CRITICAL ISSUES FOR CLEAN ENERGY FINANCING AND LEDS SUPPORT TO CENTRAL AMERICA

THE CEADIR PROJECT

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ACRONYMS

ARECA	Accelerating Renewable Energy in Central America
BANDESAL	Banco de Desarrollo de El Salvador (El Salvador Development Bank)
BCIE	Banco Centroamericano de Integración Económica (Central American Bank for Economic Integration Bank)
BIO	Belgian Investment Company for Developing Countries
BNEF	Bloomberg New Energy Finance
CAF	Banco de Desarrollo de América Latina (Development Bank of Latin America)
CAFCEF	Central American Forum for Clean Energy Financing
CAREC	Central American Renewable Energy and Cleaner Production Facility
CASEIF II	Central American Small Enterprise Investment Fund II
CDCF	Community Development Carbon Fund
CE	Clean energy
CEADIR	Climate Economic Analysis for Development, Investment, and Resilience
CEAC	Consejo de Electrificación de América Central (Central American Electrification Council)
CEL	Comisión Ejecutiva Hidroeléctrica Río Lempa (El Salvador Hydroelectric Executive Committee for the Lempa River)
CEPAL	Comisión Económica para América Latina y el Caribe (Economic Commission for Latin America and the Caribbean)
CIM	Construction, installation, and manufacturing
CNE	Consejo Nacional de Energía de El Salvador (El Salvador National Energy Council)
CNEE	Comisión Nacional de Energía Eléctrica (National Commission of Electricity of Guatemala)
CNPML	Centro Nacional de Producción Más Limpia de El Salvador (El Salvador National Center for Cleaner Production)
CO_2	Carbon dioxide
CONEE	Consejo de Eficiencia Energética de Guatemala (Guatemala Energy Efficiency Council)
DCA	USAID Development Credit Authority
ECAM	USAID/El Salvador Central America and Mexico Regional Mission
EE	Energy efficiency
ENEE	Empresa Nacional de Energía Eléctrica de Honduras (Honduras National Electric Energy Utility)
Finnfund	Finnish Development Finance Company
FOMIN	Fondo Multilateral de Inversiones (Multilateral Investment Fund)

FONDEPRO	Fondo de Desarrollo Productivo (El Salvador Production Development Fund)
GCC	Global climate change
GDP	Gross domestic product
GHG	Greenhouse gas
GIZ	Gesellschaft für Internationale Zusammenarbeit (German Agency for International Development)
GWh	Gigawatt-hour
IADB	Inter-American Development Bank
INDE	Instituto Nacional de Electrificación de Guatemala (National Electrification Institute of Guatemala)
JICA	Japanese International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau Entwicklungsbank (German development bank)
KW	Kilowatt
LNG	Liquefied natural gas
MEM	Ministerio de Energía y Minas de Guatemala (Guatemala's Ministry of Energy and Mines)
MIF	IADB's Multilateral Investment Fund
MW	Megawatt
Norfund	Norwegian Investment Fund for Development
NREL	National Renewable Energy Laboratory of the United States
O&M	Operation and maintenance
OAS	Organization of American States
OLADE	Organización Latinoamericana de Energía (Latin American Energy Organization)
PFAN	Private Financing Advisory Network
PIEE	Plan Integral de Eficiencia Energética (Guatemala Energy Efficiency Plan)
PPA	Power purchase agreement
PRONASE	Programa Nacional Para el Aprovechamiento Sustenable de la Energía (Sustainable Energy National Program)
PV	Photovoltaic
RCEI	Regional Clean Energy Initiative
RCEII	Regional Clean Energy Investment Initiative
SERNA	Secretaría de Recursos Naturales y Medio Ambiente de Honduras (Honduran Secretariat of Natural Resources and Environment)
SICA	Sistema de la Integración Centroamericana (Central American Integration System)
SIEPAC	Sistema de Interconexión Eléctrica de los Países de América Central (Central American Electrical Interconnection System)

SME	Small and medium enterprise
TWh	Terawatt/hour
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

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1. EXECUTIVE SUMMARY

The **Climate Economic Analysis for Development, Investment and Resilience** (CEADIR) Project, funded by USAID, will prepare for, conduct, and develop recommendations from a Central America regional Needs Assessment mission to assess the countries' priorities and capabilities in Clean Energy (CE) financing and Low Emission Development Strategies (LEDS) planning. The Needs Assessment will identify and recommend to USAID, based on consultative in-country meetings, the high priority activities requested by key stakeholders to help mobilize financing for CE (renewable and energy efficiency) actions and LEDS planning with initial efforts focusing in El Salvador, Guatemala, and Honduras.

1.1 STUDY PURPOSE

This desktop study reviews the state of CE markets and capacity of these countries' financial institutions for and barriers to scaling up of CE lending—especially by the commercial lending sector. In addition, the report provides background information on the enabling environments and LEDS planning that supports CE lending. It presents the major conclusions of this assessment and highlights areas for further in-country review to be able to recommend areas for technical support from CEADIR. The in-country Needs Assessment is to conduct interviews of key stakeholders to complement the desktop analysis. After conducting interviews with local financial institutions and other stakeholders, we will have a fuller understanding of the key barriers to CE lending and the work being done by other donors to understand where CEADIR technical assistance provides value added to mobilizing CE financing and enhancing LEDS planning.

1.2 CONCLUSIONS

The study provides an initial overview of the problem and issues in El Salvador, Guatemala and Honduras (Section 2), a description of CE market trends and government goals (Section 3), the state of CE financing by the commercial and public sectors (Section 4), an explanation of identified CE financing barriers and donor responses (Section 5); and recommends issues to be addressed during the Needs Assessment (Section 6). The initial analysis suggests the following set of trends, goals and conclusions, which directly affect the mobilization and scaling of financing for CE mitigation actions and LEDS planning in the three countries:

Excess Demand in Energy Markets May Lead to Higher Emissions

Large hydropower and fossil fuels dominate the electricity and liquid fuel use in all three countries. Further trends to meet rapidly rising energy demand may increase fossil fuel use as large hydro opportunities are maxed out and societal acceptance discouraged. Thus, El Salvador, Guatemala, and Honduras may see rising greenhouse gas emissions from their energy sectors unless the rate of reliance on CE exceeds a shift towards higher dependency on high-carbon fuels.

Other notable energy demand, fuel mix and greenhouse gas emission trends affecting the need for CE financing and climate change impacts from the countries include

- Electricity and liquid fuel demand in Central America is expected to continue to increase substantially over the next two decades (doubling or tripling based on the country);
- The current reliance on hydropower may be eclipsed where fossil fuel imports are projected to meet future demand; and
- Honduras plans to add 1,100 MW in capacity from coal and bunker fuel, which will have significant impact on future greenhouse gas emissions and energy security for the country.

State of Clean Energy Markets: Trends and Goals

While the use of CE is rising across these countries, there still is significant untapped potential for increasing the use of renewable energy and implementing efficient energy systems. Table E.1 shows that, except in Belize, public and private investments in CE from 2006 to 2013 remain in the low 20 percentiles of total generation for the three ECAM countries. Other trends involve the improvement of the policy and regulatory enabling environments for promoting CE markets and financing over the past decade, with the establishment of private power laws, CE purchase power agreements, feed-in tariffs, and national targets/goals for renewable and energy efficiency generation.

Expansion of CE use, however, had tapered off during the past five years as economies contracted, and barriers to entry and financing for CE still posed important hurdles. As such, renewable and especially energy efficiency projects remain under-financed and underdeveloped by the local financing and commercial sectors.

Table E.1. Public and Private Investments in CE in Central America, 2006-2013

Country	Total Clean Energy Investment, 2006-2013 (US$ billion)	Installed Power Capacity (GW)	Renewable Share (%)	Cumulative (Total) Clean Energy Generation (GWH)
Belize	0.19	0.16	56	308
Costa Rica	1.7	3	31	3952
El Salvador	0.24	2	22	1691
Guatemala	0.59	3	23	2031
Honduras	0.81	2	22	1196
Nicaragua	1.6	1	31	1442
Panama	1.3	2	8	685
Totals	**6.43**	**13.16**	**-**	**11,305**

Source: FOMIN and BNEF (*Fondo Multilateral de Inversiones* and Bloomberg New Energy Finance). 2013. *Climascopio 2013. Nuevas Fronteras para las Inversiones en Energía de Bajas Emisiones de Carbono en América Latina y el Caribe.* Washington, DC: FOMIN.

The dominant sources of renewable energy installed capacity and net generation by country are provided in Table E.2 below.

Table E.2. Installed Capacity and Net Generation in Central America, 2013

Country	Total	Hydro	Geo-thermal	Wind	Cogen-eration	Solar	Biogas	Thermal
Installed Capacity (MW)								
Central America	12,798.0	5,380.2	625.6	416.7	983.5	1.0	10.1	5,381.0
Costa Rica	2,731.2	1,725.3	217.5	148.1	40.0	1.0	3.7	595.7
El Salvador	1,562.6	486.8	204.4	0	110.0	n.a.	6.4	755.0
Guatemala	2,968.4	996.6	49.2	0	594.2	n.a.	n.a.	1,328.4
Honduras	1,747.9	558.0	0	102.0	105.5	n.a.	n.a.	982.4
Nicaragua	1,271.7	119.7	154.5	146.6	133.8	n.a.	n.a.	717.1
Panama	2,516.2	1,493.8	0.0	20.0	n.a.	n.a.	n.a.	1,002.4
Net Generation (GWh)								
Central America	45,735.3	21,671.5	3,778.7	1 351.4	2,291.1	1.4	20.0	16,621.1
Costa Rica	10,136.1	6,851.0	1,516.7	484.6	86.3	1.4	0	1,196.0
El Salvador	5,895.5	1,848.4	1,442.3	0	229.5	n.a.	20.0	2,355.3
Guatemala	9,270.6	4,630.8	212.3	0	1,520.5	n.a.	n.a.	2,906.9
Honduras	7,826.4	2,738.7	0	310.2	179.6	n.a.	n.a.	4,597.9
Nicaragua	3,744.7	448.2	607.3	555.0	275.2	n.a.	n.a.	1,858.9
Panama	8,862.0	5,154.3	0	1.6	n.a.	n.a.	n.a.	3,706.0

Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2014. *Centroamérica: Estadísticas de Producción del Subsector Eléctrico, 2013.* Chile: CEPAL.

State of Clean Energy Financing

Finance *is* flowing into CE in all countries, but the total flows come mostly from outside or donor sources of funding and represent a small portion of total existing or planned energy investments. The multilateral development and international banks (MDBs) still provide the majority of CE financing. These include KfW Entwicklungsbank (KfW) from Germany, the World Bank, and the Export-Import Bank of the United States (table E.3). Regional and national development banks such as Banco Centroamericano de Integración Económica (BCIE) and Banco de Desarrollo de El Salvador are amongst the top CE lenders. The CE lending activity recorded in public documents and by Bloomberg New Energy Finance (BNEF) from private sector banks includes Banco Agromercantil de Guatemala Honduras, Banco Lafise Honduras, Banco Finnaciera commercial Hondurena, and Banco Atlantida.

With increasing capacity development, commercial banks in-country can help to fill future CE investment needs to match and perhaps eventually exceed the outsized role currently played by MDBs, regional and national banks. An increasing role for local or regional banks appears important if sustainable CE financing industries are to evolve.

Table E.3. Top Clean Energy Project Finance Lenders by Country 2000 to 2014

Country	Project Finance Lenders	Total Lending (US $ million)	Percentage of funding by country
El Salvador			
	KfW Entwicklungsbank	22.17	49.00
	Central American Bank for Economic Integration	14.93	33.00
	Banco de Desarrollo de El Salvador	8.14	18.00
Guatemala			
	Clipper Acquisitions Corp.	42.00	31.17
	The World Bank Group	27.00	20.04
	Central American Bank for Economic Integration	21.90	16.25
	G&T Continental	16.90	12.54
	Banco Agromercantil de Guatemala SA	16.90	12.54
	KfW Entwicklungsbank	10.03	7.45
Honduras			
	The World Bank Group	184.08	27.39
	Central American Bank for Economic Integration	165.50	24.63
	Export-Import Bank of the United States	158.80	23.63
	Nederlandse Financierings Maatschappij voor Ontwikkelingslanden NV	135.63	20.18
	OPEC Fund for International Development	14.59	2.17
	EMP Global LLC	8.13	1.21
	Banco Lafise Honduras SA	2.63	0.39
	Banco Financiera Comercial Hondurena SA	2.63	0.39

Source: Alves, Lilian, Associate, Latin America, BNEF (Bloomberg New Energy Finance). January 5, 2015, private communication with Gwendolyn Andersen, Abt Associates, January 5, 2015

Barriers and Responses to Clean Energy Financing

The key barriers to scaling up CE financing from the commercial lending industry are

- Lack of direct encouragement, involvement, understanding, and commitment of the private commercial lending industry to CE financing;
- Limited credit product options and systems at private banks for marketing and financing of CE;
- Limited data on CE market size and profitable investment opportunities and data on wind or small hydropower resource;
- Public-private partnerships for scoping renewable resource potential can bolster joint development efforts such as tendering of renewable electricity capacity;
- Lack of capacity for developing integrated technical solutions;
- Time-consuming procedures;
- Insufficient regulatory frameworks to promote the introduction of renewable energy sources that require relatively high initial investment costs;
- Inadequate capacity in research, public awareness, and the private sector;
- Legal and financial frameworks that may be inadequate to accomplish CE targets;
- Small market size; and
- Electricity markets designed for fossil fuels.

The MDBs and USAID are working to address such barriers, so the Needs Assessment should focus on gathering financial institutions (FIs) perspectives on those that remain most critical to scaling up capital flows over the short and intermediate terms.

1.3 RECOMMENDATIONS

In terms of mobilizing finance for CE, there are three key areas of concern. First, it is unclear when the legislation promoting energy efficiency will be passed and how the financial markets will respond to the opportunity. Energy efficiency is typically an area of missed opportunities. Second, the financing is largely taking place without the participation of local banks, reducing the local benefits of CE investments and displaying a dependence on external development institutions rather than an integrated, competitive private market. Finally, it is unclear whether the increased investment in CE will be sufficient to meet the projected increases in energy demand without continued effort by external donors, or whether these countries will turn to fossil fuels for new capacity, increasing GHG emissions. Fortunately, there is donor activity in each of these activities. An exception is in providing hands-on, direct technical assistance and capacity development to local financial institutions.

Based on the findings of this initial review, we have identified the following areas that require further investigation during the in-country needs assessment.

Clean Energy Financing Sector

- Solicit input from senior and operational managers at local financial institutions on the perceived advantages, risks, and opportunities associated with CE lending and their needs;
- Determine the FIs' lending requirements (loan size, sectors, maximum of minimum lending criteria), lending processes, and credit product development path(s);
- Assess existing successful and identify potential financial instruments that would scale-up and/or reduce perceived risks of CE lending;
- Analyze the perceived attitudes towards CE lending of the FIs about the current enabling environments and explore recommendations for removal of any barriers;
- Inquire about interest in lending to the geothermal sector;
- Determine the short- versus long-term capitalization requirements, debt securitization, available loan guarantees, participation with other FIs (impact investors, micro-financing institutions, development banks) that help mitigate lending risks;
- Perform a cursory market diagnostic of the capability of local financial institutions on CE lending; based on an existing bank-capacity CE lending survey tool developed by Enclude Solutions, Ltd.;
- Analyze and incorporate into interviews involvement of vulnerable populations (indigenous people, women) financial institution outreach and CE lending programs; and
- Interview national, regional, and international development bank representatives and representatives of other actual or potential CE lenders to determine their current or planned involvement in the market and with commercial lending institutions.

Clean Energy Financing and LEDS Enabling Environment

- Discuss with USAID, host country governments, CE trade associations, project developers and other CE market actors the current incentives and disincentives for increasing CE lending by the commercial sectors;
- Identify current and planned use of modeling for CE and LEDS planning at the national levels;

- Solicit recommendations for linking LEDS planning to CE financing from policy makers and financiers to ensure compatibility of market signals with national climate change goals; and
- Analyze the roles for vulnerable populations and women in local and national planning initiatives and CE project development.

At the conclusion of the Needs Assessment, the CEADIR team will present options for technical assistance in the form of knowledge dissemination, networking, and training to build capacity of financial institutions for the purpose of facilitating the mobilization of private and public investment in CE in Central America to reduce greenhouse gas (GHG) emissions.

2. OVERVIEW

This section summarizes the status of the energy and CE markets in El Salvador, Guatemala, and Honduras as relevant for USAID to support the countries in mobilizing additional lending to renewables and energy efficiency systems in the countries. The purpose is not an exhaustive analysis of the enabling environments and energy needs or supplies, but rather to highlight relevant facts that affect current and future lending to CE and the preparation of LEDS plans.

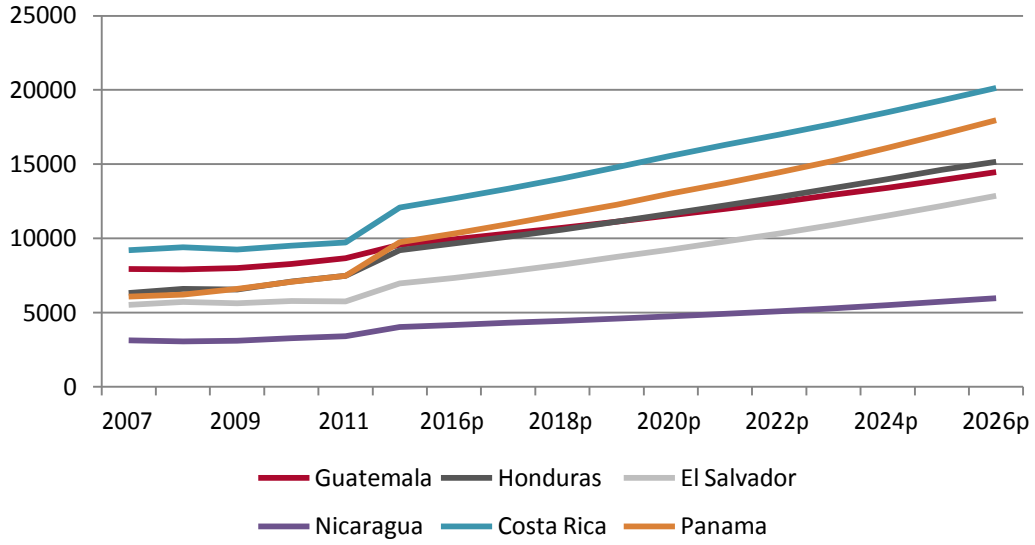
2.1 ENERGY SECTOR DRIVERS: DEMAND, AVAILABLE CLEAN ENERGY, AND NEED FOR PRIVATE FINANCING

The Central American Electrification Council (CEAC), integrated by representatives from the governments of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama, projects a near doubling of electricity consumption in the region from 42.5 TWh in 2005 to 82.8 TWh by 2025 (CEAC, 2012).[1] Panama is projected to have the highest growth during this period, followed by El Salvador and Costa Rica, as indicated in Figure 1. It should be noted that such projections estimate higher than historical growth rates and assume several favorable developments, such as a growing regional electricity market, energy integration with Colombia, and a rapid increase in access to electricity to the important share of the population that does not have it (CEAC, 2012; BNEF, 2014).

The United Nations' Comisión Económica para América Latina y el Caribe (Economic Commission for Latin America and the Caribbean) (CEPAL) (2007) estimates that intermittent renewable energy, i.e. resource that is not continuously available due to natural resource variations, such as wind and solar, could contribute approximately 20 percent of total electricity consumption by 2020. About 17.5 percent of industrial and commercial energy could be saved with efficiency measures (CEPAL, 2007). The United States Government Enhancing Capacity for Low Emission Development Strategy (EC-LEDS) Initiative signed Memoranda of Understanding for setting strategic partnerships with the governments of Costa Rica and Guatemala to provide assistance enhancing their capacity to transition to low-carbon emission development paths through displacing projected conventional fuel use with CE, defined in this document as renewable energy and energy efficiency.

[1] The source indicates that these projections were estimated using econometric and statistical methods, but does not provide any additional methodological information.

Figure 1. Historical and Projected Electricity Consumption in Central American Countries, 2007-2027



Note: p= projected.
Source: CEAC (*Consejo de Electrificación de América Central*). 2012. *Plan Indicativo Regional de Expansión de la Generación. Periodo 2012-2027.* San Salvador: CEAC.

Meeting this projected increase in electricity demand will require investments of US$ 24-27 billion in total between 2012 and 2027 (CEAC, 2012). This significant financial need provides an opportunity for USAID to help strengthen the capacity of governments and financial institutions in Central America to work with private renewable energy developers by helping to reduce costs, diversify energy sources, and move toward a low-carbon energy pathway.

While current domestic and international activities are helping CE investors at the regulatory and project preparation levels, additional capacity development is needed to reduce Central America's dependency on conventional fuels, create energy-efficient systems, and better use regional and domestic renewable resources by mobilizing investments from the public and private sectors. The development and implementation of CE lending and climate financing programs, preparation of evidence-based economic analyses of alternative climate change actions, and leverage of private commercial investors and financiers would scale up CE investments throughout the region. Increased public and private investment in CE would ensure supply and quality of energy in the region, resulting in greater competition and economies of scale. Unlocking investment in renewable energy would create employment, provide electricity to more Central Americans, and reduce GHG emissions.

2.2 SUPPORTING CLEAN ENERGY FINANCE AND LEDS

In recognition of this opportunity, the USAID/El Salvador Central America and Mexico Regional Mission (ECAM) requested the assistance of USAID's CEADIR Project to help mobilize public and private investment in CE to reduce GHG with a geographic focus on El Salvador, Guatemala, and Honduras. Phase 1 of CEADIR assistance includes preparing this initial desktop study of the critical issues facing CE financing in the region. It sets forth the existing incentives, major barriers, opportunities, and options regarding mobilizing CE financing to set the groundwork for undertaking the Needs Assessment, which will interview stakeholders and suggest new CE financing and LEDS activities for USAID/ECAM in early

2015. From Phase 1 will be a set of recommended and selected CE finance and LEDS support activities for CEADIR. Phase 2 would implement the activities selected by USAID/ECAM.

2.3 ENCOURAGING CLEAN ENERGY FINANCING

In Central America, national energy policies and regulatory frameworks are in place, as well as a regional sustainable energy strategy for 2020, including the diversification of energy sources and increased use of renewable resources (Dolezal et al., 2013). Available energy expansion plans in El Salvador, Guatemala, and Honduras suggest that the share of fossil-fired resources in new capacity additions will decrease (USAID, 2010). El Salvador plans to reduce the contribution of fossil fuels in generation from 50 percent in 2013 to 40 percent in 2018 (CNE, 2014). Guatemala plans to increase the share of electricity generation from renewable sources from 50.6 percent in 2007 to 67 percent in 2027. By 2012, more than 65 percent of electricity was already being generated from renewable sources (MEM, 2013). In Honduras, the Generation Expansion Plan 2008-2022 contemplates a net increase in installed capacity of around 1,980 MW, with 55 percent of which will be from renewable sources (ENEE, 2008). According to USAID (2010:47), developments since 2008, as well as projects expected to reach completion in the next few years anecdotally support "…the view that the long-term trend toward heavier reliance on fossil fuel generation resources has slowed and begun to reverse itself, even if to a very limited degree so far." (USAID, 2010).

