, sufficient to benefit from economies of scale. The region has traditionally been a net importer of hydrocarbons, and hydroelectricity has dominated electric generation. But more recently, thermoelectric generation (diesel and fuel oil) has greatly increased as a percentage of the regional generation market.

Progress has been made across the region's electric sector, beginning with reforms in the 1990s and the 1996 signing of a regional treaty aimed at the development of a regional energy integration project—the Central American Electrical Interconnection System, or SIEPAC. A fundamental SIEPAC goal is to set up a regional electric market and regulatory system. Indeed, after many years of development, SIEPAC is poised to open a new chapter in Central America's electric infrastructure and market. But this new era must contend with critical issues such as the need to consolidate the regional electric market, political issues surrounding the venture, and security concerns. Moreover, local conflicts, in differing degrees, have become priorities for policymakers, and these are possible barriers to completing the project.

The goals of the SIEPAC project and of deepening the broader electric integration process are possible if national and regional decision makers understand that cooperative decision making will produce better results than separate national decision making. Enhanced regional understanding and cooperative decision making, combined with an effort to reorient the terminology and dialogue vis-a-vis energy efficiency in Central America, form the core recommendations of this paper.

Introduction

Central America's energy market has the potential to benefit from economies of scale.¹ The region can be divided into six sub-markets, each with different levels of economic development, energy infrastructure, and energy preferences. Across the six nations, the electric sector and market structure differ greatly—from fully competitive wholesale markets to monopoly-integrated utilities acting as single buyers.² The entire region has struggled to achieve a reliable and cost-competitive supply of energy and is a net importer of hydrocarbons. Further exacerbating the region's oil import dependency and increasing its exposure to price fluctuations is the large expansion of thermoelectric generation capacity.

Incremental progress has been made—from reforms in the 1990s to an important regional energy integration project, the Central American Electrical Interconnection System (SIEPAC).³ SIEPAC serves as an important reference for lessons learned and underscores the key challenges and hurdles facing energy integration in the region. A fundamental SIEPAC goal and challenge is to set up a regional market and regulatory system, where political intervention assists rather than impedes integration.

¹ Economies of scale may be best understood in terms of the increase in efficiency of production as the number or size of a product or good being produced increases. Most important to the discussion of Central America's electric sector is the cost impact understood to occur through economies of scale and the corresponding lower average cost per unit through increased production. Larger scale, regional electric generation plants will be more cost efficient for the isthmus than will dispersed, smaller, national plants and electric production.

² Economic Consulting Associates, "The Potential of Regional Power Sector Integration: Central American Electric Interconnection System (SIEPAC) | Transmission & Trading Case Study," World Bank/ESMAP, March 2010. http://www.esmap.org/esmap/sites/esmap.org/files/BN004-10_REISP-CD_Central%20American%20Electric%20Interconnection%20System-Transmisison%20%26%20Trading.pdf.

³ SIEPAC is the acronym for the Spanish title *Sistema de Interconexión Eléctrica para los Países de América Central*.

The potential benefits of electric integration in Central America have long been touted, particularly the benefits derived from economies of scale. These may be facilitated as larger electric generation projects aim to tap into a regional market as opposed to being constrained by smaller, national boundaries. Efforts to date have centered on interconnection of the region's electric grid and the SIEPAC project. The project, formalized in the *Tratado Marco del Mercado Eléctrico de América Central* [Framework Treaty for the Central American Electric Market—(Treaty)],⁴ includes an 1,800-kilometer electric transmission line project that is 88% complete⁵ and that, upon final completion, will run from Panama to Guatemala, physically connecting the electric systems of all the countries of Central America. The treaty also spells out the creation of a seventh electric market, *Mercado Eléctrico Regional* (MER), a regional electric market that will permit exchanges of electric power across the existing six markets using the SIEPAC transmission infrastructure. The treaty is a relatively momentous advance for Central America's political environment. More important, it provides the legal foundation on which the foregoing institutional and physical infrastructure is based.

After many years of development, SIEPAC is poised to open a new chapter in Central America's electric infrastructure and market. But hurdles remain, particularly with regard to developing the regional electric market—including political issues surrounding the project, security concerns, and local conflicts that are increasingly impinging upon the energy sector. Also, while not necessarily a hurdle, the role of conservation and efficiency and improved utilization of energy

⁴ A copy, in Spanish, of the text of the treaty can be found here:
http://www.ceaconline.org/pdf/Marco_Legal/TRATADO%20MARCO%20MEAC.pdf.

⁵ Reuters, "Central America Readies Shared Electric Grid," August 12, 2011.
<http://af.reuters.com/article/energyOilNews/idAFN1E77726U20110812>.

resources in Central America must also be considered in a discussion of the region's electric scene.

This paper is organized into four parts, beginning with an overview of energy in Central America that focuses on regional electric integration and the SIEPAC project. The second section assesses several key issues associated with SIEPAC and the broader theme of Central American electric integration. This is followed by an elaboration upon the ideas set forth in the introduction and deemed fundamental for an enhanced regional electric market. The conclusion synthesizes the advances, issues, and challenges of the SIEPAC project and why it is important to foster electric integration in Central America.

Energy Overview, Regional Electric Integration & SIEPAC

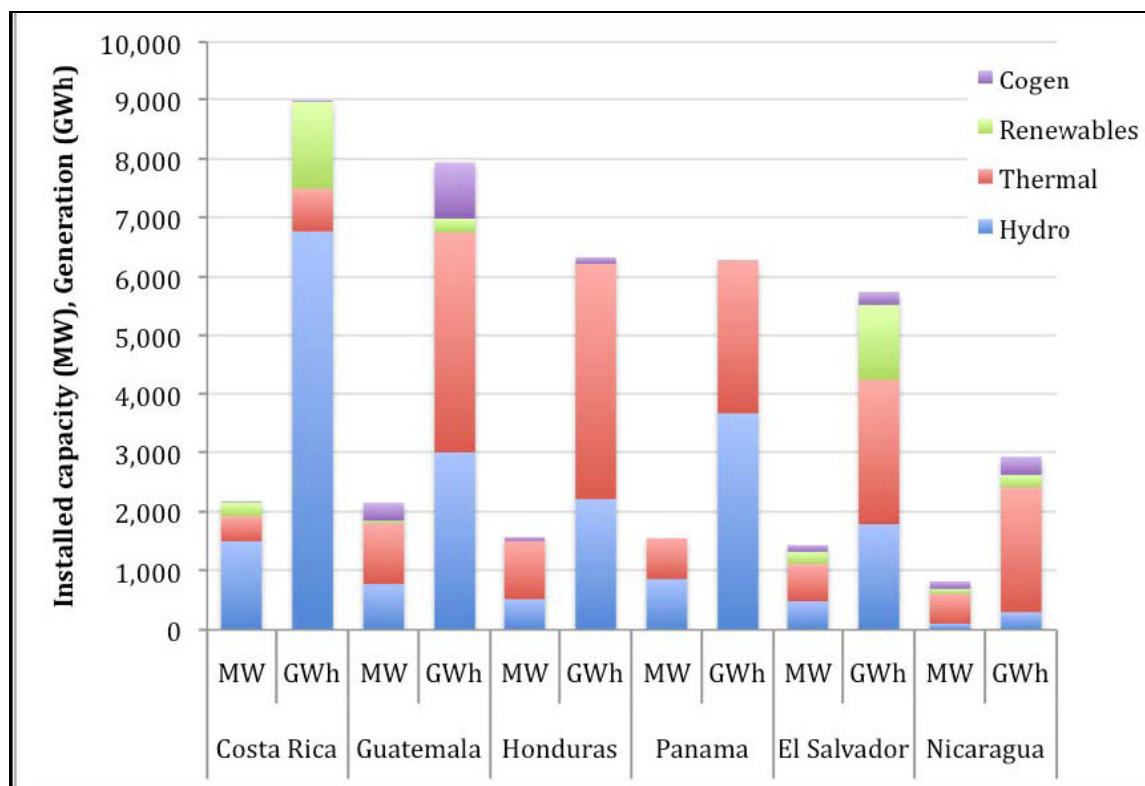
Central America Energy Overview

Central America has a population of approximately 40 million people, with a regional average GDP per capita of US\$2,000. More than half of the population lives in poverty, with more than a quarter living in extreme poverty.

The region is a net importer of hydrocarbons, with only Guatemala and Belize counting a small amount of oil production. As depicted in Table 1, hydroelectricity has dominated the region's electric generation, but in recent years there has been a strong growth of thermoelectric generation using diesel and fuel oil. The region's main source of energy for household use

remains traditional biomass, which has well-documented adverse health impacts; use of biomass is also increasingly scrutinized due to its emissions of “black carbon.”⁶

Table 1: Installed Capacity and Generation by Country 2007



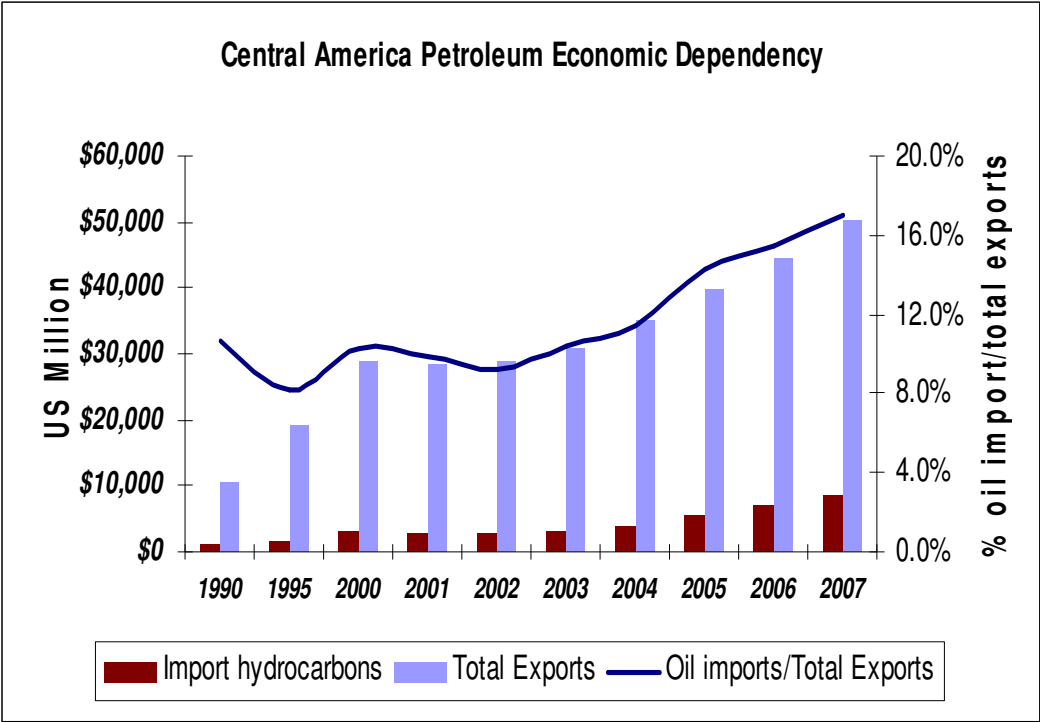
Source: CEPAL Data and Economic Consulting Associates, “The Potential of Regional Power Sector Integration.”

The trend toward increased fossil-fuel-based power generation is important given the region’s status as a net importer of crude and crude oil products. Indeed, the region is extremely exposed to the intersection of oil price, economic development, and budgets. As shown in Table 2 and based upon an Institute of the Americas analysis of Latin American Energy Organization (OLADE) data, Central America’s cost of oil imports was approximately 7% of GDP in 2007.

⁶Jessica Seddon Wallack and Veerabhadran Ramanathan, “The Other Climate Changers: Why Black Carbon and Ozone Also Matter,” *Foreign Affairs*, September/October 2009. <http://www.foreignaffairs.com/articles/65238/jessica-seddon-wallack-and-veerabhadran-ramanathan/the-other-climate-changers>.

The cost of oil imports in Central America increased from 8% of *total* exports in 1995 to more than 16% in 2007.

Table 2



Source: Latin American Energy Organization—Organización Latinoamericana de energía (OLADE), 2009.

In the aggregate, the size of the Central American energy market equals Colombia’s—large enough to benefit from economies of scale. Central America has seen progress in the development of electric production and delivery; electricity reforms aimed at improving efficiency and reducing costs were implemented in the 1990s. In 1996, a regional treaty made possible the development of SIEPAC, a project whose aim is to set up a regional electric market and regulatory system. The SIEPAC project is closer to realization.

There is increasingly positive renewable energy news, too. Wind projects are beginning to pop up from Honduras to Nicaragua, and the hydroelectric potential of Central America, a region

endowed with plentiful water resources, is far from being tapped. One source estimates the total hydroelectric potential at 22,000 megawatts. Despite the large use of hydro in some nations' energy matrices, the region as a whole is utilizing only 17% of its hydroelectric potential. The same source notes a 2,928-megawatt potential while utilizing only 15%⁷ However, hydroelectricity is not free of environmental and social challenges. In addition to financial risks and hurdles largely derived from an underdeveloped regional market, investors face increasingly stringent opposition from local communities. Small-scale hydroelectric projects have received much more attention from government and private investors. Honduras, for example, recently developed a small renewable-only bidding round.

The Central American region also counts on important geothermal resources that can be developed to meet the region's energy needs. According to CAF Development Bank of Latin America, Central America is producing nearly 3,000 megawatts from geothermal resources. CAF notes that, while important, this figure represents only 15% of the estimated geothermal energy potential in the isthmus.⁸ Other estimates indicate that the potential for geothermal energy could be as much as 5,000 megawatts, with the resource located primarily in Costa Rica, Guatemala, El Salvador, and Nicaragua.⁹ If fully developed, geothermal energy sources could represent the region's most important non-conventional renewable energy source.

⁷ Luis Enrique Berrizbeitia, "La CAF y la energía en América Latina" (presentation at Institute of the Americas Panama Energy Roundtable, Panama City, Panama, September 25, 2009).

<http://www.iamericas.org/presentations/energy/panama09/Luis%20Enrique%20Berrizbeitia.pdf>.

⁸ Ibid.