Table 1. Public and Private Investments in CE in Central America, 2006-2013 shows that investments have been made in CE albeit not sufficient to meet unserved CE developer and electricity consumer demand. (BNEF), 2014) National development banks (e.g., Banco de Desarrollo de El Salvador and Banco Agromercantil de Guatemala SA), commercial banks (e.g., G&T Continental, Banco Lafise Hondura s SA, Banco Financiera Comercial Hondurena SA, and Nederlandse Financierings Maatschappij Voor Ontwikkelingslanden NV), and international lenders (Inter-American Development Bank (IADB), International Finance Corporation, (IFC), Kreditanstalt fuer Wiederaufbau (KfW), Banco Centroamericano de Integración Económica (BCEI), the World Bank, and the Export-Import Bank of the United States) are also scaling up CE lending in the region.

Table 1. Public and Private Investments in CE in Central America, 2006-2013

Country	Total Clean Energy Investment, 2006-2013 (US$ B)	Installed Power Capacity (GW)	Renewable Share (%)	Total Clean Energy Generation (GWh)
Belize	0.19	0.16	56	308
Costa Rica	1.7	3	31	3952
El Salvador	0.24	2	22	1691
Guatemala	0.59	3	23	2031
Honduras	0.81	2	22	1196
Nicaragua	1.6	1	31	1442
Panama	1.3	2	8	685
Totals	6.43	13.16		11,305

Source: FOMIN and BNEF (*Fondo Multilateral de Inversiones* and Bloomberg New Energy Finance). 2013. *Climascopio 2013. Nuevas Fronteras para las Inversiones en Energía de Bajas Emisiones de Carbono en América Latina y el Caribe.* Washington, DC: FOMIN.

However, energy intensity in Central America has decreased at an annual rate of only 0.43 percent, trailing improvements in the global average of 1.2 percent. Energy efficiency interventions, including reductions in electricity losses, could result in energy savings of 12,255 GWh by 2025, more than 15 percent of total demand in Central America (CEPAL, 2014b). These actions could result in cost savings of close to US$ 1.5 billion for end users and reductions in carbon dioxide equivalent (CO_2e) emissions of 7.9 million tons CO_2e per year. The IADB concluded that a US$ 550 million investment in energy efficiency could eliminate the need to invest US$ 1.7 billion in 12 open-cycle, natural gas-fired electricity generation facilities over 10 years. Nexant found that investing US$ 118 million in residential, commercial, and industrial energy efficiency could reduce demand by 54 MW, (about 20 percent of average annual load growth during 2005–2009) at an average incremental cost of US$ 0.03 per kWh (USAID, 2010). Still despite the uptick in renewable energy use across all ECAM countries, some important constraints to mobilizing financing appear:

- Lack of direct encouragement, involvement, understanding, and commitment of the private commercial lending industry to CE financing;
- Minimal credit product options and systems at private banks for marketing to and financing of CE, leading to the lack of transparent procedural and lending requirements for project developers;
- Limited CE data on market size and profitable options available to CE project developers, such as lack of available resource data for wind or small hydroelectricity;
- Lack of technical capacity by regulators, grid operators, and utilities for integrating technical solutions, such as intermittent renewable energy, particularly through electricity trading;
- Complicated and time-consuming procedures to obtain permits and licenses from the appropriate authorities;
- Regulatory processes that require relatively high initial investment costs by developers;
- Inadequate research, education, and training of renewable energy professionals and lenders;
- Legal and financial frameworks that may be inadequate to accomplish CE targets and ensure they survive political transitions;
- Relatively small CE market size that is curtailed by production caps on total electricity generation to come from renewable energy projects as set by national utilities or national energy councils;
- Electricity markets and pricing designed for base-load fossil fuel use, putting intermittent renewable energy at a competitive disadvantage;
- Inadequate planning and support for geothermal energy combined with legal hurdles; and
- Limited involvement of women entrepreneurs in CE lending and project development.

While there is room for strengthening of the legal and policy enabling environments, there appears to be a need for greater involvement of and commitment by the private lenders, equity investors, and project developers to take advantage of CE opportunities.

2.4 OPPORTUNITIES FOR ASSISTANCE

Potential CE financing and LEDS interventions for ECAM include:

- Direct involvement of commercial lenders in understanding the market opportunities for and credit development needs of the CE markets;

- Capacity development tailored to commercial and potentially national development banks' and project developers' needs to mobilize lending to this emerging CE market;
- Information dissemination of CE market assessments to build a publicly available internet accessible repository of existing CE markets, including resource assessments;
- Market assessments for financial institutions to assess capabilities and develop products for CE lending;
- Establishment or expansion of use of the USAID Development Credit Authority (DCA) loan guarantees;
- Roll out the USAID Clean Energy Lending Toolkit to interested lending institutions;
- Development of a CE investor guide with project, financial lender, and bankable policy needs toolbox;
- Facilitate training for integrated clean technical solutions, including modeling that integrates LEDS economic analysis, energy, and emissions;
- Facilitate bank access to USAID/DCA loan guarantees for CE; and
- Support the establishment of monitoring and evaluation frameworks to assess the progress of El Salvador, Guatemala, and Honduras in meeting the ambitious energy policy goals they have established.

2.5 IMPLICATIONS FOR NEEDS ASSESSMENT

The desktop study investigated publicly available information and narrowed the scope of the investigation during the Needs Assessment trip. The literature indicates the need for increased capacity in electricity generation and the potential for cost-effective energy savings. There is potential for expanding production from renewable resources. Significant improvements to the enabling environment have occurred or are underway, as evidenced by the pipeline of renewable energy projects.

CEADIR proposes to conduct interviews with local financial institutions, local project developers, professors in higher education institutions, and some members of government ministries and civil society organizations during field visits to El Salvador, Guatemala, and Honduras. The team proposes to investigate the capability of local financial institutions for CE lending, learn their perspectives on the risks and opportunities involved in this market, and explore financial instruments that would reduce the perceived risks of CE lending.

Our literature review found very little information on gender representation in policy making, regulation, financial institutions, and project developers, as well as little evidence regarding the impact such representation has on outcomes. In addition, our literature review found very little information regarding the use of modeling for energy and LEDS policy setting.

The Needs Assessment will thus focus primarily on the experience, perspectives, and capabilities of local financial institutions with the purpose of developing recommendations for USAID ECAM for activities that will help scale up CE finance in a manner that complements rather than duplicates efforts of other projects and donors.

3. CLEAN ENERGY TRENDS AND GOALS

This section focuses on major trends and country goals for CE in El Salvador, Guatemala, and Honduras along with the important co-benefits that can accompany a transition to CE. In electricity, trends include rapid declines in the prices of photovoltaic and wind technologies, increasing demand for electricity, and opportunities for energy efficiency. Petroleum trends include increasing demand and opportunities to substitute CE. The co-benefit discussion includes energy security, health, job creation, and impacts on gender and vulnerable populations.

3.1 TRENDS

3.1.1 DECLINES IN PRICES FOR RENEWABLE ENERGY

A recent World Bank study on Central America found that some renewables are more cost competitive than fossil fuel energy sources for the generation of electricity. The levelized cost of energy was US$ 0.05-0.089/KWh for geothermal power and US$ 0.07-0.08/KWh for hydropower. The LCOE was US$ 0.12-0.15/KWh for heavy fuel oil and US$ 0.10-0.11/KWh for coal-powered generation (Dolezal, et al., 2013).

The LCOE for geothermal US$ 0.072-0.089/KWh (with capital costs of US$ 4,000-5,000/kW) and US$ 0.05-0.06/KWh at a capital cost of US$ 2,500/kW, (World Bank, 2012). Baseload hydroelectric power in the region cost US$ 0.07-0.08/KWh (at a capital cost of US$ 2,500/kW, which may be overly optimistic since some recent large-scale plants had a capital cost of $4,000/kW).

3.1.2 INCREASING DEMAND FOR ELECTRICITY

Member countries of [Sistema de la Integración Centroamericana (Central American Integration System) (SICA) developed the Central American Sustainable Energy Strategy 2020 with support from the CEPAL.[2] [3] The strategy estimates that regional energy demand will increase from 34,504 GWh in 2006 to 67,467 GWh in 2020. In turn, power demand will almost double from 34 TWh in 2005 to 67 TWh in 2020.[4] Meeting this growing demand would require augmenting installed capacity by 6,000–7,000 MW, with investments of US$ 12–18 billion, of which US$ 11–14 billion would be needed to expand electricity generation (CEPAL, 2007). More recent estimates by CEAC (2012) project a near doubling of electricity consumption in the region from 42.5 TWh in 2011 to 82.8 TWh by 2025. Meeting this projected increase in electricity consumption will require investments of US$ 24-27 billion in total between 2012 and 2027 (CEAC, 2012).

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[2] The member countries of SICA are Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, and the Dominican Republic.

[3] CEPAL, 2007

[4] These figures correspond to the medium-growth scenario in the strategy.

Some of the primary goals that the strategy aims to meet by 2020 are to increase the share of renewables in regional electricity generation by 11 percent; reduce from 16.2 percent to 12 percent or less the losses from the countries' electric systems; decrease by at least 10 percent the consumption of fossil fuels in the transport sector, which amounted to about 47 million barrels of oil in 2006; and reduce by 20 percent the region's GHG emissions relative to a baseline scenario, which is equivalent to a reduction of about 24 $MtCO_2eq$ (CEPAL, 2007).

Despite having significant renewable energy resources, Central American countries obtain an important share of the energy they consume from imported fossil fuels and fuelwood. Thermal power contributes 48 percent, 45 percent, and 56 percent of the installed electric generation capacity in El Salvador, Guatemala, and Honduras, respectively. In 1990, hydropower resources represented 66 percent of the total installed generation capacity, while thermal made up about 30 percent. Between1990 and 2013 the use of fossil fuels increased (Table 2).

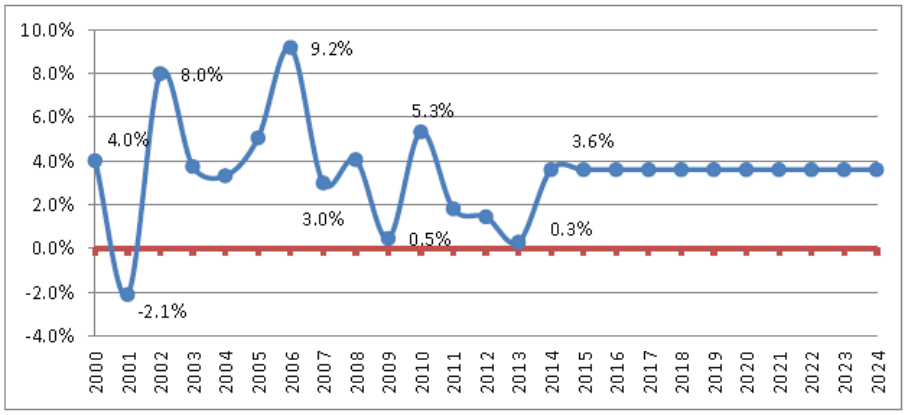
Table 2. Installed Capacity and Net Generation in Central America, 2013

Location	Total	Hydro	Geo-thermal	Wind	Cogen-eration	Solar	Biogas	Thermal
Installed (MW)								
Central America	12,798.0	5,380.2	625.6	416.7	983.5	1.0	10.1	5,381.0
Costa Rica	2,731.2	1,725.3	217.5	148.1	40.0	1.0	3.7	595.7
El Salvador	1,562.6	486.8	204.4	0	110.0	n.a.	6.4	755.0
Guatemala	2,968.4	996.6	49.2	0	594.2	n.a.	n.a.	1,328.4
Honduras	1,747.9	558.0	0	102.0	105.5	n.a.	n.a.	982.4
Nicaragua	1,271.7	119.7	154.5	146.6	133.8	n.a.	n.a.	717.1
Panama	2,516.2	1,493.8	0.0	20.0	n.a.	n.a.	n.a.	1,002.4
Net Generation (GWh)								
Central America	45,735.3	21,671.5	3,778.7	1,351.4	2,291.1	1.4	20.0	16,621.1
Costa Rica	10,136.1	6 851.0	1,516.7	484.6	86.3	1.4	0	1,196.0
El Salvador	5,895.5	1,848.4	1,442.3	0	229.5	n.a.	20.0	2,355.3
Guatemala	9,270.6	4,630.8	212.3	0	1,520.5	n.a.	n.a.	2,906.9
Honduras	7,826.4	2,738.7	0	310.2	179.6	n.a.	n.a.	4,597.9
Nicaragua	3,744.7	448.2	607.3	555.0	275.2	n.a.	n.a.	1,858.9
Panama	8,862.0	5,154.3	0	1.6	n.a.	n.a.	n.a.	3,706.0

Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2014. *Centroamérica: Estadísticas de Producción del Subsector Eléctrico, 2013.* Chile: CEPAL.

In El Salvador, the Consejo Nacional de Energía (National Energy Council) (CNE) estimates that electricity demand will grow at an average annual rate of 3.6 percent during 2011–2024 (CNE, 2010). As a result, power demand would increase from 5,983 GWh in 2013 to 8,853.3 GWh in 2024. Figure 2 shows that the estimated rate is close to the average annual growth rate of 3.5 percent observed between 2000 and 2013, although annual fluctuations ranged from -2.1 percent to 9.2 percent (CNE, 2014).

Figure 2. Historic and Projected Electricity Demand Annual Growth Rates in El Salvador

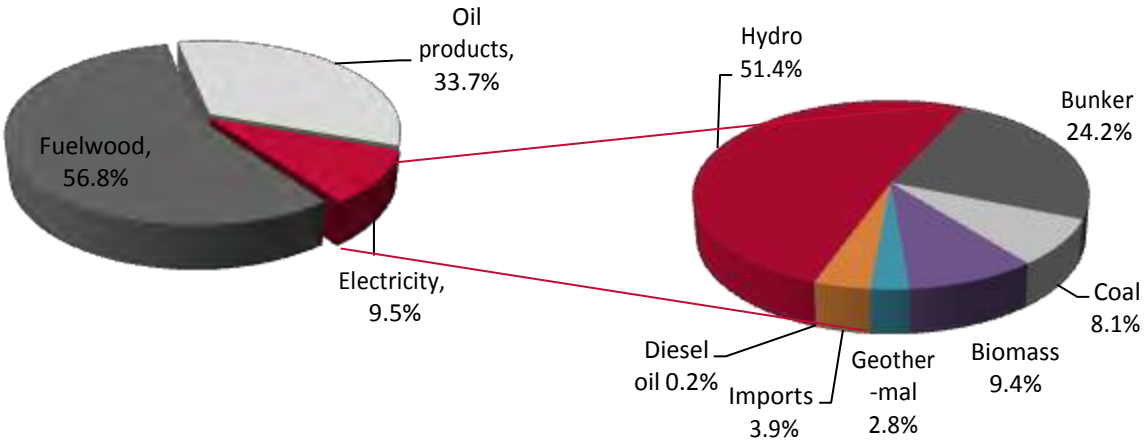


Source: CNE *(Consejo Nacional de Energía, El Salvador)*. 2014. *Plan Indicativo de la Expansión de la Generación Eléctrica de El Salvador 2014–2024*. San Salvador: CNE.

Electricity consumption in El Salvador is also likely to grow to serve the approximately 100,000 families, or 7.8 percent of the population, who still lack access to electricity in El Salvador. These are mostly located in rural areas, which have 79 percent coverage, compared with 97 percent in urban areas. Electricity coverage varies widely by department, from 63.8 percent in Ahuachapán to 83.5 percent in Santa Ana. The electrification strategy for rural areas of the Government of El Salvador emphasizes complementary connections to existing grids and the establishment of off-grid solar systems (CNE, 2010). About 27 percent of Salvadoran households use fuelwood for cooking, which provides around 31 percent of the total energy use in the country (Dolezal et al., 2013).

In Guatemala, electricity represents 9.5 percent of total energy consumption. Approximately, 51.4 percent of electricity is provided by large hydro and 12.23 percent from other renewables (biomass and geothermal). Petroleum products, mostly for the transport sector, account for 33.66 percent, while the remaining 56.84 percent consists of fuelwood (Figure 3).

Figure 3. Guatemala Energy Consumption, 2012



Source: MEM *[Ministerio de Energía y Minas (Ministry of Energy and Mines)]*. 2013. *Política Energética 2013–2027*. Guatemala: MEM.

Electricity consumption has grown at an average annual rate of 7 percent over the last 25 years, albeit at a significantly lower rate between 2008 and 2012. The National Energy Policy 2013–2027 projects that electricity demand will continue to grow 7 percent per year, to a total of 16,800 GWh in 2027. Meeting this demand would require an installed capacity of approximately 3,000 MW (MEM, 2013) (Figure 4).

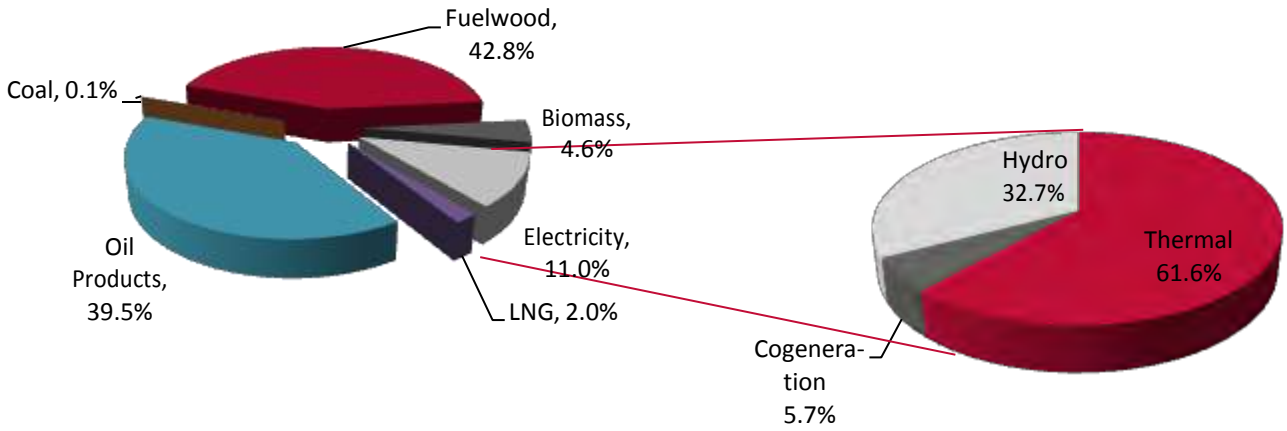
Figure 4. Electricity Consumption in Guatemala, 1986–2027

Source: MEM *[Ministerio de Energía y Minas (Ministry of Energy and Mines)]*. N.D. *Estadísticas Energéticas Subsector Eléctrico 2013*. Guatemala: MEM.

The electricity market is also likely to grow because of the high percent of the population that still does not have access to electricity. At the national level, 89.5 percent of the population has access to electricity. However, coverage varies markedly by region, from 44 percent in Alta Verapaz to 94 percent in Zacapa (MEM, 2013).

In Honduras, fuelwood was also the main source of energy, representing 43 percent of energy consumption in 2009. Petroleum products follow at 40 percent, and electricity 11 percent of total energy consumption (Figure 5).

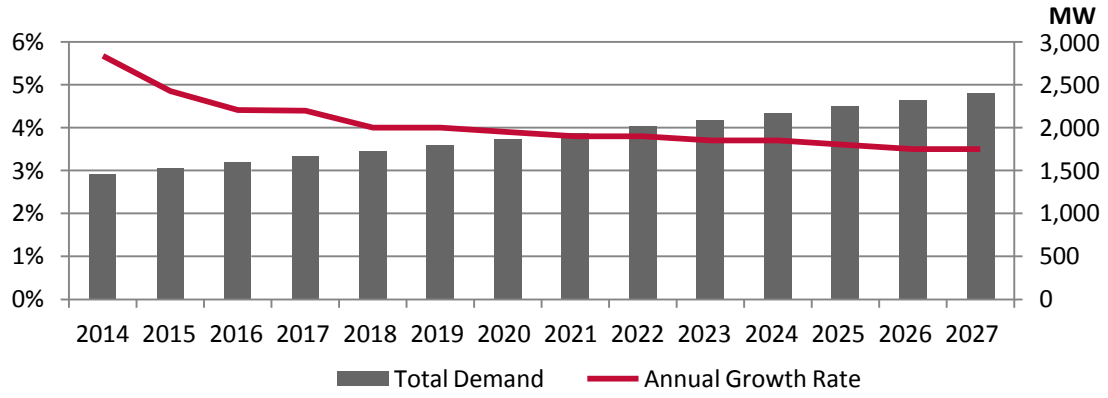
Figure 5. Honduras Energy Consumption, 2009



Sources: DGE *(Dirección General de Energía).* 2009. *Balance Energético 2009.* Tegucigalpa: DGE.;
CEPAL *(Comisión Económica para América Latina y el Caribe).* 2014b. *Energy Efficiency in Central America: Progress and Action Towards the Fulfillment of the Goals of the Central American Sustainable Energy Strategy, 2013.* Chile: CEPAL.

Empresa Nacional de Energía Eléctrica (ENEE), the Honduran national electric utility, projected that total demand for electricity would grow at an annual growth rate of 5.67 percent in 2014, gradually decreasing to 3.5 percent in 2028, with total projected consumption to of 2,400 MW in 2027 (Figure 6).

Figure 6. Estimated Total Demand in Honduras (2014–2027)



Source: EENE (*Empresa Nacional de Energía Eléctrica).* 13 June 2014. *Escenario Base Final Proyeccion de Demanda de Energía Eléctrica 2014-2028 Sistema Interconectado Nacional: ENEE. Accessed October 9, 2014, from http://www.enee.hn/planificacion/2014/resumen%20proyeccion%20demanda%20honduras.pdf*

Renewable energy generation in the Honduran grid decreased from 100 percent in 1990 to 36 percent in 2006. The capacity for large hydroelectricity stayed constant and the gap was largely met with natural gas, oil, diesel, and more recently coal.[5] This is the sharpest reduction of any country in the region and the current level of renewable energy penetration is the second lowest, only after Nicaragua. The

[5] Alves, Lilian, Bloomberg New Energy Finance, Empresa Nacional de Energía Eléctrica, Latin American & Caribbean Installed Capacity Database, August 15, 2013

country's supply–demand balance has typically been extremely tight, and this situation worsened in the first half of the last decade because of delays in securing new supplies, which prompted emergency measures and the introduction of diesel facilities. In recent years, Honduras has relied on imports to meet load growth.