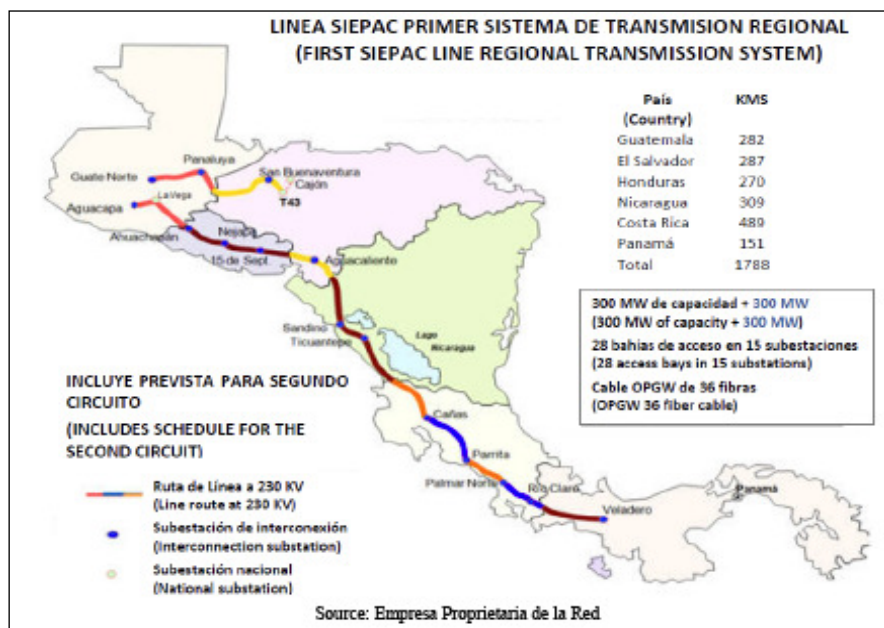
⁹ Empresa de Transmisión Eléctrica, S.A. (ETESA).

<http://www.etsa.com.pa/estudios.php?idioma=ing&act=geotermico>. Retrieved 12 September 2011.

SIEPAC Background & Regional Electric Treaty

The SIEPAC project will connect the electric systems of all Central American countries. The project will consist of 15 substations and 230-kilovolt high-tension transmission lines that will allow for capacity of 300 megawatts in both directions at the outset but will also include tower infrastructure to enable a future second circuit. The countries of Central America will have the following segments of the 1,800-kilometer SIEPAC project: Guatemala: 282 km; El Salvador: 287 km; Honduras: 270 km; Nicaragua: 309 km; Costa Rica: 489 km; and Panama: 151 km. (See Figure 1.)¹⁰

Figure 1: SIEPAC Project Map and Basic Characteristics (2010)



The project has been hyped for many possible advances in Central America, ranging from lower electricity costs for consumers in the region to improved security of supply. SIEPAC has two specific goals: (1) supporting the formation and consolidation of a Regional Electric Market

¹⁰Jeremy M. Martin, “Central America Electric Integration and the SIEPAC Project: From a Fragmented Market Toward a New Reality” (paper expanding upon remarks delivered at the third session of the Energy Cooperation and Security in the Hemisphere Task Force, University of Miami, Miami, FL, May 6, 2010). https://www6.miami.edu/hemispheric-policy/Martin_Central_America_Electric_Int.pdf.

(MER) to establish institutional, legal, and technical mechanisms that facilitate the participation of the private sector in the development of increased electric generation capacity; and (2) establishing the infrastructure for electric interconnection (transmission lines, substations, etc.), thereby permitting the exchanges of electric power among MER participants. The project and effort are firmly guided by the aforementioned treaty, and specifically its three key principles of gradual development, reciprocity, and competition.¹¹ The treaty was signed by all six Central American nations in 1996. The original treaty has since been amended to include two protocols that further define SIEPAC's project goals. The second protocol, to be discussed later, is pending full ratification.

A historically important and critical initiative for Central America, the project concept has been under discussion for nearly thirty years. Since 1998, the project's transmission infrastructure build-out has been led by the *Empresa Proprietaria de la Red* (EPR), the owner of the network and the company tasked with owning, operating, and constructing the project. EPR is a consortium of private and public companies from Central America, Mexico, Colombia, and Spain. The consortium was established in 1998 in accordance with the treaty and since 2002 has been headquartered in San Jose, Costa Rica. EPR counts the participation of each country's electric company (ies) in charge of transmission. These companies are *Instituto Nacional de Electrificación (INDE)* in Guatemala; *Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL)* and *Empresa Transmisora de El Salvador (ETESAL)* in El Salvador; *Empresa Nacional de Energía Eléctrica (ENEE)* in Honduras; *Empresa Nacional de Transmisión Eléctrica (ENATREL)* in Nicaragua; *Instituto Costarricense de Electricidad (ICE)* and *Compañía Nacional de Fuerza y Luz (CNFL)* in Costa Rica; and *Empresa de Transmisión Eléctrica (ETESA)* in

¹¹ Ibid.

Panama. The consortium also has three extra regional shareholders: *Comision Federal de Electricidad (CFE)* from Mexico; *Empresa Nacional de Electricidad (Endesa)* from Spain; and *Interconexion Electrica (ISA)* from Colombia.¹²

Current cost estimates for the project are approximately \$495 million. Of that amount, the Inter-American Development Bank (IDB) is providing \$240 million in loans to the six nations, while the Central America Bank for Economic Integration (CABEI) is providing \$100 million. In addition, the Spanish government has provided \$70 million for the project to be administered through its trust fund at the IDB.¹³

SIEPAC Update

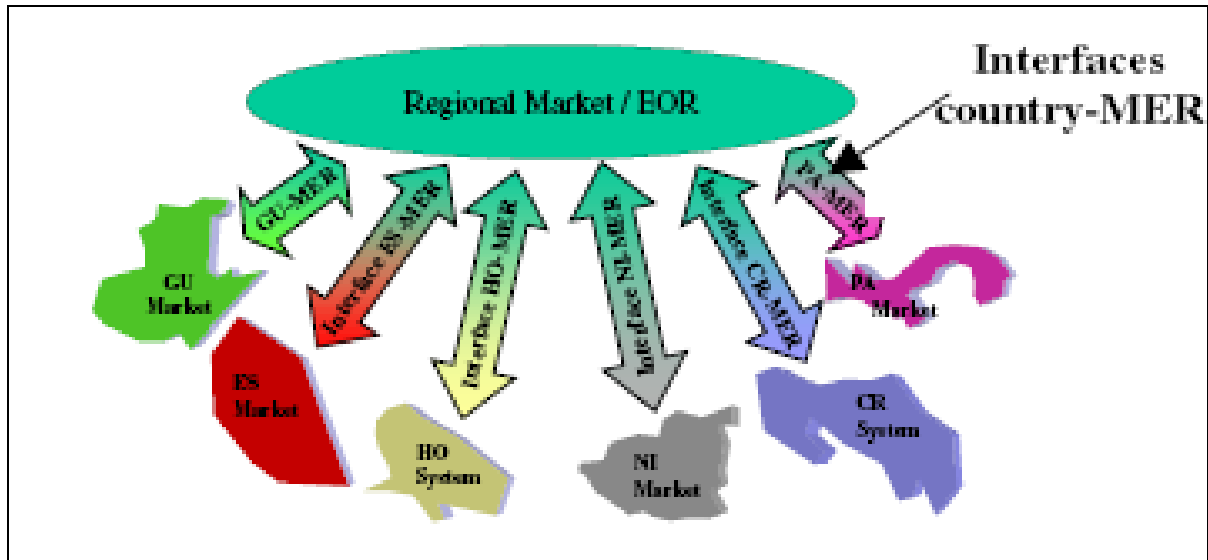
In accordance with the treaty and the two specific goals of the project, progress has been made with regard to the MER and other supporting institutions that are part of the project's mandate: the Regional Electric Interconnection Commission (CRIE) and the Regional Operating Agency (EOR). CRIE has established offices in Guatemala City and now serves as regulator for the new regional wholesale market. Its board comprises one representative from each country. EOR acts as the system's operator and administrator of regional power transactions. Its board comprises two members from each country. (See Figure 2.)

¹² José Enrique Martínez presentation at Institute of the Americas Panama Energy Roundtable, Panama City, Panama, September 25, 2009.

<http://www.iamericas.org/presentations/energy/panama09/Jose%20Enrique%20Martinez.pdf>.

¹³ Ibid & <http://grupobid.org/news/detail.cfm?language=English&id=959>.

Figure 2: Regional Market Schematic

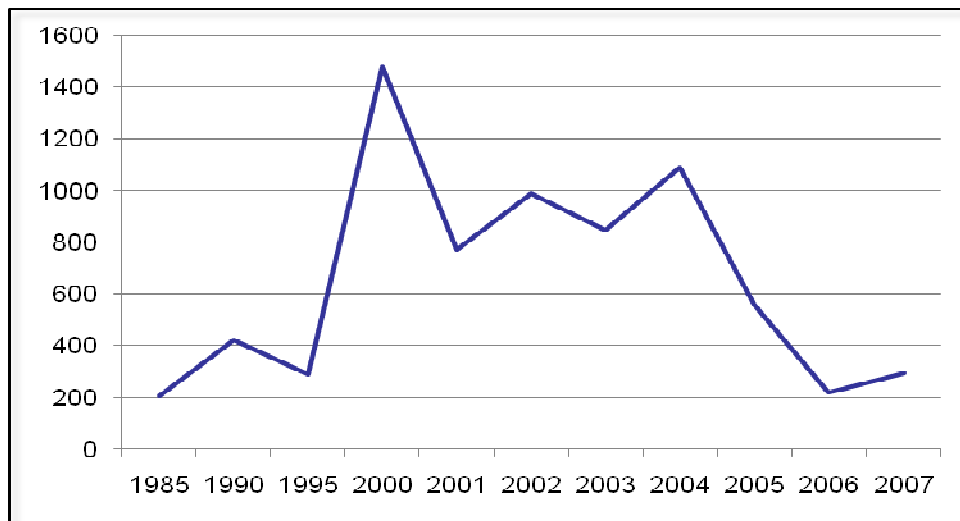


Source: *Allocation of Transmission Capacity in the Central America Electricity Market*, Ricardo Ríos, Jorge Karacsonyi, and Manuel Tinoco, 2004.

Meanwhile, the MER has begun realizing regional electric transactions utilizing existing interconnection infrastructure, albeit at a fairly low level¹⁴ Indeed, these regional energy exchanges have decreased in recent years as tighter supply and demand balances across the isthmus have limited the capacity (or political desire) to exchange electricity. Figure 3 details the evolution of regional electric exchanges between 1985 and 2007.

¹⁴Economic Consulting Associates, "The Potential of Regional Power Sector Integration: Central American Electric Interconnection System (SIEPAC) | Transmission & Trading Case Study," World Bank/ESMAP, March 2010. http://www.esmap.org/esmap/sites/esmap.org/files/BN004-10_REISP-CD_Central%20American%20Electric%20Interconnection%20System-Transmisison%20%26%20Trading.pdf.

Figure 3 Regional Energy Exchanges (GWh) 1985 - 2007



Source: *Promoting Sustainable Energy Integration in Central America, USAID El Salvador, 2010.*

SIEPAC's second overarching goal, implementation and construction of the physical transmission line, has met with delays, and the 2008 commissioning date originally targeted has long since come and gone. But all is not lost: the transmission infrastructure is now 88% complete, according to a recent analysis of the physical line associated with SIEPAC.¹⁵

None of the foregoing achievements are considered full implementation of SIEPAC project, nor are they commensurate with the actual completion and successful operation of SIEPAC and broader regional integration efforts. However, these issues should not be construed as failure or lack of commitment to the ultimate goal. Indeed, a quick look at so-called integrated energy markets in Europe underscores the enormity of what is gradually taking place in Central

¹⁵ "Central America Readies Shared Electric Grid," Reuters, August 12, 2011. <http://af.reuters.com/article/energyOilNews/idAFN1E77726U20110812>.

America. As the head of the transmission line operating company, EPR, recently noted: “The European Union (EU) doesn't have energy integration at this level.”¹⁶

Key Issues for Central America’s Electric Sector & SIEPAC

Energy Security & Geopolitics in Central America

Energy security has come to mean many things to many people, but the most relevant understanding when discussing Central America comes to what is called “defense of the domestic economy,” which implies a subordination of other policy goals to a more aggressive pursuit of domestic supplies, price controls, and trade restrictions. Simply put, domestic politics and markets trump the broader regional marketplace.¹⁷

Indeed, the challenges derived from geopolitics and energy security of determining and achieving the appropriate mix of competition and regulation are numerous, and the pitfalls after nearly two decades of “deregulation” are abundant. Central America is no stranger to these challenges, but there are two additional hurdles unique to the isthmus. The first is a relatively poor and fragmented market. There are obvious and inherent difficulties of achieving economies of scale if the market remains fragmented along national boundaries. But a dose of realism is also necessary. Energy and its geopolitical elements will always make it contentious for countries and governments to be seen as surrendering their political sovereignty over such a strategically important subject matter as electricity supply. That is to say that the region has made progress, but much remains to be done, and to do so requires diplomacy and a

¹⁶ Ibid.

¹⁷ David Mares, “Oil Policy Reform in Resource Nationalist States: Lessons for Mexico” (paper prepared for the study “The Future of Oil in Mexico,” James A. Baker III Institute for Public Policy, Rice University, April 29, 2011, 15.

<http://bakerinstitute.org/publications/EF-pub-MaresLessons-04292011.pdf>.

commonality of purpose and benefits to be understood by each polity. The goal is to show each nation that over the long run, cooperation's benefits exceed its costs, both for the region and for each nation.

The second challenge facing SIEPAC and regional integration is formalization of the second protocol of the treaty, intended to strengthen the regulation for the regional wholesale market and to coordinate agency activities. Five of the six nations of the region have signed and ratified this critical piece of the regional electric framework; Costa Rica has yet to ratify. The pending ratification can be ascribed to the lack of consensus in Costa Rica over corresponding domestic legislation that would affect elements of Costa Rica's state-dominated electric system, led by the vertically integrated state firm ICE. While the Chinchilla administration in Costa Rica has submitted an energy reform proposal to the legislature, it has not yet become a legislative priority. It bears mentioning the importance of this, given that the institutional and legal frameworks for the overarching SIEPAC project are only as strong as the consensus among the signatory nations will allow.

Interpretations of Regionalism and Electric Integration in Central America

A broader, but perhaps more critical element, is the need for each of the individual nations to understand how its decisions might affect others: There remains a fundamental need to enhance regional thinking and develop a broader common understanding of the components of successful regional electric markets. This issue, along with specific recommendations, is detailed below.

Central America's Electric Market Differences

As briefly discussed in the energy overview section, Central America saw a series of electricity reforms implemented during the 1990s. These reforms had important but varying outcomes in the six nations of the region. Guatemala, El Salvador, Panama, and Nicaragua implemented measures to move away from a vertically integrated structure, whereby they “unbundled” generation, transmission, and distribution and largely opened those segments to competition. Legislation in Honduras aimed to implement a similar effort at electric reform, but unbundling made little progress. The system remains that of a de facto single buyer; efforts to privatize distribution in the country have been unsuccessful. Costa Rica made moderate changes to its national electric policy, but it remains state dominated, and the national power monopoly, ICE, retains its vertically integrated structure, acting as a single buyer; there is a small percentage of private power, produced through an independent power producer project scheme.¹⁸

These differences in the implementation of reforms, the evolution of respective electric markets, and Costa Rica's desire to maintain a form of its electric status quo have direct relevance for the larger topic of integration of the region's electric sector. Indeed, these issues can best be traced to the foregoing discussion of geopolitics, which remains a key issue for the region to confront. Specifically, the differences pose limitations on the degree of competition across the region, a key element for the successful operation of a regional market. Moreover, this issue is compounded by what some deem is a lack of reciprocity between countries in terms of potential access to their respective electric markets.