As recently as August 2014, Honduras experienced difficulties in meeting its electricity demand. Low precipitation resulted in reduction of electricity generation by the Francisco Morazán hydroelectric plant that supplies electricity to Tegucigalpa. As a result, a series of rationing measures were introduced.[6] As part of its strategy to cope with the energy shortage, Honduras is offering a feed-in tariff for solar power plants that come online before August 2015 (Bloomberg New Energy Finance [BNEF], 2014).

3.1.3 INCREASING ENERGY EFFICIENCY OPPORTUNITIES

CEPAL (2014b) estimates that the implementation of energy efficiency interventions, including reductions in electricity losses, would result in energy savings of 12,255 GWh by 2025, over 15 percent of total electricity demand in Central America by the end of the period. These actions would result in savings of close to US$ 1.5 billion for end users and reductions in CO_2 emissions of up to 7.9 million tons (Table 3), assuming little to no direct or indirect rebound effects.

[6] Uclés, 2014

Table 3. Potential Energy Efficiency Improvements in Central America, 2014–2025

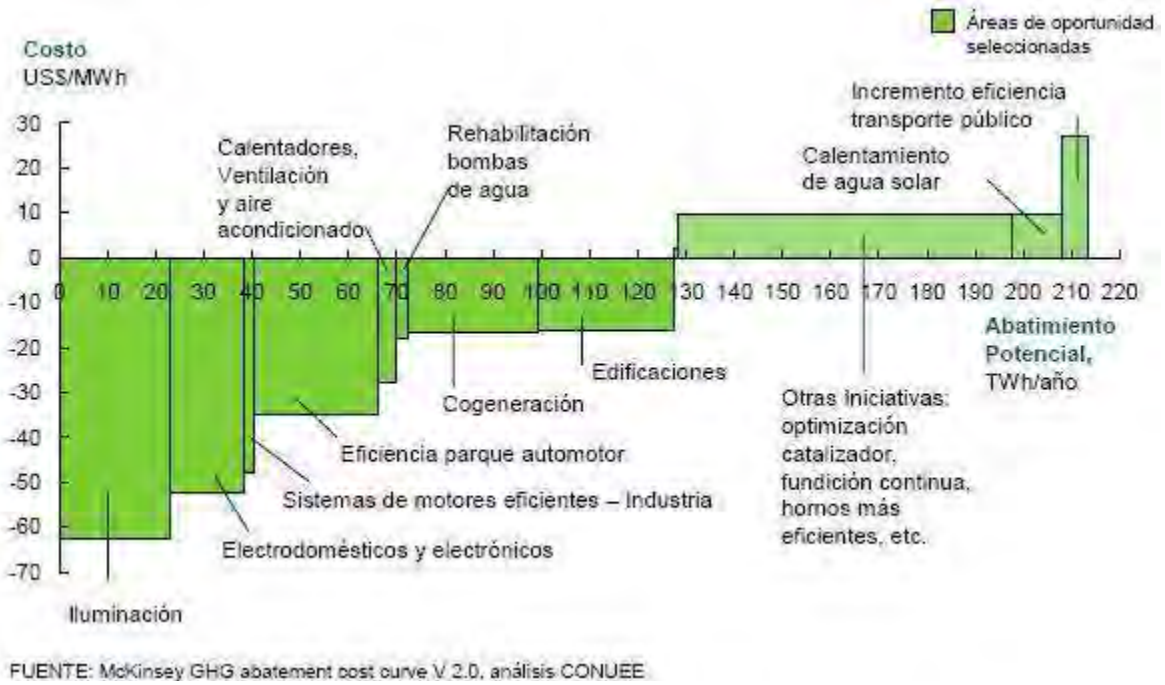
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total savings (GWh)	628.0	1,521.2	2,680.1	3,884.9	5,168.2	6,415.6	7,904.4	8,983.8	9,725.7	10,491.9	11,307.6	12,255.7
Total savings (% of demand)	1.3	3.0	5.1	7.1	9.0	10.6	12.4	13.5	14.0	14.4	14.8	15.3
Losses	271.5	569.6	893.7	1,245.5	1,627.1	2,043.5	2,851.4	3,133.4	3,433.4	3,755.7	4,100.7	4,468.0
Lighting	256.5	537.4	844.8	1,180.4	1,547.4	1,947.4	2,383.6	3,120.8	3,501.0	3,880.1	4,282.3	4,792.0
Refrigerators		100.0	393.8	656,3	912.5	1,165.6	1,350.0	1,350.0	1,350.0	1,350.0	1,350.0	1,350.0
EE in industry	100.0	314.1	547.8	802.8	1,081.3	1,259.1	1,319.4	1,379.7	1,441.3	1,506.2	1,574.6	1,645.7
MW	119.5	289.4	509.9	739.1	983.3	1,220.6	1,503.9	1,709.2	1,850.4	1,996.2	2,151.4	2,331.7
Reduction in peak power (% of peak)	1.5	3.4	5.7	7.9	10.1	11.9	14.0	15.2	15.7	16.2	16.6	17.2
Savings (US million spent on fuels)	50.2	121.7	214.4	310.8	413.5	513.2	632.4	718.7	778.1	839.4	904.6	980.5
Savings (US million for end consumers)	75.4	182.5	321.6	466.2	620.2	769.9	948.5	1,078.1	1,167.1	1,259.0	1,356.9	1,470.7
CO_2 emissions prevented (millions of tons)	0.5	1.1	2.0	2.9	3.8	4.7	5.8	5.8	6.3	6.8	7.3	7.9

Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2014. *Energy Efficiency in Central America: Progress and Action Towards the Fulfillment of the Goals of the Central American Sustainable Energy Strategy, 2013.* Chile: CEPAL
EE = Energy efficiency.

The Inter-American Development Bank (IADB) concluded that US$ 550 million in energy efficiency investments could eliminate the need to invest US$ 1.7 billion in new, natural gas-fired generation facilities over 10 years. Separately, an analysis by Nexant finds that investing US$ 118 million in a relatively small suite of residential, commercial, and industrial measures could produce annual savings in electricity consumption of 276 GWh, about 25 percent of average annual growth in sales. These investments could also reduce demand by some 54 MW, about 20 percent of average annual load growth during 2005–2009, at an average incremental cost of US$ 0.03 per kWh (USAID, 2010).

Other studies have found that energy efficiency measures can have negative costs. For example, the Programa Nacional Para el Aprovechamiento Sustenable de la Energía (PRONASE) program in Mexico in 2009 found that energy efficiency measures in lighting could save US$ 60/MWh and replacing domestic appliances and electronics with more efficient models could save US$ 55/megawatt hour (Figure 7. Abatement Cost Curve for Mexico's Energy Efficiency Program). Food refrigeration consumes the largest share of electricity in homes in many Latin American cities, likely constituting a large area of opportunity for CE financing (Figure 8).

Figure 7. Abatement Cost Curve for Mexico's Energy Efficiency Program



Source: Published on November 27, 2009, http://cgservicios.df.gob.mx/prontuario/vigente/2504.htm

Figure 8. Electricity End-Use Structure for the Residential Sector, Selected Latin American Cities

Several assessments conducted to date, including those that informed the development of energy efficiency bills in El Salvador, Guatemala, and Honduras, find that energy efficiency programs have untapped potential that could result in 5-10 percent savings of fuel in the transport sector and reductions in electricity losses from 27-12 percent to 10-12 percent (CEPAL, 2014b).[7] Each of these countries has taken important steps to articulate a national policy on energy efficiency, proposed bills that would provide the legal underpinnings to energy efficiency programs, and initiated several assessments and pilot activities. Yet the actual implementation of a coherent regulatory framework has occurred only in Costa Rica. In El Salvador, Guatemala, and Honduras, energy efficiency laws are yet to be approved by the national congresses. Development of a regional energy efficiency policy and program framework has been more limited than activities undertaken at the national level (USAID, 2010). Largely as a result of this lack of progress in the adoption of a coherent regulatory framework for energy efficiency, Central America's energy intensity, defined as energy used per unit of GDP, has fallen at an annual rate of only 0.43 percent, compared with a global average of 1.2 percent.[8]

Progress has been even slower in increasing energy efficiency in transportation, which constituted over half of total consumption of refined petroleum products in the region. Efforts to reduce fuel consumption in transportation could have considerable environmental benefits. Fuel consumption generates a number of health damaging pollutants, including fine particulate matter. As of 2010, 33 percent of the population in El Salvador 84 percent of the population in Guatemala, and 40 percent of the population in Honduras is estimated to be exposed to levels of particulate matter that exceeded the World Health Organization guidelines.[9] Reduction in fuel consumption would also result in

[7] CEAC (Consejo de Electrificación de América Central (2007), Plan Indicativo Regional de Expansión de la Generación, período 2006-2020.
CEAC (2005), Plan Indicativo Regional de Expansión de la Generación, período 2005-2019, abril.

[8] Personal email communication, Arnaldo Vierira de Carvalho, Lead Energy Specialist, Energy Division, IDB, June 25, 2014

[9] Data from databank.worldbank.org. Accessed on January 11, 2015.

macroeconomic benefits, as El Salvador, Guatemala, and Honduras spend 0.75, 0.72, and 0.43 percent, respectively, of GDP in oil subsidies and significant foreign currency in oil imports, as discussed in section 3.3.1 below (IMF, 2013). Environmental efforts to date in this area have largely focused on studies of potential strategies for inducing changes in patterns of vehicle use, public transportation systems, and the fuel efficiency or fuel substitution for motor vehicles (USAID, 2010).

Costa Rica and Panama have energy efficiency legislation in place, while El Salvador, Guatemala, Honduras, and Nicaragua have energy efficiency bills as of January 2015.

In El Salvador, in March 2014, the Ministry of Economy and CNE presented an Energy Efficiency Bill to the National Congress (*Anteproyecto de Ley de Eficiencia Energética*), which is currently under discussion and awaiting approval. The bill's main objectives are to:

- Provide legal support and increase the sustainability of actions aimed at energy efficiency.
- Empower CNE to promote, coordinate, and implement activities in the area of energy efficiency.
- Encourage energy management in productive sectors through voluntary and mandatory instruments, including education, promotion, and dissemination of energy efficiency.
- Establish the public sector's Committees on Energy Efficiency in State Institutions to formulate and implement energy efficiency plans.
- Prepare studies in the private sector to identify priority areas for action and the goals, time, and resources needed for the execution of energy savings plans.
- Incorporate energy efficiency in the appropriate educational programs and curricula. [10]

This bill was developed with technical and financial support from the IADB and Gesellschaft für Internationale Zusammenarbeit (German Agency for International Development, GIZ).

Despite the absence of effective energy efficiency legislation, a Department of Energy Efficiency was recently created within CNE, further emphasizing the importance that the organization is placing on its energy efficiency programs. The Department has five staff members who work exclusively on El Salvador's energy efficiency programs, funded through regular CNE budgets and contributions from international donors.

Ongoing energy efficiency programs in El Salvador include the following:

The **El Salvador Production Development Fund (FONDEPRO)**. This fund, created by the Ministry of Economy, aims to improve the productivity and competitiveness of micro and small and medium enterprises (SMEs) operating in El Salvador, through grants, cofinancing of projects, and technical assistance to improve their productivity and processes. FONDEPRO supports energy efficiency activities in industry through its Cleaner Production Fund, financing initiatives that are environmentally friendly or that improve energy efficiency. Through credit lines, FONDEPRO supports micro-enterprises and SMEs in implementing energy efficiency in their respective industries.

- **Centro Nacional de Producción Más Limpia** (CNPML) began operations in 1998 with financing from the Swiss Government and support from the United Nations Industrial Development Organization. CNPML works with firms, including small enterprises, in El Salvador to promote cleaner production and sustainable development. It provides consulting, financing,

[10] http://www.minec.gob.sv/index.php?option=com_content&view=article&id=2575:presentan-anteproyecto-de-ley-de-eficiencia-energetica&catid=1:noticias-ciudadano&Itemid=77.

and training in energy efficiency, renewable energy, and related areas. CNPML has launched projects for SMEs providing energy audits and technical assistance.

- The Asociación Salvadoreña de Industriales has created a program called **Aprender Haciendo** that delivers high-level training to professionals from industries so that they can identify and implement energy efficiency opportunities. It developed a tool for appraisal of energy efficiency investment, in conjunction with the Greenmax Corporation with the support of the United Nations Development Program (UNDP). This tool includes modules for project developers and financial institutions.
- **El Salvador Ahorra Energía**. This program launched in El Salvador in 2011 and coordinated by CNE involves more than 20 organizations, including international donors, universities, governmental bodies, development banks, and business chambers, that promote energy efficiency in different sectors of society.[11] The program was a result of the Energy Efficiency Program for Latin America and the Caribbean, which was implemented by the Organización Latinoamericana de Energía (OLADE). The program's goal is to promote a culture of energy efficiency among its citizens. Capacity-building efforts aim to enable industries and other commercial and public entities in the country to incorporate energy efficiency measures in their activities and processes.
- **Comités de Eficiencia Energética en el Sector Público** (Energy Efficiency Committees in the Public Sector) have been created in different public sector departments to reduce energy consumption. The CNE has calculated that energy consumption in the public sector was approximately 146 GWh in 2009 at a cost of approximately US$ 20.9 million. Members of the committees receive energy efficiency training from CNE.
- **Energy Efficiency in Government Buildings**. UNDP and CNE launched this three-year project project in 2011 to reduce public sector energy consumption with funding from the Global Environment Facility. According to CNE, the potential energy savings identified in different public sector entities would result in a 23 percent reduction in energy consumption. Energy audits conducted in 10 hospitals identified potential energy savings of more than US$ 500,000. As of the end of 2014 only a few projects had been implemented. MARN reported a 10 percent saving in energy consumption as a result of installing more efficient lightning in its main building, while the Defensoría del Consumidor office (Consumer Protection Attorney's) achieved 63 percent in energy savings with a similar project.[12]
- **Financing Program by Banco de Desarrollo de El Salvador (**El Salvador Development Bank, BANDESAL). The first phase of the financing program was launched in 2006 with a budget of US$ 10 million, and the second phase in 2009 with a budget of US$ 27 million. The program also has a Technical Assistance Fund of US$ 800,000 for energy audits and studies. Following Phases I and II, approximately US$ 20 million in credit was made available to local companies, and approximately US$ 300,000 was disbursed from the Technical Assistance Fund between 2007 and 2011. [13] In October 2014, BANDESAL and the German Development Bank (KFW) a new US$ 130 million program to finance energy efficiency and alternative energy investments in micro, small, and medium enterprises. [14]

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[11] For a list of participating agencies, see http://www.elsalvadorahorraenergia.com.sv/index.php/programa

[12] http://www.elsalvadorahorraenergia.com.sv/index.php/casos-de-exito

[13] This section is based on CEPAL (2014b).

[14] http://www.elsalvador.com/mwedh/nota/nota_completa.asp?idCat=47861&idArt=9140716

Guatemala's draft Anteproyecto de Ley de Eficiencia Energética (Energy Efficiency Bill) awaits congressional approval. It covers the following main areas:

- Creation of CONEE [Consejo de Eficiencia Energética de Guatemala/Guatemala Energy Efficiency Council] as a technical unit within the Ministry of Energy and Mines, with a dedicated budget and administrative, financial, and functional autonomy. It would be responsible for preparing and executing a National Energy Efficiency Plan, managing an Energy Efficiency Fund, and developing and enforcing norms and standards associated with rational use of energy.
- Development of a national energy efficiency plan for a 15-year period. The plan is to identify opportunities for energy efficiency and investment needs and for developing short-, medium-, and long-term energy efficiency programs. The plan would be reviewed at least every 5 years.
- Creation of an Energy Efficiency Fund to finance programs, projects, and capacity development. The Energy Efficiency Fund is expected to be financed with resources received from international organizations, taxes on the sale of energy, and contributions from domestic development programs.
- Requirement for public and private energy companies involved in the distribution of electricity, refined petroleum products, and gas to promote efficient use of energy among their customers by educating them on industry best practices. Distribution companies would also be required to measure, control, and reduce energy losses, including losses as a result of theft.
- Requirement for public sector contracts for energy-intensive appliances and equipment to take life cycle energy efficiency into account. CONEE would be responsible for implementing the standards and.
- Creation of a National Energy Efficiency Prize awarded by CONEE to individuals, companies, or entities.

Ongoing energy efficiency programs in Guatemala include the following:

- **Plan Integral de Eficiencia Energética** (PIEE, Guatemala Energy Efficiency Plan). Developed by Comisión Nacional de Energía Eléctrica (CNEE, National Commission of Electricity) with IADB funding of approximately US$ 750,000. The PIEE supported consulting services, pilot projects, research, workshops, and capacity-building measures, aimed at strengthening institutions and training individuals. A key outcome was the development of the draft Energy Efficiency Bill in 2011. Nine energy efficiency pilot projects were implemented for commercial, industrial, residential entities. The pilots had a total investment of around US$ 120,000, which resulted in actual energy savings of around US$ 300,000 and 1.12 million kWh of electricity per year (CNEE, 2012).
- **Energy efficiency campaigns.** The Ministry of Energy and Mines and CNEE have launched several energy-saving campaigns in the country through newspapers, television, and radio to educate the public on the importance of using energy efficiently. In 2011, the communications firm Ogilvy & Mather Publicidad S.A. was awarded a contract to create a public awareness campaign on energy efficiency (CNEE, 2012).
- **Replacement of incandescent lamps.** MEM and Instituto Nacional de Electrificación (INDE, National Electrification Institute) implemented a pilot project in the municipality of Estor to replace 2,640 75-watt incandescent bulbs with 15-watt compact fluorescent bulbs in 660 homes that use 80 percent less electricity percent (CEPAL, 2009).

- **Educational activities**. The MEM and Ministry of Education prepared educational material for primary school students to develop a culture of efficient energy use among students (CEPAL, 2009).
- **Modern urban transport systems**. Guatemala City and the national government developed the Transmetro and Transurbano between 2006 and 2011 to improve urban mobility and reduce traffic congestion in the metropolitan area.
- **Energy-efficient firewood stoves in rural areas**. With support from the Global Alliance for Clean Cookstoves, the country approved the National Strategy for Sustainable Use of Wood in May 2014. The strategy aims to deploy 65,000 improved cookstoves per year over the next 10 years and inform 70 percent of the population about the sustainable use of firewood. [15]

Honduras has a draft bill on rational energy use that was received by the National Congress in March 2012. A new entity would be created within Secretaría de Recursos Naturales y Medio Ambiente de Honduras (SERNA, Honduran Secretariat of Natural Resources and Environment) to promote energy efficiency. The bill proposes

- Creation of a fund to finance energy audits and energy efficiency projects and programs. The fund would be financed by domestic and international sources and be managed by SERNA.
- Establishment of a standards and labeling program for electrical appliances.
- An energy information databases to monitor energy consumption patterns in the country, under SERNA's responsibility. Suppliers and importers of energy would be required to make energy consumption data available to SERNA for the database.
- Increasing efficient energy use in transport through reorganization of traffic flows, and modernization of public transport fleets.
- Introduction of tax exemptions and other incentives for energy-efficient equipment.

Ongoing energy efficiency programs in Honduras include the following:

- **Energy efficiency standards**. The Organismo Hondureño de Normalización (Honduran Standards Agency) has developed voluntary energy efficiency standards for compact fluorescent lamps, air conditioners, motors, and refrigerators. The standards specify energy efficiency standards and labeling requirements.
- **Plan Estratégico de Ahorro de Combustible y Electricidad** (Strategic Plan for Saving Electricity and Fuels). This plan, approved in March 2012, aims to reduce energy consumption in the public and private sectors through education campaigns, time-of-use electricity tariffs, and energy conservation in public sector offices.
- **Project for Energy Efficiency in the Industrial and Business Sectors.** Launched in 2005, the project provided technical support and capacity development to promote energy efficiency in the Honduran commercial and industrial sectors. The project was promoted by the Honduran Business Council for Sustainable Development, with cooperation from the Honduran government, SERNA, UNDP, and external donors. The project promotes best practices in Honduran industry to cut GHG emissions, improve efficiency, promote use of energy-efficient equipment, and improve the overall competitiveness of businesses. Through the project, financing was made available for energy audits, capacity-building efforts, and energy efficiency research in commercial and industrial entities in Honduras (CEPAL, 2014b).

[15] This section is based on the information provided by CEPAL (2014b).

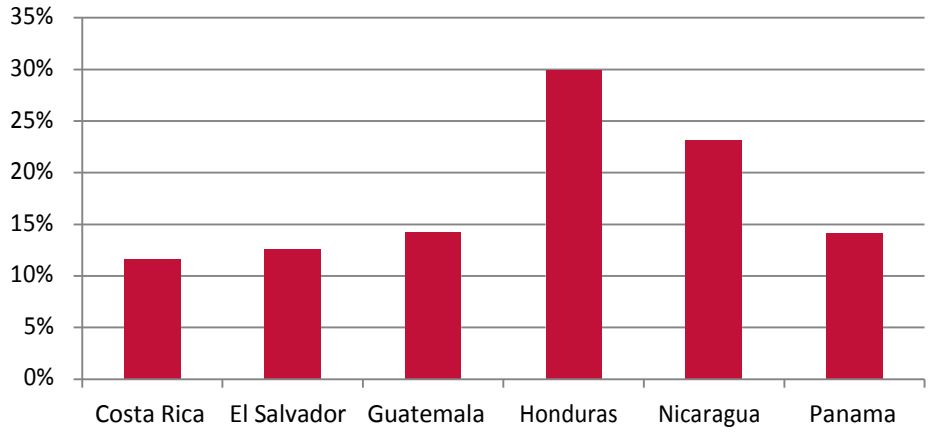
3.1.4 REDUCED LINE LOSS

Reducing energy losses in the national distribution systems is a significant potential source of savings throughout the region. These losses are particularly high in Honduras and Nicaragua, where they threaten the long-term financial integrity of the distribution companies involved (USAID, 2010).

In 2012, the average electricity loss rate across Central America was around 17.5 percent. Honduras had the highest loss level at almost 30 percent, followed by Nicaragua at close to 23 percent and 14 percent or less in other countries (Figure 9). Except in Nicaragua and Honduras, these losses levels are comparable to those in industrialized countries, losses are significant. The main cause of technical electricity losses in Nicaragua and Honduras is inadequate investment in maintaining the transmission and distribution grid (Dolezal, et al., 2013).

ENEE 's electricity consumption forecasts for 2014–2028 are based on projections that losses in Honduras will be gradually reduced percent to 26.8 percent in 2020 and 22.7 percent in 2027. Even if this is achieved, Honduras would miss the Central American Sustainable Energy Strategy's goal of reducing these losses to less than 12 percent. ENEE's high technical (electrical system losses caused by network impedance, current flows, and auxiliary supplies) and non-technical losses (typically theft, un-billed accounts, and metering errors), combined with subsidies and late payments, have put the company in a difficult financial position. In 2013, the company's accumulated debts were US$ 343 million (BNEF, 2014).

Figure 9. Total Electricity Losses as a Share of Total Generation



Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2014. *Centroamérica: Estadísticas de Producción del Subsector Eléctrico, 2013.* Chile: CEPAL. .