¹⁸ Ramón Espinasa, “Las instituciones del sector energético en Centroamérica” (prepared for the fourth meeting of the Energy Policy Working Group of the Inter-American Dialogue and Inter-American Development Bank, San Salvador, El Salvador, May 14, 2011).
http://www.thedialogue.org/uploads/Energy_Working_Group/BID-Centroamerica.pdf.

When it comes to the market and frameworks for renewable energy, Central America's efforts can best be described as nascent. Each country does count some form of legal and regulatory framework for renewable energy investment, but each tends to emphasize incentives over requirements. This issue will be addressed in the recommendation section on integrated resource planning.

Security Concerns

Efforts continue across Central America to move the six nations forward on electric integration, but issues have emerged that appear to be eroding the so-called peace dividend the region saw in the 1990s and early 2000s. It appears fairly evident that, as with Mexico, Central America pays a price for its geographical proximity to the massive illicit drug market that is the United States to its north and the massive drug production centers of South America.¹⁹

These issues are not new. The political risk consultancy Eurasia Group has analyzed and highlighted some relevant issues pertaining to this paper and to the broader theme of electric integration in Central America. Their research indicates that crime and violence can impact energy projects and infrastructure in the following ways:

- Attacks on the infrastructure (roads, pipelines, power-generation plants, transmission lines, etc.) by illegal groups.
- Fights for control over land.
- Threats or attacks against assets as a form of intimidation or extortion.

¹⁹ Eric Farnsworth, "U.S. Fiddles While Central America Burns," *The Miami Herald*, July 12, 2011. <http://coa.counciloftheamericas.org/article.php?id=3484&nav=res&rid=32>.

- Indirect consequences such as cuts in road access and electricity service.²⁰

Issues of security in Central America greatly differ across the six nations, but those issues must be understood for any current discussion and analysis of the region's electric sector. Recent news from Washington, DC, underscores the level of concern that drug issues present for policy makers: for the first time, every country in Central America has been placed on the watch list of drug-producing and trafficking nations.²¹ Assistant Secretary for the US Bureau of International Narcotics and Law Enforcement Affairs William Brownfield has said: "There is no single, ideal solution. It took us many years to get into this mess, and it will take us many years to get out of it."²²

Local Conflicts

Also challenging for the energy sector of the isthmus (and related to but, in many aspects, distinct from the security issue) are local conflicts that have emerged across Central America. Indeed, many experts have begun to see this issue as a priority for the region's energy policy makers. This topic was addressed at a recent meeting of regional and international officials. Their summary report states, "Evidence suggests that the greatest risk to growth and investment in the energy sector is local conflicts, particularly with indigenous and environmental groups."²³

²⁰ Heather Berkman, "Crime and Violence in Central America: A Potential Threat to the Energy Sector?" (presentation at the Institute of the Americas XX Annual Latin American Energy Conference, La Jolla, CA, May 18, 2011). http://www.iamericas.org/presentations/energy/lj2011/Heather_Berkman.pdf.

²¹ Tim Johnson, "U.S. Expands its Drug Watch List to Include all Central America," *McClatchy Newspapers*, September 15, 2011. <http://www.mcclatchydc.com/2011/09/15/124277/us-expands-its-drug-watch-list.html>.

²² William Brownfield, "Remarks by William Brownfield, Assistant Secretary for the (US) Bureau of International Narcotics and Law Enforcement Affairs" (remarks, Council of the Americas, Washington, DC, August 11, 2011). <http://coa.counciloftheamericas.org/article.php?id=3562&nav=res&rid=32>.

²³ Inter-American Dialogue Energy Policy Group Rapporteur's Report, San Salvador, El Salvador, May 5-6, 2011, 5-6. http://www.thedialogue.org/uploads/Energy_Working_Group/EnergyPolicyGroupRapporteursReport.pdf.

The discussion, hosted in El Salvador in May 2011, further concluded:

Conflict often arises in the context of the International Labor Organization Convention 169 on indigenous and tribal peoples, which includes the right to consultation before exploration or production can take place. Experts discussed the right of indigenous peoples to organize, and emphasized that they should be able to express their own needs. However, in Latin America the issues arise from the legal problem that while indigenous peoples may own the land above the surface, the State owns the subsoil. The State should then ensure that the benefits of the energy project are treated as a public good, and that they flow back to the community.

Additional Electric Interconnection Projects

The development of additional electric interconnection projects at Central America's northern and southern borders could have long-term importance for the region's electric market and particularly for MER. These bear discussion. Indeed, eventual interconnection of the Central American system with the larger markets of Mexico and Colombia could serve as an important driver of supply security and would considerably improve the potential to take advantage of larger, regional electric generation possibilities, contributing to enhanced economies of scale.

Mexico-Guatemala Interconnection

Electrical interconnection at the northern border, between Mexico and Guatemala, came into operation in 2009. At this point it is purely an interconnection exercised through a purchase agreement of 120 megawatts between Mexico's state power firm, CFE, and Guatemala's national firm, INDE.

Colombia-Panama Interconnection

Meanwhile, an interconnection project that could ultimately serve as a southern extension of the SIEPAC line is also under study. The project, which would interconnect the Central American market with Colombia, is currently being developed bilaterally between Colombia and Panama. The Colombia-Panama power line has been under consideration for several years by ETESA, the Panamanian state-run transmission firm, and ISA, the leading transmission company in Colombia. The \$420 million transmission line is set to begin operations in 2014.²⁴

The current development of these additional electrical interconnections with Central America is relevant but limited today, given their bilateral basis. Indeed, the fact that the two projects exist as interconnections between Guatemala and Mexico, and Panama and Colombia limits their near-term potential with regard to enhancing and promoting further competition for the Central American market (MER) as a whole.

Recommendations for Central America's Electric System and Regional Integration Efforts

Given the foregoing analysis, it would be reasonable to assume that the list of possible ideas and recommendations related to advancing Central America's electric sector and furthering the goal of regional electric integration is quite long. But many of the issues, perceived hurdles, and impediments to integration can be synthesized into three key areas: (1) incentivizing conservation and efficiency; (2) fostering regional cooperation and understanding; and (3)

²⁴ EFE, "Colombia, Panama to Invest \$420 Million in Power Line," *Latin Petroleum*, August 22, 2011. http://www.latinpetroleum.com/new/newsdetail.php?cid=34&art_id=10127&content=F&aid=10127.

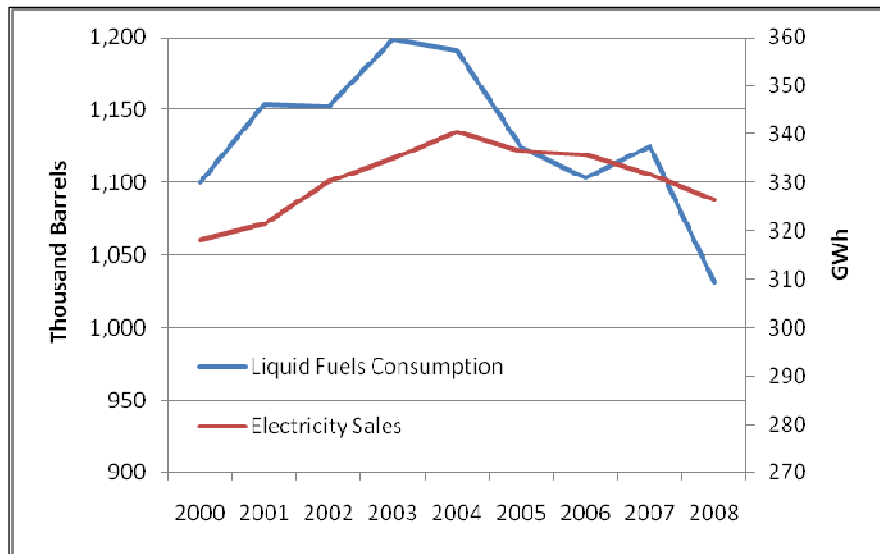
strengthening regional energy planning via integrated resource planning. These three areas are the focus of recommendations detailed here.

What about energy conservation and efficiency in Central America?

The noted energy analyst and historian Daniel Yergin, writing in his new book *The Quest*, calls energy efficiency “the fifth fuel.” For Yergin, efficiency is the “energy resource that has the potential to have the biggest impact of all.”²⁵

For a region like Central America that is hugely dependent upon foreign and imported fossil fuels, conservation and efficiency measures make abundant sense. Yet despite record energy prices, electricity consumption across Central America reflects only a modest decline, as depicted in electricity sales. (See Figure 4.)

Figure 4 Energy Consumption per USD Billion of GDP (Constant 2000)



Source: *Promoting Sustainable Energy Integration in Central America, USAID El Salvador, 2010.*

²⁵ Daniel Yergin, *The Quest: Energy, Security, and the Remaking of the Modern World*, (New York: Penguin Press, 2011), 614.

Traditionally, costs and high prices have played the role of de facto incentivization for efficiency. But the increasingly booming economies in much of Central America and, more important, the lack of true market prices given the differing electric market structures in the region have demonstrated that market-driven demand-side management for efficiency gains no longer offers a sufficient option.

Indeed, in terms of national policy-making across the six nations, most of these governments have no or limited regulatory frameworks in place to incentivize efficiency and reduce consumption. This is not surprising and, as Yergin aptly notes, efficiency may be the most difficult of all energy concepts to wrap one's hands around. For Central America, Yergin's idea of efficiency as a "fuel" may be a critical way to further policy makers' understanding of its importance. Indeed, by discussing efficiency and conservation in terms of fuel use and economic development—in effect reorienting the lexicon—the nations of Central America can have a more robust debate over how to best implement measures that allow for strained budgets, and for governments to be wiser and more innovative about energy use.²⁶

Fostering Regional Cooperation, Understanding, and Electric Integration in Central America

As briefly set forth, there is a gap in understanding across the nations regarding how their decisions might affect their neighbors. Indeed, there remains a fundamental need to enhance regional thinking and to develop a broader common understanding of the components of successful regional electric markets. Guided by this premise, there are three specific recommendations that may aid the region's electric sector and SIEPAC's successful implementation: (1) further an understanding across each of the six nations of the long-term

²⁶ Ibid.

benefits of regional cooperation, while recognizing the concerns over short-term costs; (2) enable a regional mindset—with the emphasis that harmonization does not mean homogenization, i.e., it is possible to create and preserve regional benefits while accepting some differences in how the six nations serve their individual needs; and (3) foster the common goal of achieving enhanced energy security for the region through the maximum use of native, renewable sources. This last aim can be reached most expeditiously and cost-effectively through regional cooperation at all levels because the larger size of the region relative to individual nations will facilitate the integration of these typically intermittent sources of electric supply. This ties directly into the concept of integrated resource planning, discussed next.

Integrating Resource Planning and Strengthening Regional Energy Planning

Regional energy planning, and particularly the preparation of joint plans for expansion of generation and transmission at the regional level, is a critical element for promoting and facilitating the regional electric market. A variety of assessments of the regional electric integration process in Central America have focused on this issue and with good reason. It is supremely necessary, as part of not only SIEPAC but also the longer-term horizon for regional electric integration, to strengthen the regional electricity planning process. An integrated resource plan at the regional level can and should be an important tool for facilitating regional electric integration, particularly with regard to diversification of generation sources. Such a plan should also foster development potential for generation projects at a regional scale, which would support some key original objectives of the SIEPAC project: optimization and cost reduction. Specific recommendations on integrated resource planning are detailed next.

By comparing all feasible alternatives that serve identified purposes and satisfy known constraints, one can arrive at an integrated resource plan. Such a plan must address (1) existing and future generation, both conventional and renewable; (2) energy efficiency and demand response, including differences among consumer categories (e.g., urban-rural and residential-industrial-commercial); (3) existing and future rate designs; and (4) population and industrial location patterns. A nation's integrated resource plan reflects its unique resolution of multiple conflicting goals.

Absent a regional plan, there is still a regional result, since each nation's plan involves buying or selling—or not buying and selling—with sources and destinations outside its country. But absent the compromises necessary to produce the regional plan, some nations' plans inevitably undermine others'. A regional plan that identifies and accommodates international differences is therefore the best way to stretch toward the sum of each nation's goals.

A regional integrated resource plan, periodically refreshed, is the central prerequisite for achieving shared goals. Project developers, particularly those focused on renewable projects, strongly reiterate this point. Many have noted that, especially for renewable projects and the critical effort of the region to diversify its energy matrix, balancing short-term and the long-term demands with clear and consistent policies, the goal should be to find the proper equilibrium for the energy matrix.²⁷ According to some, no less than a regional strategy for incorporating

²⁷ Marcelo Antinori, “Actualización sobre la integración eléctrica” (presentation at Institute of the Americas Panama Energy Roundtable, Panama City, Panama, September 25, 2009).
<http://www.iamericas.org/presentations/energy/panama09/Marcelo%20Antinori.pdf>.

renewables into the energy mix, including bidding based upon specific technologies at the country level, would suffice.²⁸

Conclusion

The current and continued reality is that the fundamental challenges facing energy in Central America are regulatory and geopolitical. To wit, the development of renewable energy in the region has been facing huge regulatory and market-driven hurdles for years. Despite efforts to increase the role of these sources of energy, renewable projects still find it difficult to secure sources of financing. Preference tends to be given to the energy source with the lowest short-term cost, even if this energy must be imported from outside the region. By contrast, increased diversity and security of supply often come at a premium in the short term. Moreover, current regulatory frameworks tend to favor domestic market supply, effectively discouraging trading within Central America. Under these conditions, it may be difficult for large plants to offer base-load power to neighboring countries since there is always the risk of government intervention and potential cuts in exports to meet domestic needs.

In addition, the emerging concern over security threats and local conflicts has become a higher priority for regional energy policy-makers and must continue to be considered when discussing the region's energy sector.

²⁸ Steve Ihnot, "Energía en Centroamérica: Renovables, integración e inversión" (presentation at Institute of the Americas Central America Energy Conference, San Salvador, El Salvador, December 12, 2008). <http://www.iamericas.org/presentations/energy/Salvador08/Steve%20Ihnot.pdf>.

With regard to regional integration, there is no doubt that the desire to complete the myriad aspects of the SIEPAC project continues, and SIEPAC remains a key option to address many of the challenges detailed in this paper. One of the project's strongest drivers is the current lack of economies of scale, making clear the need to gradually establish a regional market. Hopes remain high for the project's expected impact on energy distribution costs and its potential to become the conduit to a series of large energy-generation projects aimed at supplying the entire region, rather than merely supplying a specific country. However, as the implementation continues, a significant challenge for its success is the creation of independent regulatory institutions, including institutions that reflect both national and regional values. That is, SIEPAC is but a microcosm of the core regulatory and political challenges facing the region. But when discussing today's status of electric integration in Central America, it is important to recall the words of the head of the SIEPAC operating company, EPR, which give cause for optimism: "The European Union (EU) doesn't have energy integration at this level."²⁹

In sum, SIEPAC encapsulates the critical challenges for the region's electric markets: without the complete and successful implementation of a regional regulatory market untethered by political intervention from its individual members, SIEPAC—and the entire regional grid—may be kept from optimal utilization. Moreover, a strong regional regulator would greatly reduce possibilities for "gaming the system," or the possibility that companies might chase higher margins in more profitable export markets at the expense of their own consumers.