3.1.5 INCREASING DEMAND FOR LIQUID FUELS

Consumption of liquid fuels for purposes other than electricity generation is also projected to increase at an average annual rate of 3.7 percent between 2005 and 2020. Such growth would require an

additional 55.6 million barrels by the end of the period (CEPAL, 2007).[16] CEPAL (2013) reports that liquid fuel consumption in 2012 was around 95 million barrels, in line with growth projections for 2020. Light fuels are anticipated to grow faster: regular and premium gasoline, diesel, and liquefied natural gas (LNG) are expected to grow at 3.7 percent per year, compared with 2.5 percent for kerosene, 2.9 percent for asphalt, and 3.2 percent for fuel oil (CEPAL, 2007).

Despite these different dynamics, the overall consumption structure is not likely to change significantly. Diesel is projected to represent about 42.5 percent of total consumption, followed by gasoline (31.9 percent) and LNG (11.9 percent) (Figure 10). Although all Central American countries consumed between 4 and 8 million barrels of petroleum products in 1980, Guatemala's consumption has grown much faster than the regional average, and it is expected to reach about 35 million barrels of oil equivalents by 2020 (Figure 11).

In Central America, only Guatemala has domestic crude oil production, which is mostly exported because of a lack of refining capacity. The region consumed 110 million barrels of oil in 2012 (CEPAL, 2013). Only Costa Rica, El Salvador and Nicaragua have refineries, with a total capacity of around 35 million barrels of oil. Thus, the region is highly dependent on imports for its oil supply and is highly vulnerable to fluctuations in international oil prices (USAID, 2010).

3.1.6 CLEAN ENERGY AS SUBSTITUTES FOR OIL

Central America is highly dependent on oil imports. Only Guatemala produces oil, most of which is exported because of lack of refining capacity. In 2012, three refineries operated in the region, one in each El Salvador, Nicaragua, and the Dominican Republic. El Salvador's refinery met about 31 percent of the domestic demand for petroleum (CEPAL, 2013).

In 2012, the region spent US$ 17.2 billion in hydrocarbon imports, equivalent to 20 percent of the region's total exports CEPAL (2013). Hydrocarbon imports were higher percentages of total exports in El Salvador, Guatemala, and Nicaragua (Table 4). Dolezal, et al. (2013) presented a lower estimate of US$ 13.3 billion for the region, more than 13 percent of gross domestic product (GDP) in Honduras, almost 8 percent in El Salvador, and over 6 percent in Guatemala (Table 5. Oil Import Expenditures and Share of GDP in Central America, 2009–2011

Table 4. Comparison of Hydrocarbon Imports and Total Exports, 2012

	El Salvador	Guatemala	Honduras	Central America
Imported hydrocarbons (US$ million)	1,871	2,969	2,292	13,502
National Exports (US$ million)	6,767	12,449	9,005	78,353
Hydrocarbons/exports (%)	27.7	23.8	25.5	17.2

Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2013. *Centroamérica y República Dominicana: Estadísticas de Hidrocarburos, 2012.* Chile: CEPAL.

Table 5. Oil Import Expenditures and Share of GDP in Central America, 2009–2011

Country	2009		2010		2011	
	Million US$	Percentage GDP	Million US$	Percentage GDP	Million US$	Percentage GDP
El Salvador	1,038	5	1,350	6.3	1,819	7.9
Guatemala	2,014	5.4	2,227	5.4	2,951	6.3
Honduras	1,215	8.6	1,684	10.9	2,267	13.4
Central America	7,383	5.7	9,320	6.3	13,265	8

Source: Dolezal, Majano, Ochs, A., and Palencia,, 2013. *The Way Forward for Renewable Energy in Central America.* Washington, DC: Worldwatch Institute.

On October 14, 2014, the International Energy Agency significantly lowered its forecast of world oil demand. Weakening demand, coupled with abundant supplies associated with Libya's continued recovery and Iraq's growing flows, resulted in lower oil prices. The price of Brent crude has been falling since June 2014 and reached a price of less than US$ 85 per barrel by mid-October. This is the lowest price since 2010.[17] While lower oil prices could benefit Central American economies, they could also make renewable alternatives less competitive.

3.1.7 OIL PRICE FLUCTUATIONS

Central America is vulnerable to high and unpredictable oil prices. In 2008, the global price of oil reached an all-time high of $145 per barrel and Central America spent $11.2 billion on oil imports, up nearly 50 percent from 2006. As energy-intensive industries across the region faced rising costs, their competitiveness diminished in international markets relative to industries where electricity was not dependent on petroleum.

Increased spending on oil imports can negatively affect the trade deficit of countries. The resulting rising costs for electricity generation can create political pressures for price controls or subsidies creating uncertainty for potential investors (Dolezal et al., 2013).

Governments across Central America have used energy subsidies to shield their economies from high oil prices, improve people's access to energy, and promote economic growth. These subsidies have increased dramatically in recent years. El Salvador alone provides $420 million annually in energy subsidies for electricity, gasoline, propane, and public transportation—nearly double the amount of Honduras and representing nearly 14 percent of the national revenue (Table 6). According to more recent figures from IMF (2013), fuel subsidies in El Salvador, Guatemala, and Honduras were equivalent to 4.21, 6.12, and 1.81 percent of the government's revenue respectively.

[17] http://www.iea.org/oilmarketreport/omrpublic/

Table 6. Energy Subsidies, 2008

Country	Electricity	Gasoline	Propane	Public Transportation	Share of GDP	Share of Revenue
	million U.S. dollars				percent	
El Salvador	223	n.a.	140.0	57.1	1.5	13.5
Honduras	42.1	156.6	n.a.	19.9	1.6	9.5
Guatemala	37.8	n.a.	n.a.	48.4	0.2	2.2

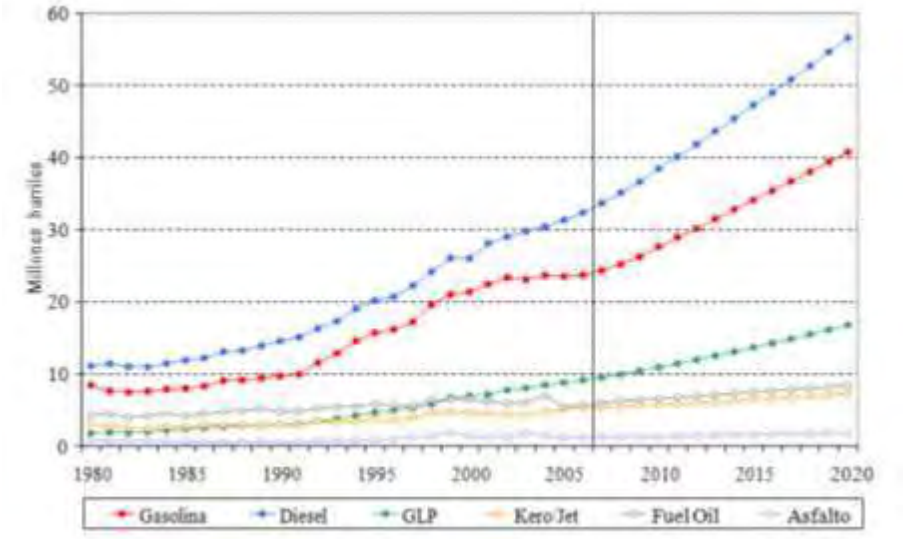
Source: Dolezal, A., Majano, A.M., Ochs, A., and Palencia, R. 2013. *The Way Forward for Renewable Energy in Central America.* Washington, DC: Worldwatch Institute.

Spot market prices for electricity in the competitive wholesale markets of El Salvador, Nicaragua, and Panama increased significantly after 2004 due to the sharp increase in the price of bunker fuel used by less efficient and more expensive marginal generation plants (USAID, 2010).

Electricity prices for end users have generally risen due to higher generation costs, but residential tariffs remain relatively low, particularly in Honduras where residential consumer were subsidized up to 55 percent as of December of 2014. The Empresa Nacional de Energía Eléctrica (National Electricity Utility) accumulated a debt of US$ 343 million as a result of technical and non-technical losses, late payments and subsidies (BNEF, 2014). Furthermore, the increases in electricity losses occurring in some countries, particularly Honduras, have added to the financial burden on distribution companies. World Bank estimates suggest that the total deficit associated with insufficient tariffs totaled approximately US$ 554 million in 2008. This figure does not include the effect of cross-subsidies or the cost of additional losses, so it must be considered a lower bound for the total cost of shielding consumers from higher electricity tariffs.

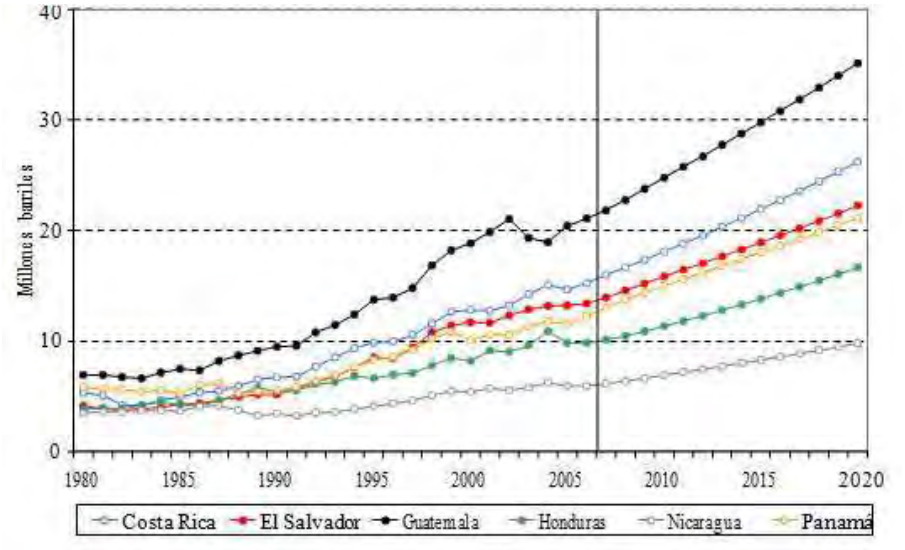
The Consejo de Electrificación de América Central (Central American Electrification Council) has conducted simulations and analysis indicating that increased use of renewable resources (particularly hydropower) could reduce total expansion costs because lower operation costs would offset higher upfront investment costs (USAID, 2010). The World Bank (2010) similarly concludes that switching to renewable energy for electricity generation can result in cost advantages compared to fossil fuels.

Figure 10. Types of Petroleum Products Consumed in Central America, 1980–2020



Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2007. *Estrategia Energética Sustentable Centroamericana 2020.* México, D.F.: CEPAL.

Figure 11. Total Consumption of Petroleum Products in Central America, by Country, 1980–2020



Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2007. *Estrategia Energética Sustentable Centroamericana 2020.* México, D.F.: CEPAL.

3.1.8 ENABLING ENVIRONMENT

This section describes the state of the readiness of public institutional finance. All countries in the region have begun to adopt measures to encourage a favorable investment climate for sustainable energy.

Although Central American governments have conducted renewable energy sources assessments with support from international donors, they have largely focused on the early stages of energy planning. For actual investment decisions, more detailed, location-specific assessments that include data on seasonal and diurnal variability of demand and supply are needed. In the case of wind energy, policy makers would benefit from having access to information about optimal wind conditions in broad geographic zones. Policy makers could use this information to design energy strategies that integrate wind profiles with data from other technologies, demand curves, and transmission opportunities and barriers. More detailed information for individual sites could be later assessed by project developers. The potential and challenges of using wind power throughout the day and year need to be analyzed for a set of potential sites, thus enabling policy making and investments (Dolezal et al., 2013).

NREL's online tool "PVWatts" contains site-specific data to calculate photovoltaic energy output for Belize, Guatemala, Honduras, Nicaragua, and El Salvador (http://pvwatts.nrel.gov). While this tool provides a good overview of the solar potential, it does not eliminate the need for technical feasibility studies particular locations.

There is a lack of comprehensive energy system analysis for integrated planning in the region. Renewable energy potential needs to be considered with load profiles in a region and integrated with other existing and planned electricity sources—and efficiency measures, including off-grid solutions. Data on how the expected variability of different renewable resources aligns with daily and seasonal electricity demand patterns can help energy planners harness these energy sources efficiently. Integrating diverse renewable and nonrenewable energy resources from different locations into the grid can reduce the effects of localized intermittency (Dolezal et al., 2013).

All countries in the region have begun to adopt measures to encourage a favorable investment climate for sustainable energy. Although many have established fiscal incentives for renewable energy regulatory measures and public financing are less common (Table 7).

Table 7. Fiscal Incentives for Renewable Energy in El Salvador, Guatemala and Honduras

	Capital Subsidy, Grant, or Rebate	Investment of Production Tax Credits	Reduction in Sales, Value-Added Tax, Income, Customs or Other Taxes	Energy Production Payment
El Salvador	No	Yes	Yes	Yes
Guatemala	No	Yes	Yes	No
Honduras	No	Yes	Yes	No

Source: Dolezal, A., Majano, A.M., Ochs, A., and Palencia, R. 2013. *The Way Forward for Renewable Energy in Central America.* Washington, DC: Worldwatch Institute. .

Honduras offers renewable electricity projects a 10 percent price premium for the first 15 years under the Law for Promotion of Electricity Generation with Renewable Sources adopted in 2007. In 2014, , the country began offering a feed-in tariff for solar plants that come online before August 2015 to help reduce electricity shortages. Solar plants can receive a price of US$ 180/MWh for 15 years, an increase of about US$ 30/MWh over the 10 percent premium offered by the 2007 law. The new feed in tariff (FiT) is limited to 300 MW, but only 130 MW is expected to come online before the deadline (BNEF, 2014).

Central America currently has no legally binding quota obligations (also known as renewable portfolio standards, or RPSs) in place. These measures require distributors to purchase a minimum amount of

electricity generation from renewables or require that a utility purchase or generate a certain amount of its electricity from renewables by a given date.

Despite of these incentives, project developers interviewed by Dolezal et al. (2013), complained that governments have not fulfilled past obligations to reimburse import taxes or delays have been lengthy and there was a lack of coordination with customs and other tax authorities on tax rebates. Income tax exemptions for renewables exist in El Salvador, Guatemala and Honduras. However, these instruments need to be tailored to the characteristics of renewable energy projects. This is illustrated by the case of El Salvador, where tax exemptions only applied to the first 10 years of a project, although much of the net income from wind development in the region is not generated within that period.

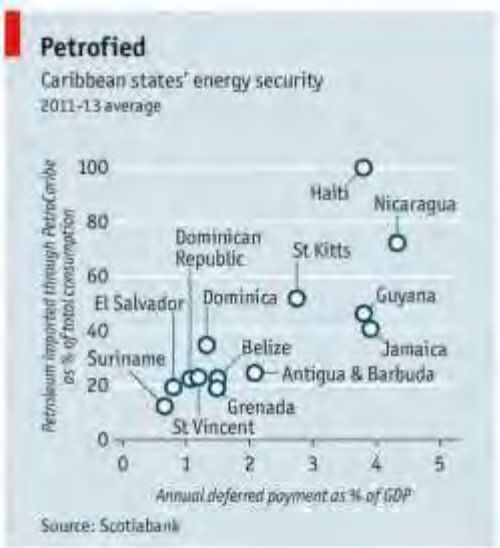
Despite growing institutional capacity aimed at promoting sustainable energy, barriers to governance and transparency hinder the growth of renewables in the region. The time-consuming government approvals that developers have to obtain to advance a project and the lack of transparency, reliability, and accountability of the process, are major barriers. One of the most notable obstacles is the long time required to process an environmental impact assessment, approve construction permits, and obtain tax concessions for renewable energy projects. For example, it took more than a decade for the largest wind farm in the region, Cerro de Hula in Honduras, to proceed from the feasibility study to commissioning.

3.2 IMPORTANT CO-BENEFITS

3.2.1 ENERGY SECURITY CONCERNS

El Salvador imports 100 percent of its oil and diesel 47 percent of the national installed power capacity (FOMIN and BNEF, 2013). Guatemala, Honduras, and El Salvador are part of the Petrocaribe initiative, through which countries buy oil from Venezuela, paying a 5-50 percent upfront with a grace period of one to two years. The rest can be paid through a 17-25 year-financing agreement with a 1 percent interest rate if oil prices are above US$ 40 per barrel. However, there are signs that Venezuela's economic difficulties may result in renegotiation of these terms. This may pose a particular risk for El Salvador, which bought about 20 percent of its oil imports from Venezuela and had annual deferred payments equivalent to 1 percent of GDP (Figure 12).

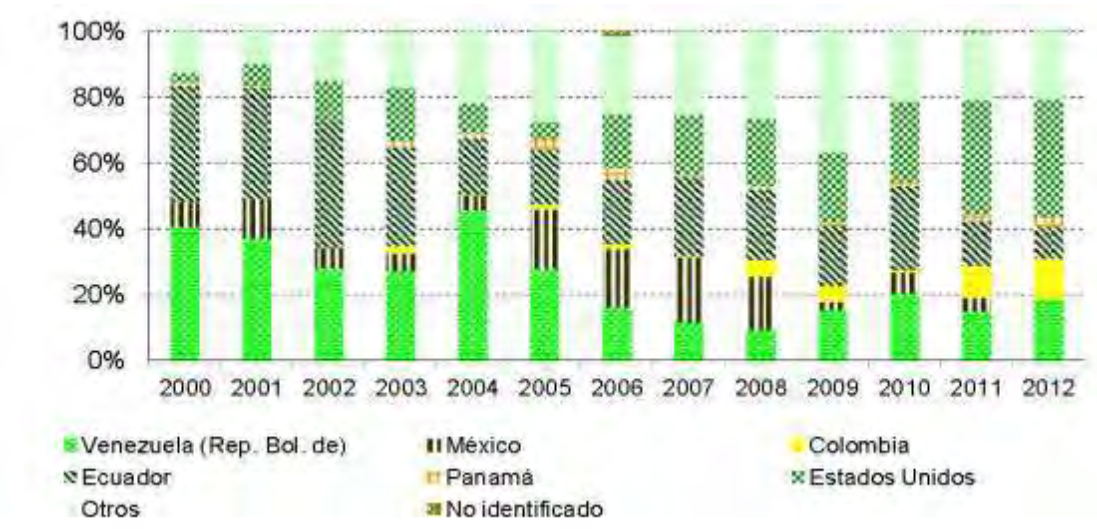
Figure 12. Energy Security in and Central America and the Caribbean



Source: http://www.economist.com/news/americas/21621845-venezuelas-financing-programme-leaves-many-caribbean-countries-vulnerable-single-point

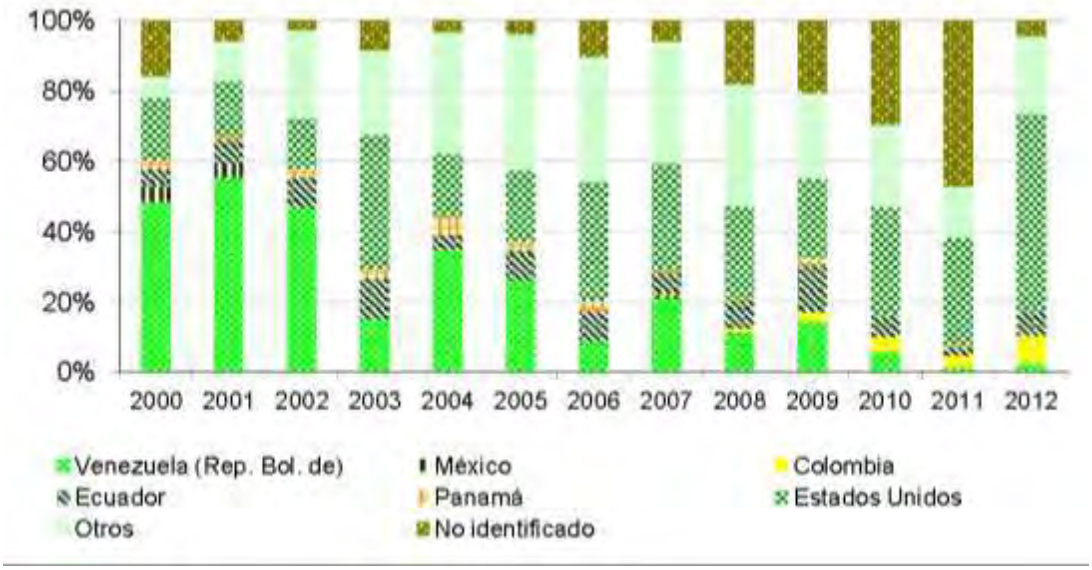
Central import hydrocarbons from a relatively small group of exporters, the United States, Venezuela, Colombia, Mexico, and Ecuador. Imports from Venezuela have been decreasing steadily since the early 2000s, while the United States has increased its share in these markets, particularly in Honduras, where it supplies practically all hydrocarbon imports (Figure 13. Origin of Total Hydrocarbon Imports in El Salvador, 2012 through Figure 15. Origin of Total Hydrocarbon Imports in Honduras, 2012

Figure 13. Origin of Total Hydrocarbon Imports in El Salvador, 2012



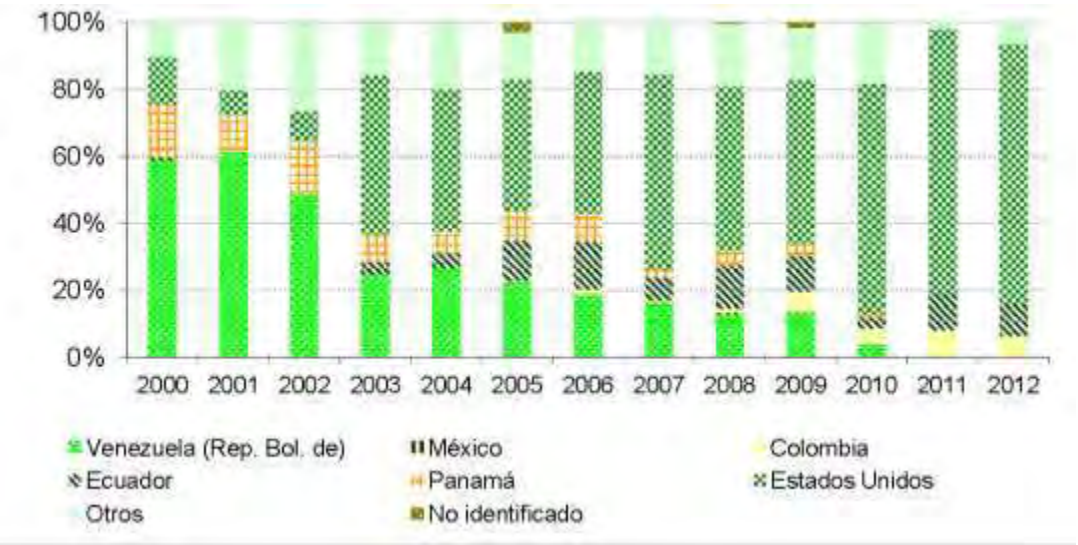
Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2013. *Centroamérica y República Dominicana: Estadísticas de Hidrocarburos, 2012.* Chile: CEPAL.