²⁹ Reuters, "Central America Readies Shared Electric Grid," August 12, 2011. <http://af.reuters.com/article/energyOilNews/idAFN1E77726U20110812>.

But perhaps the most succinct conclusion for the current status of Central America's electric sector and regional integration is a familiar maxim: Out of challenge, opportunity.

Works Cited

- Antinori, Marcelo. "Actualización sobre la integración eléctrica." Presentation at Institute of the Americas Panama Energy Roundtable, Panama City, Panama, September 25, 2009. <http://www.iamericas.org/presentations/energy/panama09/Marcelo%20Antinori.pdf>.
- Berkman, Heather. "Crime and Violence in Central America: A Potential Threat to the Energy Sector?" Presentation at the Institute of the Americas XX Annual Latin American Energy Conference, La Jolla, CA, May 18, 2011. http://www.iamericas.org/presentations/energy/lj2011/Heather_Berkman.pdf.
- Berrizbeitia, Luis Enrique. "La CAF y la energía en América Latina." Presentation at Institute of the Americas Panama Energy Roundtable, Panama City, Panama, September 25, 2009. <http://www.iamericas.org/presentations/energy/panama09/Luis%20Enrique%20Berrizbeitia.pdf>.
- Brownfield, William. "Remarks by William Brownfield, Assistant Secretary for the (US) Bureau of International Narcotics and Law Enforcement Affairs." Remarks delivered to the Council of the Americas, Washington, DC, August 11, 2011. <http://coa.counciloftheamericas.org/article.php?id=3562&nav=res&rid=32>.
- Economic Consulting Associates, "The Potential of Regional Power Sector Integration: Central American Electric Interconnection System (SIEPAC) | Transmission & Trading Case Study," World Bank/ESMAP, March 2010. http://www.esmap.org/esmap/sites/esmap.org/files/BN004-10_REISP-CD_Central%20American%20Electric%20Interconnection%20System-Transmisison%20%26%20Trading.pdf.
- EFE, "Colombia, Panama to Invest \$420 Million in Power Line," *Latin Petroleum*, August 22, 2011. http://www.latinpetroleum.com/new/newsdetail.php?cid=34&art_id=10127&content=F&aid=10127.
- Empresa de Transmisión Eléctrica, S.A. (ETESA). <http://www.etsa.com.pa/estudios.php?idioma=ing&act=geotermico>. Retrieved 12 September 2011
- Espinasa, Ramón, "Las instituciones del sector energético en Centroamérica." Prepared for the fourth meeting of the Energy Policy Working Group of the Inter-American Dialogue and Inter-American Development Bank, San Salvador, El Salvador, May 14, 2011. http://www.thedialogue.org/uploads/Energy_Working_Group/BID-Centroamerica.pdf.
- Farnsworth, Eric, "U.S. Fiddles While Central America Burns," *The Miami Herald*, July 12, 2011. <http://coa.counciloftheamericas.org/article.php?id=3484&nav=res&rid=32>.

- Ihnot, Steve. “Energía en Centroamérica: Renovables, integración e inversión.” Presentation at Institute of the Americas Central America Energy Conference, San Salvador, El Salvador, December 12, 2008.
<http://www.iamericas.org/presentations/energy/Salvador08/Steve%20Ihnot.pdf>.
- Inter-American Dialogue, Energy Policy Group, *Rapporteur’s Report*, San Salvador, El Salvador, May 5-6, 2011.
http://www.thedialogue.org/uploads/Energy_Working_Group/EnergyPolicyGroupRapporteursReport.pdf.
- Johnson, Tim, “U.S. Expands its Drug Watch List to Include all Central America,” *McClatchy Newspapers*, September 15, 2011. <http://www.mcclatchydc.com/2011/09/15/124277/us-expands-its-drug-watch-list.html>.
- Mares, David R. “Oil Policy Reform in Resource Nationalist States: Lessons for Mexico.” James A. Baker III Institute for Public Policy, Rice University, April 29, 2011.
<http://bakerinstitute.org/publications/EF-pub-MaresLessons-04292011.pdf>.
- Martin, Jeremy M. “Central America Electric Integration and the SIEPAC Project: From a Fragmented Market Toward a New Reality.” Paper expanding upon remarks delivered at the third session of the Energy Cooperation and Security in the Hemisphere Task Force, University of Miami, Miami, FL, May 6, 2010. https://www6.miami.edu/hemispheric-policy/Martin_Central_America_Electric_Int.pdf.
- Martínez, José Enrique. Presentation at Institute of the Americas Panama Energy Roundtable, Panama City, Panama, September 25, 2009.
<http://www.iamericas.org/presentations/energy/panama09/Jose%20Enrique%20Martinez.pdf>.
- Reuters, “Central America Readies Shared Electric Grid,” August 12, 2011.
<http://af.reuters.com/article/energyOilNews/idAFN1E77726U20110812>.
- Sistema de interconexión eléctrica de los países de América Central – SIEPAC* (Electric Interconnection System of the Central American Countries), December 30, 1996.
http://www.ceaconline.org/pdf/Marco_Legal/TRATADO%20MARCO%20MEAC.pdf.
- Wallack, Jessica Seddon and Veerabhadran Ramanathan, “The Other Climate Changers: Why Black Carbon and Ozone Also Matter,” *Foreign Affairs*, September/October 2009.
<http://www.foreignaffairs.com/articles/65238/jessica-seddon-wallack-and-veerabhadran-ramanathan/the-other-climate-changers>.
- Yergin, Daniel. *The Quest: Energy, Security, and the Remaking of the Modern World*. New York: Penguin Press, 2011.

About the Author

Jeremy Martin is the director of the energy program at the Institute of the Americas at the University of California, San Diego. Martin is a frequent commentator on Latin American and energy issues, having spoken at international conferences and appeared in both print and broadcast media. He has testified before the US Congress on energy issues in Latin America. His writing and commentary have appeared widely across the United States and Latin America. Thanks to his upbringing, he's also a diehard Red Sox fan, Civil War buff, and news junkie. He graduated with honors in history from The Citadel in Charleston, South Carolina, and earned a Master of Arts degree in international affairs from the International Development Program at American University in Washington, DC. He has yet to achieve his lifelong dream of being a stand-up comic.

WHEMSAC Publications

Phase II

Kristina Mani, "Beyond the Pay: Current Illicit Activities of the Armed Forces in Central America." September, 2011.

Anthony T. Bryan, "Building Regional Security Cooperation in the 21st Century: The Case of the Caribbean Regional Security System [RSS]." September 2011.

Kristina Mani, "Innovating from the War Economy: Formal, Informal, and Illicit Economic Activities of the Military in Colombia." September 2011.

Antonio L. Mazzitelli, "Mexican Cartels Influence in Central America." September 2011.

Douglas Farah, "Islamist Cyber Networks in Spanish-Speaking Latin America." September 2011.

Vanda Felbab-Brown, "Law Enforcement Actions in Urban Spaces Governed by Violent Non-State Entities: Lessons from Latin America." September 2011.

Jairo Lugo-Ocando, "Silence by Stealth: Freedom of the Press and Polarization in Latin America." September 2011.