Figure 14. Origin of Total Hydrocarbon Imports in Guatemala, 2012



Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2013. *Centroamérica y República Dominicana: Estadísticas de Hidrocarburos, 2012.* Chile: CEPAL.

Figure 15. Origin of Total Hydrocarbon Imports in Honduras, 2012



Source: CEPAL *(Comisión Económica para América Latina y el Caribe).* 2013. *Centroamérica y República Dominicana: Estadísticas de Hidrocarburos, 2012.* Chile: CEPAL.

3.2.2 HEALTH BENEFITS

CEPAL (2009) estimated the externalities of fossil fuel-based electricity generation in Central America under several scenarios. It found that the health costs from local pollution would raise the cost of

electricity anywhere from US$ 0.0009/KWh to US$ 0.0027/KWh, or by an average of US$ 0.0014/KWh.[18] According to CEPAL, 59 percent of the cost was caused by SO2 emissions, 29 percent by particulate matter, and 12 percent by NOx emissions. When the climate impacts of CO_2 emissions were considered, the "true cost" of electricity increased by another US$ 0.0087-0.023/KWh 0.87 - 2.3 cents per kWh, using a conservative social cost of $20 per ton of CO_2 emitted. Internalization of both types of externalities would raise electricity costs by an average of US$ 0. 0157/KWh 1.57 cents per kWh.

CEPAL also analyzed externalities for energy in Central America and the Caribbean over the period 2010–23. It found that average annual climate-related costs were US$ 307 million, and average annual health-related costs were US$ 44 million. Applying these results to energy expansion scenarios used in the Central America Sustainable Energy Strategy 2020, the study found that externalities related to health and climate change would increase the real cost of fossil fuel generation plants by between 8 and 10.6 percent through 2020 (CEPAL, 2009).

3.2.3 JOB CREATION

Investments in energy efficiency, renewable energy capacity, and improving the electrical grid are expected to create new job opportunities in Central America. Direct renewable energy jobs are generally divided into two categories: (1) construction, installation, and manufacturing (CIM), and (2) operation and maintenance. CIM jobs tend to be concentrated in the first few years of setting up a renewable energy facility. In comparison, most O&M jobs exist for the lifespan of the facility. In general, renewable power plants are more labor intensive than fossil fuel-based power plants, resulting in a comparatively higher number of jobs. Given that almost all fossil fuels in Central America are imported, it is expected that a major switch toward renewable energies would result in significant job-creation benefits.

In the short term, each new MW of photovoltaic capacity may create 20 manufacturing jobs, 30 installation jobs, and one maintenance job. Assuming a 25-year lifespan for PV installations, this would result in 0.8 manufacturing jobs and 1.2 installation jobs annually per MW of installed capacity.[19] Each additional MW of wind capacity may create 16 jobs in manufacturing and the supply of components; five jobs in wind farm development, installation, and indirect employment; and 0.33 jobs in O&M.[20] Assuming again a 25-year lifetime for wind installations, this would result in 0.64 manufacturing jobs and 0.2 installation jobs annually per MW generated (Dolezal et al., 2013).

Despite the lack of a fully developed CE value chain in any Central American country, necessitating the use of some foreign labor, installation and O&M jobs require in-country technicians and professionals. Most manufacturing will be concentrated in the countries where renewable energy equipment and materials are made.

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[18] This study was conducted before the World Health Organization published its *2010 Global Burden of Disease Report*, which provided higher costs for the health effects caused by fine particulate matter.

[19] M. Wei, S. Patadia, and D.M. Kammen, "Putting Renewables and Energy Efficiency to Work: How Many Jobs Can the Clean Energy Industry Generate in the US?" Energy Policy, vol. 38 (2010), pp. 919–31.

[20] Case Study 4 from L.M. Salazar, "Zamorano Leads Projects: Alternative Energy Sources," 23 April 2010 at www.zamorano.edu/english/2010/04/23/zamorano-leads-projects-alternative-energy-sources.

3.2.4 GENDER AND VULNERABLE POPULATION IMPACTS

For many years, the discussion on gender and energy has focused largely on household energy, particularly the burning of traditional biomass for cooking and its impacts on health of women and children. As of 2011, the share of population using fuelwood for cooking was 27 percent in El Salvador, 73 percent in Guatemala, and 69 percent in Honduras (generally in closed environments with inefficient cookstoves) (Dolezal et al., 2013).

Provision of modern energy, including from renewables, has the potential to reduce hours spent collecting fuelwood and other energy sources for use in the home and allow time for education and income generation. Women are also increasingly involved in renewable energy technical projects and are taking on new responsibilities, such as electrifying their communities, businesses, and homes.

Currently, as true for most of the world, women are underrepresented in the electricity industry, and in related businesses and university programs. Women are becoming increasingly economically active in business with women's business associations. The team anticipates meeting with these groups to discuss the potential for improving the gender balance in the CE sector.

3.3 GOALS

Table 8 summarizes goals and targets of the national CE plans in El Salvador, Guatemala, and Honduras. Available expansion plans suggest that the share of fossil-fired resources in new capacity additions will decrease relative to previous periods. Developments from 2008 to the present, as well as projects expected to reach completion in the next few years, suggest that there is a trend toward reducing reliance on fossil generation resources (USAID, 2010).

Table 8. National CE Plans' Goals and Targets in El Salvador, Guatemala, and Honduras

Country (Renewable Share of Electricity Use, 2011)	Energy Plan (Issuing/Overseeing Agency)	CE Goals and Targets
El Salvador (63.3%)	*Política Energética Nacional* 2010–2024 (National Energy Council)	• Provide affordable and continuous power supply • Build institutional capacity • Reduce oil dependence • Minimize detrimental environmental and social impacts of energy, considering climate change
Guatemala (64.2%)	*Politica Energética* 2013–2027 (Ministry of Energy and Mines)	• Cover current and future energy demand • Strengthen electric power transmission • Diversify the energy mix and reduce oil dependence • Generate 80% of electricity from renewable sources by 2027
Honduras (43.5%)	*Visión del País* 2010–2038 *Plan de Nación* 2010–2022 (Technical Secretariat for Planning and External Cooperation)	• Reduce reliance on hydrocarbons • Mitigate and adapt to climate change • Expand country-wide electricity coverage to 85% by 2015 and 90% by 2020 • Generate 60% of electricity from renewable sources by 2022 and 80% by 2038 • Invest $1.5 billion in renewable and hydroelectric sources by 2022

Source: Dolezal, A., Majano, A.M., Ochs, A., and Palencia, R. 2013. *The Way Forward for Renewable Energy in Central America.* Washington, DC: Worldwatch Institute.

3.3.1 EL SALVADOR

To meet El Salvador's projected demand, 200 MW of electric power capacity may need to be installed in 2015–2016. Approximately19 percent of El Salvador's electricity generation, about 1,290 GWh, was expected to be provided by projects developed between 2011and 2015 (CNE, 2010). Table 9 lists the main projects that were expected to begin operations between 2014 and 2024. There was no mention in the National Energy Policy about the role of energy efficiency in meeting the country's growing electricity demand.

Table 9. Planned CE Projects in El Salvador (2014–2024)

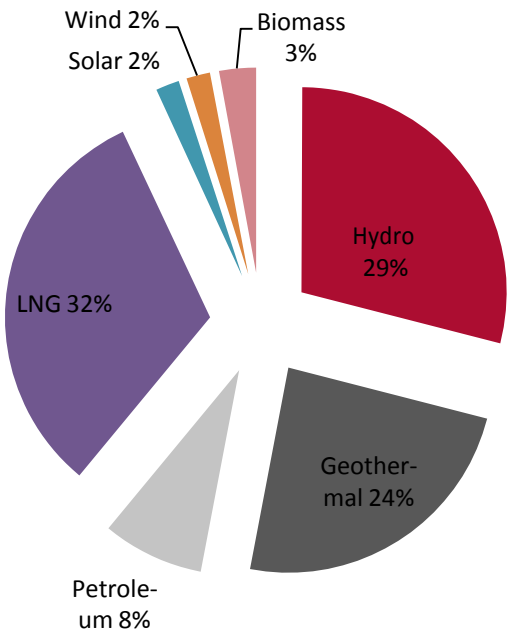
Name	Energy Source	Expected Operational Date	Installed Power (MW)	Investment ($/kW)	Fixed, O&M costs ($/kW year)
5 Noviembre (expansion)	Hydro	2016	80.0	258.85	1.98
Chaparral	Hydro	2017	65.7	585.81	1.98
Cimarrón	Hydro	2023	261	336.58	1.98
H-Xacbal	Hydro	2015	30.0	n.a.	n.a.
Ahuachapán (optimization)	Geothermal	2016	6.0	711.14	6.45
Berlín V-1	Geothermal	2017	6.0	338.80	6.45
Berlín V-2	Geothermal	2019	30.0	338.80	6.45
Chinameca	Geothermal	2019	30.0	276.55	6.45
Motores a GN	LNG	2017	380.0	158.15	3.56
CEL Photovoltaics	Solar	2014	14.2	293.08	2.93
FV Zona Oriental	Solar	2017	60.0	293.08	2.93
Wind project	Wind	2018	40.0	234.47	2.93
El Angel (expansion)	Biomass	2015	21.0	n.a.	n.a.
Caparrastique (expansion)	Biomass	2015	55.0	n.a.	n.a.

Source: CNE *(Consejo Nacional de Energía, El Salvador).* 2014. *Plan Indicativo de la Expansión de la Generación Eléctrica de El Salvador 2014–2024.* San Salvador: CNE.
Note. Figures in US$ calculated using an exchange rate of 8.53 colones = 1 USD, based on www.oanda.com, accessed October 09, 2014.

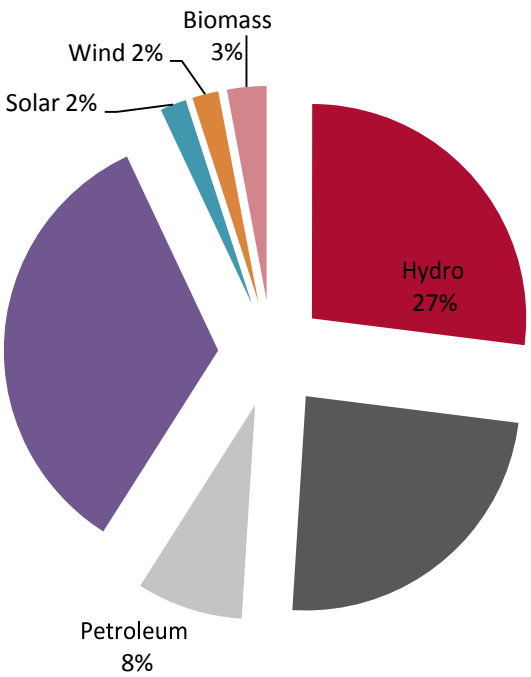
When the LNG project is slated to begin operations in 2018, about 40 percent of El Salvador's energy is expected to originate from fossil fuels, and the remainder of renewable energies. The share of fossil fuels could increase about 2 percent if hydropower projects are delayed or cancelled as a result of social opposition (Figure 16. Anticipated Electric Power Generation Sources in El Salvador in 2018). Also, if hydropower projects do not start operations, energy prices in El Salvador were expected to be 13 percent higher in 2024 (CNE, 2014).

Figure 16. Anticipated Electric Power Generation Sources in El Salvador in 2018

Scenario 1: With New Hydropower Operations at El Chapparal, Cimmaron, and Hidro Xacbal



Scenario 2: Without New Hydropower Operations

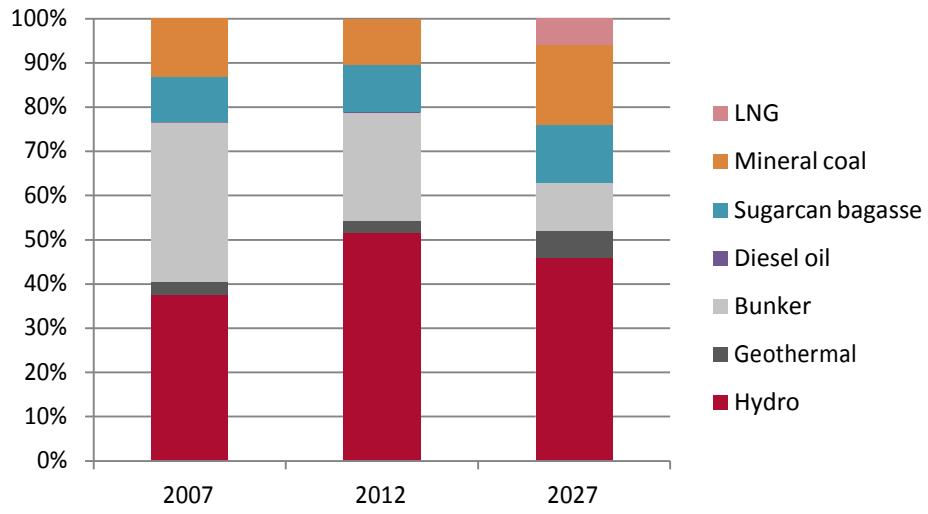


Source: CNE *(Consejo Nacional de Energía, El Salvador).* 2014. *Plan Indicativo de la Expansión de la Generación Eléctrica de El Salvador 2014–2024.* San Salvador: CNE.

3.3.1 GUATEMALA

Guatemala's National Energy Policy 2013–2027 projects a significant increase in the contributions of renewable sources to its electricity generation matrix (Figure 17). Bunker fuel is anticipated to decrease from 36 percent in 2007 to 11 percent of electricity generation in 2027. Hydropower is expected to become the fastest growing source of electricity, from 37.6 percent in 2007 to 46 percent in 2027, while geothermal would double from 3 percent to 6 percent during the same period. The policy aims to increase renewable energy generation by 500 MW by 2027 (MEM, 2013).

Figure 17. Guatemala's Electricity Generation Matrix, 2007, 2012, and 2027



Source: MEM *(Ministerio de Energía y Minas)*. N.D. *Estadísticas Energéticas Subsector Eléctrico 2013*. Guatemala: MEM.

Guatemala is planning to add 1.8 GW of new capacity (above the existing 2.8 GW) between 2014 and 2018. Approximately1.2 GW of this increase is anticipated to come from large and small hydropower. The country appeared to be on track for this goal, as it auctioned 623 MW of capacity to be delivered by 2015 and is tendering another 250 MW to be delivered by 2017 (BNEF, 2014). Recent auctions have included renewable energy quotas. The 2012 auction of 600 MW required at least 300 MW from renewables, including at least 200 MW from hydropower, 70 MW from biomass, and 30 MW from solar and wind. A maximum of 20 MW was allowed for bunker fuel, 80 MW for coal, and 200 MW for natural gas.[21] In August 2014, MEM indicated that it was analyzing the possibility of organizing an auction for 300 MW of geothermal power.[22]

3.3.1 HONDURAS

ENEE's generation expansion plan for Honduras 2008–2022 proposed an addition of 1,921 MW between 2014 and 2022, with 1,100 MW from coal and bunker fuel, and 821 MW from hydropower. Over this period, six coal and bunker fuel plants with a capacity of 1,338 MW were expected to stop operating. Thus, there would be a net increase in installed capacity of 583 MW, excluding small hydropower or other renewables (Table 10. Planned Fossil Fuel and Large Hydro Electric Projects in Honduras (2014–2022)

[21] http://www.mem.gob.gt/2012/10/29/presentan-ofertas-para-contratacion-de-600-mw/

[22] http://www.mem.gob.gt/2014/08/28/peg-3-alcanza-los-precios-mas-bajos-de-la-historia-en-compra-de-energia/

Table 10. Planned Fossil Fuel and Large Hydro Electric Projects in Honduras (2014–2022)

Project	Fuel	Year	MW
Diesel engines	Bunker	2018	500
Coal plant	Coal	2017/2019/2021	100/300/200
Tablón	Hydro	2014	20
Piedras Amarillas	Hydro	2015	100
Tornillito	Hydro	2015	160
Llanitos	Hydro	2015	98
Jicatuyo	Hydro	2016	173
Valencia	Hydro	2020	270

Source: EENE (*Empresa Nacional de Energía Eléctrica).* 13 June 2014. *Escenario Base Final Proyeccion de Demanda de Energía Eléctrica 2014-2028 Sistema Interconectado Nacional: ENEE,.Accessed October 9, 2014, from http://www.enee.hn/planificacion/2014/resumen%20proyeccion%20demanda%20honduras.pdf*

In June 2014, ENEE approved more than 40 contracts for the generation of 560 MW from renewables, including 450 MW from hydro, 70 MW from biomass, and 40 megawatts. A new law that ended ENEE's generation monopoly entered into force on July 4, 2014. Thus, developers that expect to be able to participate in competitive bids based on the new law criticized the timing of these contracts.[23]

[23] http://www.energias-renovables.com/articulo/aprueban-560-mw-de-energia-renovable-20140628

4. CLEAN ENERGY FINANCING

This section focuses on current and planned lending for CE.[24] The section covers sources of CE finance including banks, international climate and development funds, and microfinance. It then discusses instruments typically used for project finance that, if adopted by local banks, would allow more local banks to manage the risk of CE project finance. It offers ideas on instruments that are beginning to be used in other areas of the world for project finance that could, theoretically, become important in Central America. Finally, it covers the current state of CE financing by types of renewable resources listing the completed, pending, and potential CE investments by country.

4.1 CURRENT CLEAN ENERGY LENDING

Although there is some lending by local banks, such as Banco Atlantida in Honduras, the majority of CE lending in Central America is by large, multilateral development banks or national development banks. BNEF tracks large investments that meet a size threshold of at least one MW or US$ 1million. Only three local banks meet this threshold: Banco de Desarrollo de El Salvador, a public sector bank that offers a specific credit line for renewable energy; Banco Lafise Honduras, which offers financial services in the Central American and Caribbean region; and Banco Financiera Comercial Hondurena, offering corporate and consumer banking products.

4.1.1 BANK LENDING

The majority of CE lending in Central America is by large, multilateral development banks or national development banks rather than local banks according to the most recent monitoring by BNEF. Figure 18 provides a summary of the top CE financiers for Central America overall from 2008 to 2014. In contrast,

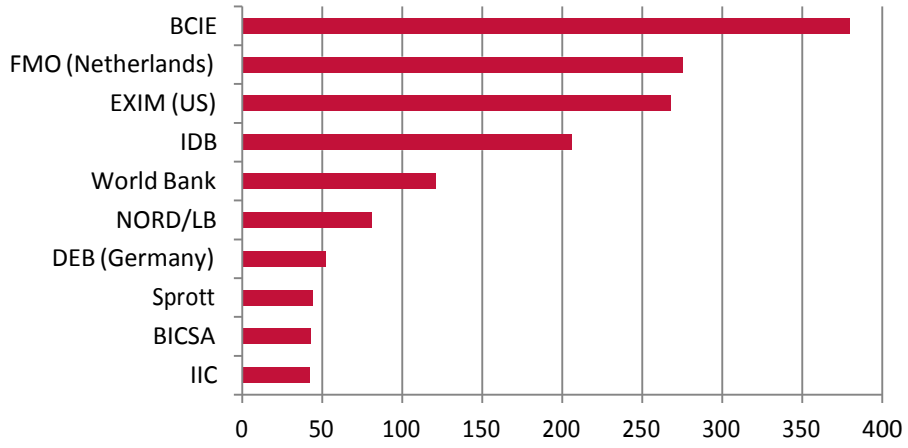
[24] Dolezal, et al. (2013) is a primary reference for the CE financing issues and values found in this section.

Table 11 provides the top project finance lenders by country from 2000 to 2014.

These two graphics show that the regional and national development banks play an outsized role in CE investments relative to the local private sector banks. Despite CE increasing as a portion of total generation, the bulk of the CE lending comes from external or regional financiers. It might be that to build a sustainable CE financing market, the lending sector would benefit from more local financing of CE projects. The reliance on "outside" or higher volume lenders with project financing financial instruments demonstrates that they are willing to accept and can mitigate higher perceived market risks of CE relative to other lending opportunities.

In 2009, CABEI's Accelerating Renewable Energy in Central America (ARECA) program interviewed representatives of the largest banks in each country. In Honduras, the four banks reported participated in the financing of renewable energy power plants of up to ten MW. Four out of six banks interviewed in Guatemala said that they had done so. Only one local bank in El Salvador had financed a renewable energy power plant.[25]

Figure 18. Top 10 Clean Energy Financiers in Central America, 2008–2014 (US$ Million)



Source: BNEF (Bloomberg New Energy Finance). 2014. *H2 2014 Mexico and Central America Market Outlook. In the midst of transformation.* 31 July 2014.

[25] CABEI's studies are found here: http://www.proyectoareca.org/?cat=1015&title=Estudios&lang=es

Table 11. Top Project Finance Lenders by Country from 2000 to 2014

Country	Project Finance Lenders	Cumulative Lending (US $Million)	Percentage of funding within country
El Salvador			
	KfW	22.17	49.00
	Banco Centroamericano de Integración Económica	14.93	33.00
	Banco de Desarrollo de El Salvador	8.14	18.00
		Total	100%
Guatemala			
	Clipper Acquisitions Corp.	42.00	31.17
	The World Bank Group	27.00	20.04
	Banco Centroamericano de Integración Económica	21.90	16.25
	G&T Continental	16.90	12.54
	Banco Agromercantil de Guatemala SA	16.90	12.54
	KfW	10.03	7.45
		Total	100%
Honduras			
	The World Bank Group	184.08	27.39
	Banco Centroamericano de Integración Económica	165.50	24.63
	Export-Import Bank of the United States	158.80	23.63
	Nederlandse Financierings Maatschappij voor Ontwikkelingslanden NV	135.63	20.18
	OPEC Fund for International Development	14.59	2.17
	EMP Global LLC	8.13	1.21
	Banco Lafise Honduras SA	2.63	0.39
	Banco Financiera Comercial Hondurena SA	2.63	0.39
		Total	100%

Note: BNEF tracks all assets above 1 MW and all investment above US$ 1M.
Source: Alves, Lilian, Associate, Latin America, BNEF (Bloomberg New Energy Finance). January 5, 2015, private communication.

4.1.2 SPECIALIZED AND NON-SPECIALIZED FUNDS

Globeleq Mesoamerica Energy is a venture capital fund that specializes in development of wind power in Central America (it previously operated as Mesoamerica Energy). The Central American Renewable Energy and Cleaner Production Facility (CAREC) was developed by E+Co Capital with support from the IADB's Multilateral Investment Fund (MIF), El Banco Centroamericano de Integración Económica (BCIE), the Belgian Investment Company for Developing Countries (BIO), the Finnish Development Finance Company (Finnfund), and the Netherlands' Triodos Bank. CAREC used mezzanine financing mechanisms such as subordinated debt, convertible debt, preferred shares, and other non-traditional financing instruments to fund energy projects. Between 2006 and 2011, CAREC invested close to $10 million in eight projects, including three small hydropower plants in Honduras and a biogas production facility in Guatemala. By 2012, the fund allocation stage for CAREC had ended, and it focused entirely on managing existing investments.