Harold A. Trinkunas, "Latin America: Nuclear Capabilities, Intentions and Threat Perceptions." September 2011.

Vanda Felbab-Brown, "Human Security and Crime in Latin America: The Political Capital and Political Impact of Criminal Groups and Belligerents Involved in Illicit Economies." September 2011.

Lilian Bobsa, "Democratizing Violence: The Case of the Dominican Republic." August 2011.

Douglas Farah, "Mapping Transnational Crime in El Salvador: New Trends and Lessons from Colombia." August 2011.

Erich de la Fuente, "The Current State of Argentina's Oil Industry." August 2011.

Genaro Arriagada and Patricia I. Vásquez, "Perspectives on Latin America's Energy Security." August 2011.

Adriana Moreno Blanco, "Food Security in Latin America," August 2011.

Orlando J. Pérez, "The Basis of Support for Hugo Chávez: Measuring the Determinants of Presidential Job Approval in Venezuela." August 2011.

J. Mark Ruhl, "Guatemala: A Failing State?" July 2011.

Hugo Corrales Compagnucci, "Armed Groups and Violence in Paraguay." July 2011.

Luis Bitencourt, "The Security Challenges for the 2016: Rio de Janeiro Olympic Games." July 2011.

Carmen Rosa de León-Escribano, "Capabilities of Police and Military Forces in Central America: A Comparative Analysis of Guatemala, El Salvador, Honduras and Nicaragua." July 2011.

Rodolfo F. Robles-Montoya, "The Use of the Military for Law Enforcement Activities in Central America." June 2011.

Ivelaw Lloyd Griffith, "The Re-Emergence of Suriname's Désiré (Desi) Bouterse: Political Acumen and Geopolitical Anxiety." June 2011.

Paola Prado, "The Impact of the Internet in Six Latin American Countries." June 2011.

Harold Trinkunas, "International Bolivarianism and its Influence." June 2011.

David Scott Palmer and Alberto Bolívar, "Peru's Shining Path: Recent Dynamics and Future Prospects." May 2011.

Erich de la Fuente, "ALBA: A Political Tool for Venezuela's Foreign Policy." May 2011.

Norman Munroe, "Climate Change and Regions at Risk: A Look at Central America." May 2011.

Juan Pablo Sarmiento & Gabriela Hoberman, "Disaster Risk Management Disparity in the Caribbean: Evidence from Barbados, Dominican Republic, Jamaica and Trinidad and Tobago." May 2011.

Daniel E. Moreno, "The Indigenous in Plurinational Bolivia: Perceptions of Indigenous People in Bolivia Before and During the Morales Government." April 2011.

Raúl L. Madrid, "Indigenous Movements, Democracy, and U.S. Interests in Latin America." April 2011.

Thomas Bruneau, "An Analysis of the Implications of Joint Military Structures in Argentina, Brazil, Chile, and Colombia." April 2011.

Rut Diamint, Pablo Policzer and Michael Shifter, "Latin American Coups: Have They Vanished or Taken New Shapes?" March 2011.

Antonio L. Mazzitelli, "The New Transatlantic Bonanza: Cocaine on Highway 10." March 2011.
Carlos Pereira, "Brazil Under Dilma Rouseff: Similar Policy Directions Maintained." March 2011.

Patricio Navia, “Venezuela and Chile: Two opposite Paths of Democratic Consolidation and Economic Development.” March 2011.

Miguel L. Castillo-Girón, “Land Ownership Transfers in Petén, Guatemala.” February 2011.

ARC, “Latin America and the Caribbean in 2011 and Beyond.” February 2011.

Iñigo Guevara Moyano, “Defense Expenditures: Argentina, Chile, Uruguay, and Paraguay.” December 2010.

Bradley S. Porter, “Altered Landscapes or Arms Race? Making Sense of Military Spending in South America.” November 2010.

Iñigo Guevara Moyano, “Defense Expenditure: Andean and Amazon Regions.” November 2010.

Ambassador Peter DeShazo, “Consolidating Security and Development in Colombia: Lessons for Peru and Panama.” November 2010.

Johanna Mendelson-Forman, “South American Defense Council: What it means for regional security?” November 2010.

Erich de la Fuente, “Cuba’s Role in Venezuela’s Control of the Internet and Online Social Networks.” October 2010.

Marifeli Perez-Stable, “Raul Castro’s Government: Recent Economic Reforms and Some Political Considerations.” October 2010.

Iñigo Guevara Moyano, “Defense Expenditures: Central America and Dominican Republic.” September 2010.

Hal Brands, “Criminal Fiefdoms in Latin America: Understanding the Problem of Alternatively Governed Spaces.” September 2010.

ARC, “Honduras’ Stressed Social Fabric: Instability and Risks.” August 2010.

CTC and ARC, “Uranium in Latin America: Reserves, Energy, and Security Implications.” August 2010.

John Proni, “Independent Monitoring of the Cuban Economic Zone Oil Development.” July 2010.

Kristina Mani, “Military Entrepreneurship in Latin America: A Brief Overview.” June 2010.

Bruce Bagley and Olga Nazario, “Lithium and Bolivia: The Promise and the Problems.” June 2010.

Brian Fonseca, "Domestic Politics in the Dominican Republic after the Earthquake in Haiti." June 2010.

Student Papers Series

Pablo Atencio, "China's Relations with Brazil and Argentina and Implications for U.S. Security Concerns." September, 2011.

Michael Aranda, "The Transitioning Economic Dynamics of the Military in Communist Regimes: A Comparison of Cuba, China and Vietnam." September 2011.

David Fields, "Two Decades Out of the Whirlpool: Past (and possible Future) United States Interventions in Latin America." September 2011.

Regina Joseph, "Rio and the Reds: The *Comando Vermelho*, Organized Crime and Brazil's Economic Ascent." September 2011.

Andreina Fernandez Fuenmayor, "The Rise of Native Voices Against Natural Resource Extraction in Latin America." September 2011.

Antoine Perret, "Private Security Trends and Challenges in Latin America." August 2011.

Phase I

Brian Fonseca, "Human Smuggling & The Terrorist-Criminal Nexus." January 2009.

Arturo Contreras and Francisco Ledantec, "General Overview of Transnational Threats in Latin America with a Special Focus in South America & Its Effect on International Security and US-Latin American Relations." December 2008.

Thomas Bruneau, "Civil Military Relations in Democratic Latin America." December 2008.

Brian Fonseca, "Identifying Opportunities for US-Cuba Military Cooperation." December 2008.

Harold A. Trinkunas, "Understanding Venezuelan Strategic Culture." December 2008.

Joanna Mateo, "US-Brazil: Forging a New Relationship." November 2008.

Joanna Mateo, "Las Maras in Honduras." November 2008.

Joanna Mateo, "Advancing Security Cooperation in the Americas: An Historical Perspective." August 2008.

Julio A. Cirino, "The Media Component in a Visual Culture and the Spread of Populism in Latin America: Exploring the Spiral of Silence." June 2008.

Brian Fonseca and Evan Ellis, "Emerging Relationships: China and Latin America." May 2008.

Joanna Mateo, "Gang Violence in Central America: The Case of Honduras. Identifying a Role for USSOUTHCOM." April 2008.

Anthony P. Maingot, "The New Geopolitics of the Andes: The Dangers of a State-on-State War." April 2008.

Joanna Mateo, "Health Threats to Stability in the Americas." February 2008.

Brian Fonseca, "Emerging Relationships: Iran & Latin America." February 2008.

Brian Fonseca, "Energy Outlook: Brazil." January 2008.

FIU

**Applied Research
Center**