In addition, many non-specialized funds are open to investments in renewable energy. For example, the Central American Small Enterprise Investment Fund II (CASEIF II) is a US$ 35 million risk capital fund administered by the Latin American Financial Services (Grupo LAFISE) regional banking group. Investors

include the IADB's MIF, Banco Centroamericano de Integración Económica (BCIE), the Norwegian Investment Fund for Development (Norfund), the Swiss Investment Fund for Emerging Markets, Finnfund, CAF, and BIO. CASEIF II was created to invest in small and medium enterprises in the growth stage in Central America and the Dominican Republic. It invests in shares and other capital or quasi-capital instruments and remains a shareholder for a four to seven year period. In 2009, the fund acquired 20 percent participation in Tecnosol, a Nicaraguan company specialized in off-grid renewable energy solutions to rural families, which plans to expand to other countries in the region.

These limited experiences suggest that long term and flexible financing and equity instruments can help to complement the commercial options available in the region, especially for small- and medium-scale private developers. Some of these funds have also invested technical and financial resources to help project developers prepare business plans, find other sources of financing, and obtain permits.

4.1.3 GREEN MICROFINANCE

Increasingly, microfinance institutions are developing programs to support distribution of renewable energy in communities and to meet the energy needs of small businesses. The number of institutions offering green microfinance in Central America is growing. However, 2012 data suggest that the existence of these institutions and their programs has not necessarily translated into increased CE lending, particularly in Guatemala and Honduras.

This is due to their inability to evaluate CE projects. Financial costs on microloans range from 1.5 to 28 percent, depending on the institution and product. Table 12 provides information on the number of registered microfinance institutions in each country.

Table 12. Green Microfinance in El Salvador, Guatemala, and Honduras, 2012

Country	Total Number of Microfinance Institutions	Number of Microfinance Institutions Offering Green Loans	Average Interest Rate on Green Microloans	Total Amount of Green Microloans Disbursed	Number of Borrowers
El Salvador	19	3	11%	$250,000	500
Guatemala	23	3	n.a.	0	0
Honduras	24	6	n.a.	0	0

Source: Dolezal, A., Majano, A.M., Ochs, A., and Palencia, R. 2013. *The Way Forward for Renewable Energy in Central America.* Washington, DC: Worldwatch Institute.

4.2 FINANCING INSTRUMENTS

Infrastructure projects such as energy generation and distribution are complex and require long-term investment capabilities as they have a long payback period. They also require sizable capital investment. Thus, the types of financial instruments often needed for supporting CE projects by the lending industry are fairly specific, although commonly known. This section describes the types of available financial instruments needed for CE lending. In addition it addresses how local financial institutions in these three countries have learned or can learn how to manage risk associated with CE lending through training in project finance techniques and, for example, with use of the USAID Clean Energy Lending Toolkit. Finally, this section includes a discussion of other instruments that, recently, are beginning to be used in project finance and could conceivably become important in the area of CE funding.

Over the past few decades, developing countries have increasingly turned from reliance on public funding (World Bank, International Finance Corporation, regional banks) to the private sector to help finance, construct, and manage electric power. The turn to the private sector resulted from the desperate need for investment in infrastructure to improve service levels, coupled with state owned enterprises that were no longer credit worthy or financially viable.

In traditional corporate finance, lenders assess and rely upon the overall creditworthiness of the corporation making the investment. The lender has recourse to all of the corporation's assets. If a corporation funds a project and the project declares bankruptcy it could impact on the rest of the corporation's portfolio. The size, complexity, and long-time frame of energy investments leave corporations unwilling to make these investments without the protection of limited recourse finance where only those funds invested in the project are at risk. Funding of power projects, from electricity generation to transmission, has thus increasingly taken the form of project finance. Project finance provides lenders with recourse, or claim, only to the cash flows and assets of the specific project itself, not to corporations other assets. In practice, in developing countries, project finance is frequently backed by government or donor guarantees to provide greater reassurance to lenders of repayment. This increases lending available and reduces the cost of capital.

Investments typically involve equity and debt. Equity is money or the monetary value of contributions that provide an ownership stake. Debt is money that has to be repaid to a lender, with interest. The lower the equity contribution, the less the project sponsors, or owners, are risking. Simultaneously, the lower the equity contribution, the higher the debt contribution (or debt-equity ratio) must be, resulting in greater risk to the lenders and decreasing their willingness to lend.

In project finance, equity, or ownership financing, is largely provided by corporate sponsors and developers. Debt financing is largely provided by bank syndicated loans. The loans are secured by project assets, not on the other assets of the project sponsors, and repayment is based on the cash flows of the project.

In standard project finance, the project sponsors establish a new company for the purpose of a specific infrastructure project. This company is in the form of a Special Purpose Vehicle (SPV). Because they are formed for a specific project they are sometimes called "single purpose entities." SPVs allow investors such as corporations to limit their risk to the amount of money invested rather than expose their other assets in the event of bankruptcy. Frequently, the equity investors include companies that are contractually involved in the project and thus have multiple financial incentives in its success; they are

paid for their portion of the construction and they are incentivized by cash flows from a successfully operating project.

The bulk of project finance is in the form of debt, not equity. Debt capital is provided as either loans or bonds. The vast majority is provided through loans. The amount of debt required is typically too risky for one bank to take on alone so banks join together to form a syndicate. Syndication allows banks to participate in lending for large power projects while managing their risk by limiting their exposure. In a syndicate, one bank or a small group of banks serves as the mandated lead arranger, committing to the SPV to provide the entire loan of a set amount. The arranger then invites other banks to participate by providing a portion of the loan. These banks may proceed to a third tier by allowing other banks to participate, creating a pyramid structure.

With the debt supplied through project bonds, investors lend money to the SPV and are repaid through cash flows generated by the SPV throughout its life. The use of bonds as a form of debt financing has started to increase as more institutional investors see infrastructure investment as attractive for long-term, predictable cash flows. In addition, the market for "green/climate" bonds has increased markedly over the past five years and may become a significant source of CE financing for Latin American projects. Nearly US$ 37 billion of green bonds were issued in 2014, more than triple the 2013 issuance (BNEF, January 15, 2015). Through skillful application of project finance techniques, most risks can be mitigated. This route may be cheaper than creating external mitigating or credit enhancement instruments where a bank perceives a risk.

The key characteristics of project financing are:

- **Capital intensity**: Project finance techniques are used when a project requires a large upfront investment and project income is spread over a long period (typically 10–25 years). Most infrastructure projects fall into this category.
- **Use of special-purpose entities**: Project financing supports a new legal entity (the project company), with the sole purpose of executing the project. The special-purpose vehicle (SPV) limits investor risk to the funds provided.
- **Complex codified structure**: Project finance transactions have similar structural components and stakeholders, regardless of the sector. Each transaction may have a greater number of stakeholders than balance sheet financing.[26] All relationships between stakeholders are governed by contractual agreements. The number of contractual agreements increases the complexity of project finance over typical corporate finance.
- **Focus on cash flows not assets:** Since a new, special-purpose vehicle (SPV) has no credit history, lenders need to focus on the project's cash flow, which requires a different credit evaluation process. Lenders must concern themselves with the project's sensitivity to potentially adverse factors, such as construction overruns and operational risks.
- **Higher Costs:** Raising capital through project finance is generally more expensive than through balance sheet financing. The greater need for information, monitoring, and contractual agreements increases transaction costs. Lenders charge a higher interest rate to compensate for the non-recourse financing. Margins for project financing also often include premiums for country and political risks.

[26] A company's balance sheet lists assets and liabilities as of a set moment in time. "Balance sheet financing" includes liabilities that appear on the balance sheet such as loans, debt, and equity and thus include typical secured debt financing and third party equity. In typical secured debt financing lenders look at the assets of an owner or developer rather than the cash flow of the project. The assets of the owner or developer can be seized to repay the loan.

As mentioned in section 4.1.2, the Central American Renewable Energy and Cleaner Production Facility (CAREC) used mezzanine financing to fund energy projects. This may be an instrument that grows in importance for infrastructure finance. Mezzanine financing mechanisms such as subordinated debt, convertible debt, and preferred shares has not typically been used to finance infrastructure. Mezzanine debt gives the lender the right to convert the loan amount to an ownership or equity stake if the loan is not paid back in time and on full. It is often employed in buyouts, growth financing, and other private equity transactions. Mezzanine debt combines characteristics of debt and equity instruments.

There is speculation that crowdfunding may be a source of investment for infrastructure in the future. There are some examples in developed countries of crowdfunding being used to raise money for public infrastructure. Mosaic is a crowdfunding platform to finance solar arrays. Mosaic charges a one percent fee on each investment. Loans are typically paid back over ten years. The minimum investment is US $25. Divvy is a crowdfunding platform for renewable energy with two pilot projects that repay investors with reductions on their utility bills.27 This instrument could allow people to directly invest in and have an ownership stake in CE projects. This could potentially increase the funds available and result in greater public support for CE projects and policies.

Aggregation of small renewable energy projects would allow smaller banks to originate loans and resell them to larger investors. Accomplishing this would require standardized approval processes and lending guidelines that met the criteria of the loan purchaser.

Case Study – Banco Atlantida

Banco Atlantida in Honduras is a good example of how CE lending capacity can be improved. Banco Atlantida identified mid-scale renewable energy lending as a long-term strategic opportunity and received a US $50 million credit line from the IFC-Canada Climate Change Programme for this purpose. Banco Atlantida hired local consultants to assess the technical feasibility of project proposals and ensure compliance with government permitting and environmental and social laws and IFC policies. A social and environmental compliance expert monitored implementation of the agreements with local partners after projects had been commissioned. Banco Atlantida had good relationships with the parastatal electric utility (ENEE) and the Ministry of Environment. Loan applicants submitted information on all compliance requirements to the bank's credit committee early in the loan appraisal process.

Banco Atlantida offers project finance for the following types of CE:

- Energy efficiency for buildings, transport, and industry;
- Photovoltaics;
- Biogas;
- Biomass;
- Clean cookstoves;
- Wind power; and
- Hydropower.

These loans can be used for capital costs; civil engineering works (concrete, canals, roads); and cables, wiring, and auxiliary equipment. Banco Atlantida has found cross-selling of its CE loan products to corporate clients effective. It has actively marketed RE loans at national and regional conferences across Central America. Banco Atlantida has trained staff in its commercial and risk departments on RE technology, contracts, and finance. The renewable energy finance unit is part of a new department that includes a project finance unit and a syndication unit.

The bank's Risk Department played an important role in appraisal of RE projects before they went to the main credit committee for approval. It relied on power purchase agreements as the basis for financing project cash flows, although it required collateral from some project developers, depending on their credit history and project size.

[27] Gilpin, Lyndsey, How crowdfunding solar power is democratizing the way we finance clean energy, TechRepublic, March 13, 2014 http://www.techrepublic.com/article/how-crowdfunding-solar-power-is-democratizing-the-way-we-finance-clean-energy/ accessed January 23, 2015.

4.1 MARKET ACTIVITY BY CE RESOURCE TYPE

This section discusses current and planned investment activities in renewable energy electricity generation by resource type. It provides an overview of the renewable energy resources and discusses current investments. This section focuses on market activity publicly reported as of October, 2014, in wind, on-grid photovoltaics, geothermal, and biofuels/biomass sectors.

CEPAL, 2007 and Dolezal, et al., 2007 quantified the total and remaining effective potential of renewable sources in the region based on each country's energy policy. While these figures are not always consistent, they showed that most of the region's renewable energy potential was not being used (Table 13).

Table 13. Remaining Effective Potential of Renewable Resources in Central America, as of 2009 (GWh)

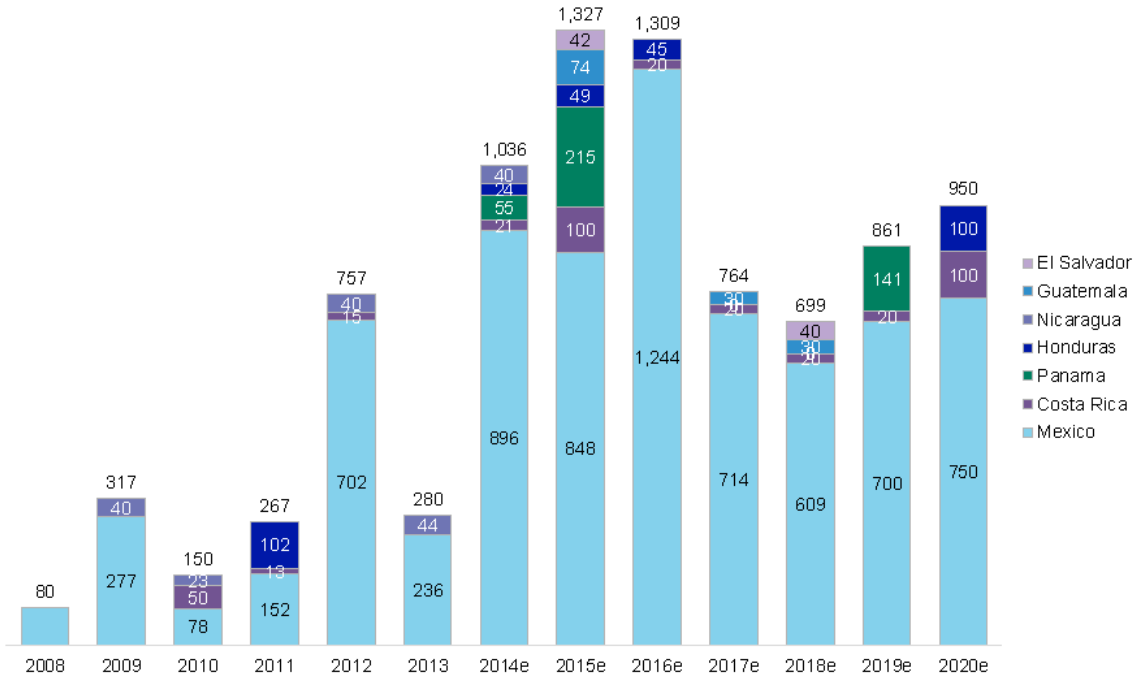
Country	Hydropower		Geothermal		Wind		Bagasse	
	Total	Remaining	Total	Remaining	Total	Remaining	Total	Remaining
El Salvador	9,483	6,544	2,039	2,605	n.a.	2,798	n.a.	273
Guatemala	17,107	15,010	6,132	3,630	n.a.	2,124	n.a.	1,075
Honduras	21,900	15,302	736	545	n.a.	2,883	n.a.	320
Central America	94,171	73,758	18,157	13,984	n.a.	17,085	n.a.	2,316

Source: Total figures are from CEPAL *(Comisión Económica para América Latina y el Caribe).* 2007. *Estrategia Energética Sustentable Centroamericana 2020.* México, D.F.: CEPAL.; Remaining potential figures are from Dolezal, A., Majano, A.M., Ochs, A., and Palencia, R. 2013. *The Way Forward for Renewable Energy in Central America.* Washington, DC: Worldwatch Institute.

4.1.1 WIND

Wind power is still at an early stage in much of Central America. As of 2014, El Salvador and Guatemala had no installed wind electric generation capacity. El Salvador's state-owned electric utility is planning to develop its first utility-scale wind farm. Earlier this year Guatemala closed financing on its first wind farm. Honduras had 102 MW of installed wind generation capacity (BNEF). BNEF (2014) estimated 1.3 GW of new wind capacity would be installed in Central America (excluding Mexico) through 2020 (Figure 19).

Figure 19. Mexico and Central America Wind Installation Forecast, 2008–2020 (in MW)



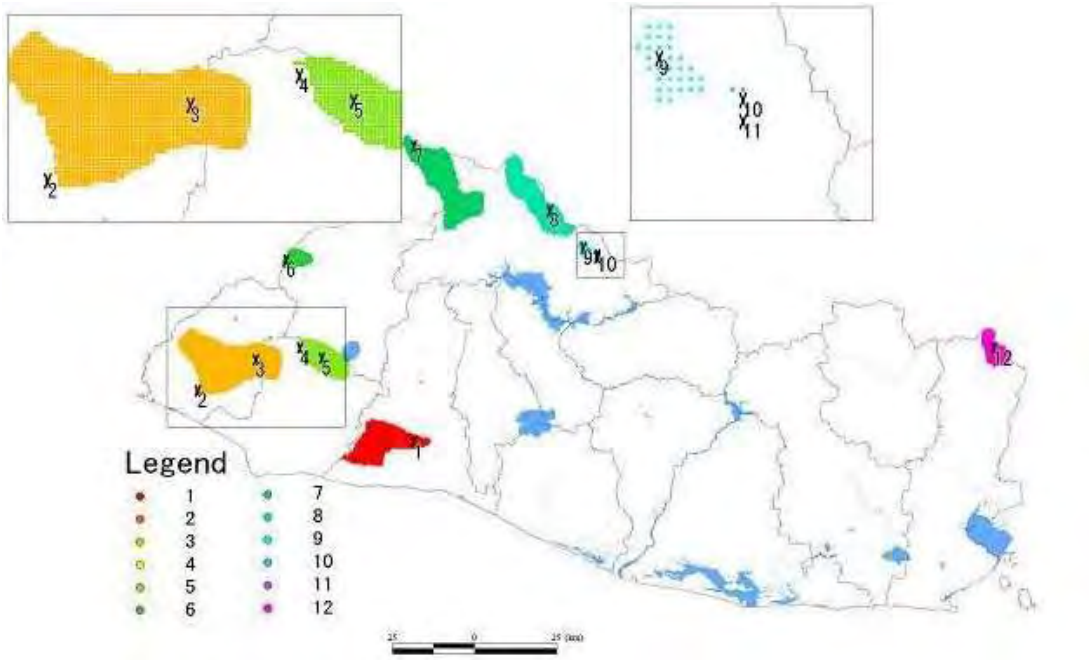
Source: BNEF (Bloomberg New Energy Finance). 2014. *H2 2014 Mexico and Central America Market Outlook. In the midst of transformation.* 31 July 2014.

El Salvador has many areas with good-to-excellent wind resources, particularly on elevated terrain areas of the southwest, northeast, and northwest. The Japan Weather Association identified 12 suitable sites for wind power development based on a wind potential map created by the Solar and Wind Energy Resource Assessment and wind measurements conducted in 2006–2007 by the Finnish Meteorological Institute. Each of these sites has a wind potential greater than 700 W/m^2 at 50 m above ground level (Figure 20). Establishment of a wind monitoring system would be an important next step.

A review of closed asset financing from BNEF reveals no wind projects in El Salvador. Asset financing is borrowing based on balance sheet assets. Thus no wind projects in El Salvador have concluded, or closed, on financing based on assets. The state-owned parastatal Comisión Ejecutiva Hidroeléctrica Río Lempa (CEL) plans to develop the nation's first utility-scale wind project to diversify the country's energy mix.[28] Forty two MW of wind power in El Salvador. CEL's original plan to commission the plant by 2015 will not be achieved as no apparent progress has been made since 2012. In addition, a recent tender for 40 MW in a different site ended without a winner (BNEF, 2014).

[28] Nielsen, Stephen, CEL Planning El Salvador's First Wind, Solar Energy Projects, BNEF, June 14, 2012

Figure 20. Wind Potential Sites in El Salvador



Point (area)	Annual Mean Wind Speed meters per second (m/s) at three different measuremtn heights			Annual wind Potential watts per meter squared (W/m^2) at three different measurement heights		
	30 m	50 m	80 m	30 m	50 m	80 m
1	6.50	7.32	7.66	574.0	843.8	1010.2
2	5.15	5.94	6.62	401.6	703.4	1036.7
3	8.20	8.52	8.69	1072.2	1231.2	1348.9
4	6.61	7.42	7.94	485.1	707.0	899.1
5	8.19	8.48	8.55	1100.8	1237.1	1281.8
6	8.22	8.87	9.33	806.0	1013.6	1193.8
7	8.61	8.95	9.08	1183.2	1363.3	1460.1
8	7.26	7.81	7.96	1029.6	1287.6	1402.6
9	5.82	6.26	6.44	589.5	749.0	849.5
10	5.96	6.30	6.47	591.6	708.8	794.9
11	5.94	6.30	6.46	576.9	700.9	782.6
12	6.75	7.56	7.98	636.4	911.5	1103.1

Source: CNE/JICA *(Consejo Nacional de Energía/*Japanese International Cooperation Agency). 2012. *Plan Maestro para el Desarrollo de la Energía Renovable en El Salvador*. San Salvador: CNE/JICA.

In Guatemala, data from the National Rural Electric Cooperative, wind turbine manufacturer Kenetech Windpower, and wind developers confirm areas of good wind resource in the southeast. Data were available from areas south of Guatemala City and Antigua, ridges near Comapa and the border with El

Salvador, and ridges in Huite region near Zacapa. A wind map developed by the U.S. National Renewable Energy Laboratory (NREL) indicates many other areas in southern and eastern Guatemala with good-to-excellent wind resources. Wind resources are generally lower at high elevations above 2,500–3,000 m than in exposed terrain at elevations of 800–2,000 m. This reduction in wind resource at very high elevations is confirmed by upper-air data and by measurement towers, including data from a site at 3,300 m elevation in southwestern Guatemala where measured wind resource was only low-to-marginal (Class 1–2) (NREL, N.D.).

Banco Centroamericano de Integración Económica (BCIE) is providing a US$ 50.7 million loan to finance the 53 MW San Antonio el Sitio wind farm, the first in Guatemala. Located in the, in the municipality of Villa Canales, this wind farms is expected to be commissioned in 2015 (BNEF, 2014). BCIE's financial support was structured as a syndicated loan with the participation of the G&T Continental Bank and the Banco Agromercantil de Guatemala.[29] Two additional wind farms have been contracted, the 30 MW Teresa C1 plant and the 21 MW Viento Blanco plant. Both of these were planned to be completed in 2015, but financial closure has not been reached in either case. Additional wind projects could be contracted through further energy auctions being conducted by the Government of Guatemala (BNEF, 2014).

In Honduras**,** data from Kenetech and wind developers confirm areas of good-to-excellent wind resources (Class 4–7) on the ridge crests and elevated terrain areas in the region near Tegucigalpa, particularly at several sites near Santa Ana along the divide south of Tegucigalpa. [30] Upper-air data from Tegucigalpa confirm the very strong winds that occur in this region. There are numerous other areas of good-to excellent wind resources in southern Honduras. Some of the prominent ridge crests in northern Honduras are expected to have good wind resources, based on upper-air data, but no on-site measurement data are available. Ocean satellite data show areas of moderate-to-good wind resources (Class 3–4) for exposed coastal areas and offshore islands of the Caribbean Sea, except for the western coast of Honduras where the resources are only Class 1–2. Unfortunately, no wind measurement data were available to confirm the Class 3–4 resources estimated for the exposed coastal areas (NREL, N.D.).

Honduras had 102 MW of installed wind capacity in 2013 (BNEF). The Mesoamerica Cerro de Hula Wind Farm commenced operation in 2011.[31] Cerro de Hula is also expected to increase its installed capacity to 126 MW, with an investment of US$ 60 million by Globeleq, partly financed by the U.S. Export–Import Bank. In 2014 the project received a guarantee from the Multilateral Investment Guarantee Agency, the political risk insurance and credit enhancement arm of the World Bank Group, to enable the expansion.[32] When operational, Cerro de Hula is expected to be able to supply 10 percent of the country's electricity demand. Electricity from Cerro de Hula is expected to be sold at US$ 0.12 per KW/hour, resulting in savings of US$ 40 million for the utility.[33]

Spanish firms Iberdrola and Gamesa have initiated construction of the 50 MW San Marcos wind farm, 140 km south of Tegucigalpa near the border with Nicaragua. Honduran Grupo Terra, owner of the

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[29] http://www.energias-renovables.com/articulo/financiacion-para-el-primer-parque-eolico-20140325

[30] Class 3 or above is considered suitable for utility-scale wind turbines.

[31] Globeleq website, http://globeleq.com/portfolio/operating_assets/11/Cerro-de-Hula, accessed December 16, 2014.

[32] "Honduran project gets $82m investment guarantee," WindPower Monthly, 7 February 2014, http://www.windpowermonthly.com/article/1230369/honduran-project-gets-82m-investment-guarantee, accessed December 16, 2014.

[33] http://www.proceso.hn/component/k2/item/28138.html

Cerro de Hula wind farm, received a US$ 127.5 million loan from an international consortium. The debt arranger is Nederlandse Financierings Maatschappij voor Ontwikkelingslanden NV. Other members of the syndicate are the German development finance institution Deutsche Investitions- und Entwicklungsgesellschaft mbH (DEG), the private sector investment arm of the French development body Agence Française de Développement, the OPEC Fund for International Development (OFID), and the Interact Climate Change Facility (ICCF).[34] The term loan was closed February 5, 2014 (BNEF, 2014). The development of the 45 MW Chinchayote wind farm also began in 2013. Vientos de San Marcos is developing this project with an investment of US$ 170 million. The 3.9 MW Ocean View wind park farm is under construction in Roatán Island, located in the Bay Islands archipelago in the Caribbean. The total investment for this project is estimated at US$ 4.5 million.[35]

Wind power has the lowest investment cost per unit of capacity among the renewable energies in El Salvador in CNE's project pipeline (US$ 235/kW). Its' fixed and operation and maintenance (O&M) costs of US$ 2.93/kW year are similar to those of solar energy and lower than LNG and geothermal.

4.1.2 ON-GRID PHOTOVOLTAICS

The photovoltaics market in El Salvador, Guatemala, and Honduras is still nascent, with no utility-scale photovoltaic capacity as of 2013 (BNEF). Financing for the first utility-scale plant in El Salvador was obtained in 2013. This 14.2 MW project called "15 de Septiembre", located in the municipalities of Estanzuelas and San Ildefonso, about 90 km away from San Salvador, is expected to cost US$ 58 million (BNEF, 2014). If the plant began operations in 2014, as planned, it will be the largest photovoltaic power plant in Central America. A 5 MW photovoltaic plant began operating in Guatemala in 2014. Honduras had no utility-scale photovoltaic capacity in operation, but large projects underway (BNEF, 2014).

A 60 MW photovoltaic powerplant in the Eastern Zone of El Salvador is expected to begin operations in 2017. Only project development and installation are done in country (*Fondo Multilateral de Inversiones* {Multilateral Investment Fund FOMIN [/] and BNEF, 2013). DELSUR contracted 94 MW of PV capacity at an average price of US$ 116/MWh that are to be delivered by October 2016. These will be developed by three firms: DP NEOEN-ALMAVAL has a 60 MW PV project; Solar Reserve Development will develop a 20 MW project; and UDP Proyecto La Trinidad will develop two projects of 8 MW and 6 megawatts.[36] DELSUR's tender was originally open to both wind and solar, but the wind bids were above DELSUR's ceiling price of US$ 123/MWh (BNEF, 2014).

Guatemalan President Otto Pérez inaugurated a 5 MW photovoltaic power plant in May 2014 located in the northeastern Zacapa. The power plant, developed by the firms Green, ECO Solar, Gransolar, and IDC group, is expected to provide electricity for 40,000 households.[37] The solar complex Xepultul II is to be built by an alliance formed by the Italian firm Enel Green Power and Barefoot College, a nongovernmental organization that develops renewable energy based electricity for rural communities. This complex is to provide electricity to the public areas of three communities, including schools, meeting areas, town offices, and religious buildings.[38] The 6.2 MW Sibo plant won a 15-year power

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34 http://www.energias-renovables.com/articulo/iberdrola-ingenieria-y-gamesa-construiran-un-parque-20140714

35 http://www.energias-renovables.com/articulo/isla-de-roatan-permiso-ambiental-para-un-20130318

36 http://www.cne.gob.sv/index.php?option=com_content&view=article&id=425:2014-07-25-23-15-28&catid=1:noticias-ciudadano&Itemid=77

37 http://www.mem.gob.gt/2014/06/02/sol-zacapaneco-iluminara-40-mil-hogares/

38 http://www.energias-renovables.com/articulo/xepultul-ii-fotovoltoica-para-tres-pueblos-rurales-20140204

purchase agreement (PPA) contract with Empresa Electrica de Guatemala in an energy auction in 2012. The Sibo plant is being developed by Gransolar and Greenergyze (part of Grupo Ecos), and obtained US$ 130/MWh in financing from the Guatemalan G&T bank. Grupo Onyx has filed for a US$ 14.23 M solar electric facility called Horis I, but has not yet closed on financing (BNEF).

Three solar power plants have been announced in Honduras, but financing has not yet closed -- the SunEdison Pacifico Solar PV Plant, Upower Pacific Solar Energy Nacome PV Plant, and the Upower PRODERSSA Nacome PV Plant. The first was seeking a term loan while the other two were looking for balance sheet financing (BNEF). Solar Power and Compania Hondurena de Energia Solar announced in October 2014 that they had reached an agreement with Canadian Solar Inc. to develop two 73.2 MW solar farms in southern Honduras which are expected to be complete in March of 2015.[39]

Solar power has investment capital cost of US$ 293/kW and O&M costs of US$ 2.93/kW year. These are lower than most geothermal and hydropower power plants, but relatively higher than other renewable sources.

Honduras was offering a 15-year feed-in tariff (US$ 180/MWh) for solar plants commissioned by 2015. The incentive is limited to a maximum of 300 MW of capacity.

4.1.3 GEOTHERMAL

According to the World Bank (2012), the potential for geothermal power generation in Central America is estimated at 3,000 - 13,000 MW,[40] About 50 sites have been identified for possible development, including 4–13 in El Salvador, 8–13 in Guatemala, and 6–7 in Honduras. If the upper range of the capacity estimate is developed, geothermal could supply nearly all of the region‘s electricity demand. The range of estimated potential is wide because only a small fraction of the identified sites has been validated by actual drillings, and because different groups have used alternative methodologies to estimate the potential. This underscores the large uncertainty of resource estimates in the absence of drilling information and indicates the need for increased exploration and test drilling to fill the information gap (World Bank, 2012).

Geothermal energy comprised 24 percent of El Salvador’s installed electricity capacity (204 MW) in 2014, one of the largest shares in the world for this resource. The CNE has included three geothermal power plants in the pipeline: 1) a 6 MW expansion at Ahuachapán by 2016, 2) a 16 MW expansion of Berlín another in 2017, and an additional 30 MW expansion of Berlín by 2019. These projects are welcome developments as there has not been significant investment in geothermal power plants for nearly a decade (Table 14).

Domestic components of geothermal power in El Salvador include exploration/production drilling, turbine and power block, balance of plant, and project development (FOMIN and BNEF, 2013).

[39] Munro, Stephen, “Canadian Solar Supplying 146.4 Megawatts for Honduras Projects,” BNEF, October 15, 2014.

[40] World Bank estimates are based on the following studies: Bundshuh, T. Knopp, R. Muller, R, Kim, J.L., Neck, V., & Fanghanel, T., 2000. “Application of LIBD to the determination of the solubility product of thorium (IV)- colloids”. *Radiochimica Acta*, 88, 625-629; Japanese Bank for International Cooperation (JBIC). “The Role of Geothermal Energy in the Electric Sectors of the Plan Puebla Panama Region”, November 2006; and Guzman, Carlos Roberto, “Desarrollo Geotérmico en Centroamérica”, *La Geo*, 2009.

Table 14. Geothermal Power Financing in El Salvador

Name	Financial Deal Status	Date of Close	Financing Type	Disclosed Transaction Value ($M)	Equity Provider
LaGeo Berlin Geothermal Plant Phase III Refinancing	Completed	30/09/2005	Balance Sheet	13.00	LaGeo SA de CV
LaGeo Berlin Geothermal Plant Phase II	Completed	01/05/2005	Balance Sheet	90.02	Enel Latin America LLC, LaGeo SA de CV
LaGeo Cuyanausul Geothermal Plant	Completed	02/01/2005	Balance Sheet		LaGeo SA de CV
LaGeo Berlin Geothermal Plant	Completed	05/01/1997	Balance Sheet	113.13	LaGeo SA de CV

Source: BNEF (Bloomberg New Energy Finance). 2014b. *H2 2014 Geothermal Market Outlook. With a safety net, will geo take a leap?* 28 August 2014. Downloaded November 6, 2014.

The National Electrification Institute of Guatemala (INDE) of Guatemala has studied geothermal resources since the 1970s. Two geothermal fields have been developed in Guatemala -- Zunil and Amatitlán. Zunil, with 28 MW installed, is operated under a build-own-operate agreement. INDE operates the field and delivers steam to the power plant owned and operated by the firm Ormat. Amatitlán has 20 MW of installed capacity and is operated by Ormat. In both cases, Ormat has a PPA with INDE.

INDE continues to be interested in geothermal development and has built up its capacity in a dedicated geothermal department that has hands-on experience with development of the Zunil and Amatitlán fields. INDE currently holds exploration rights for several sites, including Zunil, Amatitlán, Moyuta, San Carlos, and Tecuamburro. However, the exploration concession and power development are open to the private sector, which is expected to bear all exploration risks, as is also the current practice in Nicaragua (World Bank, 2012).

In September 2013, the Ministry of Energy and Mines (MEM) announced that it will initiate bidding s to develop 250 MW of geothermal energy in the departments of Jutiapa, San Marcos, Guatemala, and Quetzaltenango. MEM also announced that the Government of Japan is supporting creation of a Geothermal Department that within the Ministry. Only 2 percent of Guatemala's geothermal potential has been tapped.[41]

Table 15 lists the geothermal asset financing in Guatemala. Ormat is by far the dominant player. It is not surprising that geothermal power production is limited to large, international players due to the considerable risk.

[41] http://www.energias-renovables.com/articulo/anuncian-licitaciones-por-250-mw-geotermicos-20131020

Table 15. Geothermal Asset Financing in Guatemala

Name	Financing Status	Closing Date for Financing	Financing Type	Disclosed Transaction Value ($M)	Equity Provider
USG El Ceibillo Geothermal Plant	Announced /filed		Balance Sheet		US Geothermal Inc
Ormat Amatitlan Geothermal Plant Refinancing	Completed	21/05/2009	Term loan	42.00	Ormat Technologies
Orzunil I de Electricidad Zunil Geothermal Plant Acquisition	Completed	26/06/2006	Balance Sheet	3.25	Ormat Technologies Inc
Orzunil de Electridad Zunil Geothermal Plant Acquisition	Completed	20/03/2006	Balance Sheet	14.75	Ormat Technologies Inc
Amatitlan Geothermal CDM Project	Completed	15/03/2006	Balance Sheet	55.20	Ormat Technologies Inc

Source: BNEF (Bloomberg New Energy Finance). 2014b. *H2 2014 Geothermal Market Outlook. With a safety net, will geo take a leap?* 28 August 2014. Downloaded November 6, 2014.

In Honduras, six geothermal sites were identified in the 1970s and 1980s. The potential was considered modest, with the Platanares field being the most promising. The Government has awarded concessions for three: the Pavana, Azacualpa (Geopower), and the Platanares field (Geoplatanares). SERNA coordinates geothermal activities in the country and it has conducted a complete survey of 204 surface manifestations.

The Government of Honduras has provided concessions to private companies for the development of the resource. Exploration of Platanares had been conducted since the 1980s with public resources and international help, but is now being developed by the private sector (World Bank, 2012). In late 2013, Ormat purchased the Platanares geothermal plant, which is expected to produce 39 megawatts. Ormat can hold the concession for 15 years and it has obtained a PPA agreement signed for the plant with the public utility ENEE. Platanares plant was developed as a result of a competitive bid tendering process for renewable energies conducted by the Honduran Government in 2010. Honduran energy developer Elcosa oversaw the exploratory phase of the Platanares project (BNEF, 2014b).

Geothermal pre-survey and exploration activities are risky because they can lead to negative conclusions about the potential of the geothermal resource, but these are relatively low-cost activities. Test drilling is high risk since it requires US$ 2–6 million and has an uncertain outcome. Greenfield deep-well drilling

is successful in one out of three attempts. The success rate may improve with multiple drillings at a site, but the maximum success rate of around 60–80 percent. If the first three activities can be carried out successfully, the development risk may fall dramatically and be similar to other thermal power-generating technologies. Although the risk is lower than in exploration and test drilling phases, there is long-term operational risk related to declining temperature and permeability of the geothermal reservoir, the possibility of a high level of mineralization, and problems with the reinjection process of geothermal fluids. These risks are considered manageable.

Investments to address the high, upfront risks for geothermal development are large. For example, US$ 14–39 million may be needed in the first three phases with no guarantee of success. Given that lenders are unlikely to finance these activities, government risk-sharing measures can be critical for complementing private sector resources, either through a joint public-private partnership or other financial instruments.

Three broad development models have been used for geothermal development in Central America -- the state-owned model, public-private partnerships, and private sector concessions. In Costa Rica, the national power company was the only developer of geothermal resources in the country. LaGeo in El Salvador is a good example of a public-private development strategy. In particular, it is worth highlighting the catalytic role of the private firm Enel in providing technical advice and funding for the company. The approach in El Salvador has been successful, although project risks were indirectly backed by the Government. Nicaragua awarded concession areas to the private sector, which had to take on the exploration risk and develop the resource. The situation in Honduras was similar to Nicaragua, but only two concessions had been contracted as of 2012. In recent years, Guatemala followed an approach similar to Nicaragua's. The GoG offered concessions to private developers, except for those already held by INDE. In the early years, the upfront resource risks were borne solely by the GoG.

Concessional finance from development financial institutions for geothermal power has increased along with use of risk mitigation and reduction tools and increased market participation. CAF [*Banco de Desarrollo de América Latina/* Development Bank of Latin America, Germany's KfW [*Bank aus Verantwortung*/German Development Bank], and the European Commission created a risk mitigation fund for geothermal power, that is expected to begin operating in 2015. The fund is to initially serve early-stage development projects in Bolivia, Chile, Colombia, Ecuador, and Peru, but might expand to other Latin American countries (BNEF, 2014b).

Comprehensive inventories of geothermal resources with high-quality data are available in relatively few countries (e.g., Indonesia), but are a strong attraction for the private sector. Nicaragua is the only country in Central America with a completed geothermal resource inventory and the private sector there has shown significant interest in getting exploration concessions, particularly for sites with quality resource information.

El Salvador has accumulated extensive in-country experience and is in a good position to scale up geothermal capacity, but needs to clarify the role of LaGeo, the sole geothermal developer in the country. Honduras and Panama have relatively little experience in this area.

The Guatemalan Government could usefully strengthen in-house capacity for geothermal development, develop its geothermal resource inventory, and explore other risk-sharing mechanisms in addition to the separation of steam and power production. Honduras and Panama need to undertake an inventory of geothermal resources and, based on that, decide if geothermal will play a role in their power expansion. [42]

[42] This section draws heavily from the World Bank (2012).

4.1.4 BIOFUELS/BIOMASS

Biofuel production in Central America falls far short of its potential. Both Guatemala and El Salvador have an estimated potential to produce 265–285 metric billion tons of biofuel. Although the bulk of this capacity is for ethanol, about a tenth of El Salvador's is for biodiesel. Guatemala and Honduras each generate an estimated 1 million liters annually mainly from and palm, jatropha, and castor oil plan for domestic use (Dolezal et al., 2013).

CEPAL (2007) simulated the effects of blending sugarcane-based ethanol with gasoline, starting with 1.1 percent in 2007, steadily increasing to 10 percent by 2015, and staying at that level until 2020. Meeting this goal would require an annual production of around 650 million liters of ethanol per year and an additional 115,000 hectares (ha) would need to be allocated to sugarcane plantations, a 28.1 percent increase over 2005. Under this scenario, Guatemala would need to use 16 percent of its arable land to grow sugarcane, 15 percent more than in 2005. El Salvador would have to devote 11 percent of its land for sugarcane, a 33.6 percent increase over 2005.

CEPAL (2007) also estimated the land required for a gasoline blend with 5 percent palm oil-based biodiesel by 2020. This would require 1,259 ha in El Salvador, 2,294 ha in Guatemala, and 581 ha in Honduras. The Government of El Salvador has stated that, high-quality arable land should be used to grow food, while biofuel crops should be grown in marginal lands the country's small size (CEPAL, 2007).

In 2010, the San Francisco-based firm Nexant found strong interest in biofuels in the region, but noted that despite the momentum toward more comprehensive policies and programs to promote the production and utilization of biofuels, the broader development of biofuels in the region faced important limitations. These include availability of land, environmental and social concerns, production volumes, international markets, quality assurance, technical limitations and costs, political and administrative complexity, and public communication. It also concluded that fossil fuel use was likely to grow faster than biofuels in the future (USAID, 2010).

In El Salvador, CNE has expansion of two biomass power plants in its pipeline that would add a total of 76 MW of capacity in 2015. Two other power plants were being developed to expand the capacity of existing sugar mills and feed surplus electricity to the grid. In El Paisanal (40 km from San Salvador), La Cabaña planned to invest US$ 35.5 million to increase its capacity 20 MW by 2014–15. Between January and June 2013, La Cabaña fed 12.8 GWh to the grid.

The Chaparrastique sugar mill, owned by the *Compañía Azucarera Salvadoreña* (Cassa), planned to increase its electric generation capacity from 16 to 62 megawatts. Chaparrastique and another sugar mill, Centaral Izalco, also owned by Cassa produced over 120 GWh during the first half of 2013, while El Angel sold with 61.8 GWh to the grid in the first half of 2013.[43]

The first sugarcane-based ethanol production plant in El Salvador was inaugurated in July 2014. It is located in the city of Catacamas and is part of an initiative by the Organization of American States (OAS) to expand biofuel activity with technical assistance from Brazil and the United States. This plant is expected to produce 290 liters every eight hours. The Hernández administration is supporting farmers to grow palm for biodiesel. The country anticipates investments of over US$ 72 million to expand the cultivated area of African palm from 135,000 ha in mid-2014 to 260,000 ha over four years.[44]

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[43] http://www.energias-renovables.com/articulo/avanza-la-biomasa-20130814

[44] http://www.energias-renovables.com/articulo/entra-en-operaciones-la-primera-planta-de-20140725

Table 16 lists biomass, biofuel, and landfill investments in El Salvador between 2002 and 2011.

Table 16. Biomass and Biofuel Asset Financing in El Salvador

Name	Sector	Financial Deal Status	Date of Close of Financing	Financing Type	Disclosed Transaction Value ($M)	Equity Provider
Southridge El Salvador Bioethanol Plant	Biofuels	Abandoned	30/11/2011	Balance Sheet		Southridge Enterprises Inc
Nejapa Landfill Gas Plant	Biomass & Waste	Completed	31/03/2010	Balance Sheet	14.30	AES Corp/VA
Gasohol Acajutla Bioethanol Dehydration Plant Expansion	Biofuels	Completed	31/12/2008	Balance Sheet		
Nejapa Landfill Gas Plant Acquisition	Biomass & Waste	Completed	01/04/2008	Balance Sheet		AES Corp/VA
Ingenio La Cabana El Paisnal Bioethanol and Power Plant	Biofuels	Completed	31/12/2006	Balance Sheet		Ingenio La Cabana SA de CV
Bio Energia Valle Zapotitán Biodiesel Plant	Biofuels	Completed	19/04/2006	Balance Sheet	2.50	
Gasohol Acajutla Bioethanol Dehydration Plant	Biofuels	Completed	31/12/2005	Balance Sheet		
ARFS Acajutla Bioethanol Dehydration Plant	Biofuels	Completed	30/09/2005	Balance Sheet	13.00	American Renewable Fuel Suppliers Ltda de CV
CASSA Central Izalco Biomass Plant	Biomass & Waste	Completed	01/07/2002	Balance Sheet		Cia Azucarera Salvadorena SA
CASSA Central Izalco Biomass Plant	Biomass & Waste	Completed	01/07/2002	Balance Sheet		Cia Azucarera Salvadorena SA

Source: BNEF (Bloomberg New Energy Finance). 2014b. *H2 2014 Geothermal Market Outlook. With a safety net, will geo take a leap?* 28 August 2014. Downloaded November 6, 2014.

The Guatemalan Government signed a memorandum of understanding with the OAS in August 2014 to begin a pilot project to mix ethanol with gasoline. If successful, the project may lead to a national ethanol program. The six-month pilot will involve 20 vehicles owned by individuals and government agencies. The Ministry of Energy and Mines highlighted the importance of substituting imported

petroleum products with biofuels from domestically grown sugarcane. The OAS will also support creation of a biofuels unit within MEM.

The Magdalena sugar mill, located in Guatemala's southern Escuintla Department, began operation of a new US$ 80 million plant in 2012, increasing its installed capacity from 69 MW to 125 megawatts. The sugar mill uses 50 MW for internal consumption, and the remaining 75 MW are dispatched to the grid. It also plans to operate a biogas plant using wastes from the vinasses (alcohol distillation residues). This sugar mill is the fourth largest in the world and is expected to provide to the grid an amount equivalent to almost 5 percent of the national electricity consumption.[45]

Table 17 shows the biomass, biofuel, and waste projects financed in Guatemala between 2001 and 2010.

[45] http://www.energias-renovables.com/articulo/un-ingenio-genera-energia-que-aporta-al-20121127

Table 17. Biomass and Biofuel Asset Financing in Guatemala

Name	Sector	Financial Deal Status	Date of Close	Financing Type	Disclosed Transaction Value ($M)	Equity Provider
Ingenio Palo Gordo Biomass Plant	Biomass & Waste	Completed	31/12/ 2010	Balance Sheet		Cia Agricola Industrial Ingenio Palo Gordo SA
ILG DARSA Cuyotenango Bioethanol Plant	Biofuels	Completed	31/12/ 2009	Balance Sheet		Industrias Licoreras de Guatemala SA
Pantaleon Bioetanol Bioethanol Plant Expansion	Biofuels	Completed	02/06/ 2009	Balance Sheet		Pantaleon Sugar Holdings Co Ltd
Guatecarb Colonia Landivar Landfill Gas Flaring CDM Project	Biomass & Waste	Completed	01/09/ 2008	Balance Sheet		UniCarbo Energia Biogas Ltda
Olmeca Tecun Uman CDM Biomass Plant	Biomass & Waste	Completed	16/06/ 2008	Balance Sheet		Olmeca SA
Ingenio Magdalena Bioethanol and Power Plant	Biofuels	Completed	31/12/ 2007	Balance Sheet		Ingenio Magdalena SA
Agrocaribe Champona Biogas Project	Biomass & Waste	Completed	01/05/ 2007	Balance Sheet		Agroindustrial Del Caribe SA
Pantaleon Bioetanol Bioethanol Plant	Biofuels	Completed	31/12/ 2006	Balance Sheet		Pantaleon Sugar Holdings Co Ltd
Pantaleon Bioetanol Biomass Plant Expansion	Biomass & Waste	Completed	31/12/ 2004	Balance Sheet		Pantaleon Sugar Holdings Co Ltd
San Diego Masagua City Biomass Plant	Biomass & Waste	Completed	01/08/ 2004	Balance Sheet		San Diego SA
Alcoholes MAG Bioethanol Plant	Biofuels	Completed	31/12/ 2001	Balance Sheet		Ingenio Magdalena SA, Central Agroindustrial Guatemalteca SA

Source: BNEF (Bloomberg New Energy Finance). 2014b. *H2 2014 Geothermal Market Outlook. With a safety net, will geo take a leap?* 28 August 2014. Downloaded November 6, 2014.

In Honduras, the Asociación Hondureña de Maquiladores (Honduran Maquila Association) reported that four biomass projects would begin operations between 2013 and 2015 to provide energy to the textile industry. A total of US$ 180 million will be invested in two power plants in the Choloma municipality with a total capacity of 60 megawatts. The municipality of Potrerillos is expected to obtain an investment of US$ 60 million for a 20 MW biomass project. The fourth one, in the municipality of Quimistán, representing investments of US$ 80 million, is to have a capacity of 26 megawatts.

Table 18 shows biomass and waste energy projects financed in Honduras between 2002 and 2008, but transaction values were not available.

Table 18. Biomass Asset Financing in Honduras

Name	Sector	Financial Deal Status	Date of Close	Financing Type	Disclosed Transaction Value (US$M)	Equity Provider
ERH El Negrito Biogas Plant	Biomass & Waste	Completed	01/07/ 2008	Balance Sheet		Not Reported
Lean Exportadora del Atlantico Biogas Plant	Biomass & Waste	Completed	01/06/ 2008	Balance Sheet		Exportadora del Atlantico Aguan
Simtex International Green Valley Biomass Plant	Biomass & Waste	Completed	09/02/ 2008	Balance Sheet		Simtex International S de RL de CV
Biogas Energia Los Leones Biogas Plant	Biomass & Waste	Completed	12/12/ 2007	Balance Sheet		Not Reported
Exportadora del Atlantico Aguan Biogas and Biomass Project	Biomass & Waste	Completed	01/12/ 2007	Balance Sheet		Exportadora del Atlantico Aguan
EECOPALSA El Castano Village Biomass Plant	Biomass & Waste	Completed	29/12/ 2006	Balance Sheet		Energia Ecologica de Palcasa SA
Eecopalsa El Progreso Biogas Plant	Biomass & Waste	Completed	01/06/ 2006	Balance Sheet		Energia Ecologica de Palcasa SA
CAHSA Villanueva Biomass Plant	Biomass & Waste	Completed	31/12/ 2004	Balance Sheet		Cia Azucarera Hondurena SA
Azucarera Chumbagua San Marcos Biomass Plant	Biomass & Waste	Completed	29/10/ 2004	Balance Sheet		Cia Azucarera Chumbagua SA de CV
Cia Azucarera Tres Valles Biomass Plant	Biomass & Waste	Completed	02/04/ 2003	Balance Sheet		Cia Azucarera Tres Valles SA de CV
Inversiones Hondurenas El Progreso Biomass Plant	Biomass & Waste	Completed	05/08/ 2002	Balance Sheet		Inversiones Hondurenas SA de CV
Azucarera La Grecia Marcovia Biomass Plant	Biomass & Waste	Completed	01/06/ 2002	Balance Sheet		Azucarera La Grecia SA de CV
Cerveceria Hondurena San Pedro Sula Biogas Plant	Biomass & Waste	Completed	12/01/ 2002	Balance Sheet		SABMiller PLC

Source: BNEF (Bloomberg New Energy Finance). 2014b. *H2 2014 Geothermal Market Outlook. With a safety net, will geo take a leap?* 28 August 2014. Downloaded November 6, 2014.

5. BARRIERS AND RESPONSES

This section summarizes the barriers identified in the literature to CE lending in El Salvador, Guatemala and Honduras. Many of these are being addressed by USAID and other donors, including the IADB and World Bank. During the Needs Assessment we will explore with local stakeholders what barriers present the greatest impact and are not being addressed. We will investigate what technical assistance to financial institutions in the form of knowledge dissemination, networking, and training would facilitate private and public investment in CE in Central America to reduce GHG emissions. In addition, we will inquire about the use of energy and economic modeling for energy and low emission development planning as we were not able to answer this question with a desktop review.

This section also explores the activities being undertaken by various donors in Central America to address the barriers identified. USAID desires to leverage and contribute to rather than duplicate existing efforts. A review of existing efforts by USAID and other donors demonstrates that there remains a need in developing the local capacity of lenders in the CE sector.

5.1 BARRIERS TO CLEAN ENERGY LENDING

Remaining barriers to CE lending and LEDS include

- **Lack of direct encouragement, involvement, understanding, and commitment of the private commercial lending industry to CE financing.** Many lenders do not understand renewable energy technology, Special Purpose Vehicles,[46] and other innovations for project finance. The staff of many domestic financial institutions interested in beginning CE lending operations generally have not received formal project finance training and often lack experience with complex transactions. Without this understanding, new areas are considered risky and less likely to get funding or funding on competitive terms. Local banks need long-term, on-site assistance in the sourcing and origination of projects, screening of these on their technical merits, and the step-by-step process from analysis and credit decision to disbursement. In-house project finance training based on actual projects is the preferred method to ensure a bank's ability to finance renewable energy projects.[47]
- **Limited credit product options and systems at private banks for marketing and financing of CE.** Without active interest in CE lending, most private banks do not have specific finance products available or dedicated staff for this market. This leads to a lack of transparent procedural and lending requirements and higher transactional costs for project developers.
- **Limited data on CE market size and profitable investment opportunities and data on wind or small hydropower resource**. National assessments have been conducted for wind, solar, geothermal, and bioenergy in Central America, but many have not been comprehensive. After key resources zones are identified through country-wide assessments,

[46] A Special Purpose Vehicle is a legal entity created to fulfil narrow, specific or temporary objectives. They are typically used by companies to isolate the firm from financial risk.

[47] Project finance is the long-term financing of infrastructure projects based on projected cash flows from the project rather than assets of its equity investors, also called "project sponsors". Debt and equity are repaid from cash flows, with the project's assets as collateral. Project finance is a form of "off balance sheet finance" as it does not show up on the sponsors' balance sheets.

site-specific assessments and feasibility studies are still needed. In some cases, public utilities possess detailed resource assessments for various renewable resources, but these are not made available to other energy developers. The desirable restructuring processes undertaken in several markets altered the perceived interests of major actors, limiting their willingness to share information about potential projects.

- **Public-private partnerships for scoping renewable resource potential can bolster joint development efforts such as tendering of renewable electricity capacity.** The amount and quality of information available about renewable energy resources in the region are uneven, geographically and across sectors.
- **Lack of capacity for developing integrated technical solutions.** Energy sector regulator and utility development of renewable energy assets requires assessment of integrated solutions. Hydro, solar, and wind power require careful planning to ensure that baseload demand are met and overproduction is avoided. For large-scale, grid-connected renewables, regulators and grid operators should consider integration within countries and the potential for trade across countries. It is also important to continue to integrate renewable energy and energy efficiency efforts. Utilities need to consider how different intermittent renewables can complement each other and non-renewables.
- **Time-consuming procedures.** The streamlining of procedures is often complicated by a lack of capacity in lead institutions as well as the involvement of multiple agencies. In addition to reducing the overall stages for project permitting, a "one-window stop" for project developers can be a useful approach for making project approval less time-consuming and less costly.
- **Insufficient regulatory frameworks to promote the introduction of renewable energy sources that require relatively high initial investment costs**. Feed-in tariffs and quota obligations—policies responsible for the majority of installed capacity around the world—are largely lacking in the region. While most Central American countries have one or two of these policies in place, in most cases these measures are either underdeveloped or not fully implemented. One critical element that is missing in today's regulatory framework is the absence of significant economic incentives for the production of electricity from renewable resources. The measures adopted have tended to feature fiscal incentives such as tax and import-duty exemptions, as opposed to the feed-in tariff arrangements favored in many European countries or the portfolio standards typically adopted in the United States, and these incentives have been insufficient. Policymakers should seek advice on international best practices when developing and reforming renewable energy policies.
- **Inadequate capacity in research, public awareness, and the private sector.** Capacity-building efforts are needed to expand research, education, and training of renewable energy professionals, identified as a critical gap by CNE/JICA (2012). Public awareness campaigns are also essential to educate Central Americans about renewable options and to strengthen political support for a regional energy transition. In the private sector, greater awareness of renewable energy potentials, technologies, and incentives is needed on the part of energy developers and investors. The capacity of banks to understand the value proposition of different renewable energy technologies needs to be improved; at the same time, renewable energy developers should have greater understanding of the information that banks need to approve a loan.
- **Legal and financial frameworks that may be inadequate to accomplish CE targets.** El Salvador, Guatemala, and Honduras have adopted national and regional CE targets, yet it remains unclear whether the existing legal and financial frameworks are adequate to achieve them. To track progress toward these targets, qualitative and rigorous monitoring and evaluation should be conducted on an annual basis.
- **Small market size.** The limited size of the national power sectors of the seven countries is an important constraint. While clearly this is true in numerous sectors throughout the region and not just in renewable energy, this problem does tend to accentuate the challenges facing

renewable energy projects on the basis of their cost relative to other generation technologies. The challenge of small market size is also well understood, and increasing the size of the regional market is an important element of the rationale behind the integration of a regional market.

- **Electricity markets designed for fossil fuels**. In many countries the electricity markets were developed during a period when only fossil fuels were available and thus are designed for fossil fuels. For example, in Guatemala, the electricity services sold on the wholesale market *(mercado mayorista)* are power and capacity. Intermittent resources such as wind would not receive a capacity payment under the current system, while energy is priced at short-run marginal cost. Hence, in the absence of any specific pricing arrangements for wind power, wind cannot compete economically with other resources. There is also evidence that generators in the country with conventional facilities are lobbying to open future tenders, such as one that has been announced for the purchase of 700 MW of renewable energy generation, to the participation of conventional technologies.
- **Inadequate planning and support and legal framework for geothermal energy.** Like most countries in the region, Guatemala has considerable geothermal potential. However, this resource has been underutilized in the country because of a combination of legal and administrative problems that compound the intrinsic financial challenges associated with development geothermal resources. Indigenous communities often live in areas with geothermal potential in Guatemala. Under the Constitution, the central government owns subsurface resources. However, the risk of potential conflict over land property slows the pace of development because INDE must take the lead in securing land in resource-rich areas (USAID, 2010).

5.2 DONOR ACTIVITY

The European Union and the Governments of Finland and Austria have funded a regional Energy and Environment Partnership with Central America. Since its creation in 2002, this partnership has invested nearly €14 million (US$ 18 million) in 284 projects, mostly small-scale and community organization led (Dolezal, et al., 2013).

ARECA is a joint program funded through BCIE, UNDP, and the Global Environment Facility that supports renewable energy investment through a series of market studies, guidelines, and other tools. ARECA has established a Program of Partial Loan Guarantees for projects under 10 MW, which reinforces guarantee coverage from BCIE's intermediary financial institutions, the local banks that disburse the loans to project developers. By early 2013, the program had supported the development of ten projects, totaling 38.7 MW, and identified 30 potential projects to be included in its partial loan guarantee program for 2013–14. Further efforts are needed to communicate how many loan guarantees have been made through this program, at what amounts, and their success rates (Dolezal, et al., 2013).

USAID has been providing important assistance in the region in the areas of energy and low-emission development strategies. The U.S. Government has supported renewable energy development in Central America, including through Private Financing Advisory Network (PFAN), the Regional Clean Energy Investment Initiative (RCEII) and the Regional Clean Energy Initiative (RCEI).

An important barrier to local lending in Central America for renewable energy is the lack of information and knowledge. First, small power plant developers often lack the capacity to present bankable proposals to financial institutions and bank officials may lack the technical knowledge to assess the value proposition and risks. PFAN, begun in 2008, is a multilateral, public-private partnership initiated by the Climate Technology Initiative (CTI), in cooperation with the Expert Group on Technology Transfer of the United Nations Framework Convention on Climate Change. PFAN bridges the gap between

investors and CE businesses. This network assists developers with mentoring and deal facilitation to develop investment ready-projects. It then connects these developers with investors one-on-one and at special investment forums. CTI-PFAN has helped dozens of projects to raise capital, resulting in over $500 million of investments globally. In addition, regional operations such as ARECA and GIZ's 4E program are attempting to fill this gap.

In March 2012, USAID launched RCEI to build on PFAN's experience, expanding coverage in Central America. In fact, as part of RCEII in Central America, USAID co-financed the Central American Forum for Clean Energy Financing (CAFCEF) in October of 2014, in Antigua, Guatemala. By bringing together CE project developers and financial sector representatives, CAFCEF aimed to fill the so-called "missing middle" between promising CE projects and the debt and/or equity capital financing needed.

RCEI has been helping Central American countries to improve the enabling environment for CE development and to reduce energy consumption through energy efficiency measures in the region. RCEI is a two-year base program with three option years that end in 2016. The purpose is to improve the investment climate for CE development by

- Harmonizing regional regulatory and trade policy to optimize the use of the SIEPAC [*Sistema de Interconexión Eléctrica de los Países de América Central*/Central American Electrical Interconnection System], mainly by strengthening procurement processes.
- Designing and promoting financial incentives for energy efficiency investments and training industry groups, government officials, and other stakeholders on energy efficiency.

In addition, the Development Credit Authority (DCA) has an agreement with Citibank in Central America to reduce the risk of lending for CE projects.

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is implementing a Renewable Energies and Energy Efficiency in Central America program. Its objective is to improve the investment climate and the institutional and human resources prerequisites for the promotion of renewable energies and energy efficiency, and for climate protection measures. The program is active in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. It strengthens regional organizations and platforms, in particular SICA, and promotes regional exchanges to improve conditions for renewable energies and energy efficiency measures. In cooperation with the private sector, the program helps increase the number of renewable energy and energy efficiency projects in the region. It also develops education courses and dialogue processes for decision makers and managers from ministries and public administration.[48]

The Inter-American Development Bank has provided important technical assistance and financing to El Salvador, Guatemala, and Honduras. In October of 2014, IADB's project database showed eight projects in preparation or implementation phases in the three countries (Table 19).

[48] http://www.energias4e.com/elprograma.php

Table 19. IADB Projects in El Salvador, Guatemala, and Honduras, in Preparation or Implementation

Name	Description	Status	Amount (US$ million)
El Salvador			
ES-L1059: Programmatic Support to the Agenda of Structural Reforms in Electric Energy	The program consists of two components supporting policy and institutional measurements. The components are (1) macroeconomic stability, improvement and consolidation of institutional framework; and (2) promotion of renewable energy, bioenergy and energy efficiency, and improvement of the regulatory directives and private sector participation.	Completed	100
ES-M1031: Access to Alternative Energy and Water Products through Credit and Distribution	This project is to improve access to water and energy of low-income households and small businesses in mostly rural communities by adapting and expanding an innovative supply chain and credit model. A new package of competitively priced and certified water and energy products is to be developed and distributed to the target population through retail outlets. Households can purchase solar energy and/or water purification systems to be installed and maintained by a certified technician. Credit for purchasingf these products is to be provided through microfinance institutions, adapted to the needs, preferences, and economic capabilities of the consumers..	Implementation	0.99
ES-X1004: Geothermal Regional Training Support Program	This project is strengthening a regional geothermal training program in El Salvador that can be a sustainable center for geothermal training in Latin America and the Caribbean.	Implementation	1.25
Guatemala			
GU-L1084: Multiphase Rural Electrification Program Phase II	The project supports (1) connection projects to the electric grid including the execution of infrastructure works associated with transmission and distribution; (2) the promotion and development of electrification projects in isolated systems; (3) initiatives on energy efficiency targeted to public lighting; and (4) institutional support to promote efficient use of rural electrification.	Preparation	55
GU-L1080: Supporting Low-Carbon Fuels in	IADB financing is proposed for the development of up to 10,000 ha of jatropha	Preparation	30.6

Name	Description	Status	Amount (US$ million)
Guatemala: Jatropha Oil and Biomass Production	plantations, and operation of a jatropha pure plant oil extraction facility. The project is expected to produce 147,000 barrels of oil and 640,000 metric tons of biomass per year in the dry corridor of Guatemala.		
Honduras			
HO-L1102: Canaveral-Rio Lindo Hydropower Complex Rehabilitation Project	The objective of the project is to recover and conserve the power generation capacity from renewable energies, contributing to energy security, through the improvement of the efficiency and the extension of the lifespan of the power generation and transmission infrastructure. The project has two components: (1) power generation and transmission rehabilitation and (2) strengthening of the ENEE's business development unit.	Preparation	30
HO-L1099: Corporacion Industrial del Norte, SA (Corinsa) Self-Supply Solar	Corinsa, is a Honduran beverage company that bottles and distributes soft drinks and water. The proposed project would generate zero-emission electricity for self-consumption through photovoltaic solar panels on the roofs of Corinsa's buildings. The loan may also incorporate energy efficiency upgrades to the plant. The estimated cost of the solar project is at US$ 7.5 million, while other energy efficiency measures may amount to another US$ 2.5 million	Preparation	7.50
HO-T1178: Strengthening the Renewable Energy Policy and Regulatory Framework (SREP) for Honduras Comp I	The Program on Scaling-Up Renewable Energy in Low-Income Countries is developing an investment plan for Honduras including an assessment of energy policy and the institutional framework. It is to include support for meetings and technical workshops; aconsensus-building activities, studies, technical guides, training, and materials for a long-term energy policy and low carbon development strategy, legislation, tariffs and standards for renewable energy;;and institutional strengthening capacity development.	Implementation	0.85

Source: International Asian Development Bank, Project Detail pages, www.iadb.org.,Accessed October 10, 2014.

MEM's website listed two additional IADB-supported projects in Guatemala. The Environmental and Social Management and Private Sector Participation Program for the Development of Renewable Energy Sources in Guatemala has a US$ 0.5 million budget. It aims to support the preparation of Strategic Environmental and Social Assessments of hydropower projects, support for policy development, and support to MEM's Geographic Information System and Communication and Dissemination Strategy. The US$ 0.5 million Biofuels Action Plan consists of the development of studies to support decision making for the development of a national biofuel production and consumption program.[49]

In October 2014, the World Bank's project database lists only two projects in Honduras and no projects in either Guatemala or El Salvador (Table 20).

The Japanese International Cooperation Agency finances the Promotion of Productive Activities with the Use of Clean Energies in Northern Villages project. JICA provided a US$ 11 million grant to Guatemala to increase incomes of more than 1,000 households through the construction of micro-hydroelectric plants and distribution systems in high-poverty regions of the Alta Verapaz municipality.[50]

[49] http://www.mem.gob.gt/viceministerio-del-area-energetica-2/proyectos/

[50] http://www.mem.gob.gt/viceministerio-del-area-energetica-2/proyectos/

Table 20. World Bank Active Projects in Honduras

Name	Description	Status	Amount
Power Sector Efficiency Enhancement Project	The objective is to improve ENEE's operational and financial performance , for contributing to the sustainability of power production and distribution.	Active	42.3
La Esperanza Hydroelectric Project	The objective is to support a small, 12MW hydroelectric project in La Esperanza through purchasing GHG emission reductions. There are two components to the project, the first component being delivery of carbon emission reductions as a byproduct of electricity generation. La Esperanza is expected to reduce annual GHG emissions by 39,000 tCO_2 equivalent. The Community Development Carbon Fund (CDCF) will purchase a total of 310,000 tCO_2 emission reductions at ae price of US$ 4.50. The minimum annual delivery will be 30,000 tCO_2 per year, but CDCF will purchase all annual emissios reductions up to a cumulative total of 310,000 tCO_2. The total payment for the reduced emissions will be US$ 1.4 million. This total does not include recovery of project preparation expenses such as those related to the baseline establishment, validation, monitoring, verification, and certification. These will be deducted annually up to the cumulative maximum of US$ 125,000. The second component is the delivery of environmental and social community benefits. The payments for the emission reductions are directly linked to the sponsor's meeting the conditions set in the community development plan. These include: (1) full-time employment of at least 70 permanent residents of La Esperanza and surrounding communities during the construction phase; and (2) full-time employment of at least 20 permanent residents of La Esperanza and surrounding communities during plant operation (through December 31, 2012).	Active	1.4

Source: International Asian Development Bank, Project Detail pages, www.iadb.org.,Accessed October 10, 2014.

6. INITIAL NEEDS ASSESSMENT ISSUES

The purpose of the desktop study is to provide a review of publicly available information on the capacity of local financial institutions in Central America for and barriers to scaling up of CE lending. In addition, the report provides background information on the enabling environments and LEDS planning that supports CE lending. It also covers the potential for various forms of renewable energy, projects in the pipeline, and the current sources of financing. With a review of barriers to CE lending and current activities by donors we provide some ideas for potential additional support that contribute to the mobilization of finance without duplicating other efforts.

There is information we were not able to find and thus intend to gather through direct conversations with local financial institutions, project developers, and government officials. This information includes the status of modeling capabilities for LEDS programming, gender impacts on utility scale energy, and what local financial institutions, developers, and government officials perceive as the primary barriers to CE financing. After the interviews with local financial institutions and other stakeholders we will have a fuller understanding of the key barriers to CE lending and the work being done by other donors. We are eager to get their perceptions of the assistance that would be most beneficial to them and incorporate them into our analysis and recommendations.

Our investigation of the policy environment in El Salvador, Guatemala, and Honduras showed that a great deal of effort has gone in to improving the enabling environment, with the possible of energy efficiency. In each country there is legislation to promote energy efficiency written but not yet passed.

These three countries also have tremendous renewable energy resources and unexploited potential. There are energy efficiency measures with negative costs. Central America's energy intensity, however, has fallen less than the global average.

Between the improvements in the enabling environment and the large renewable energy potential it is unsurprising that investment in renewable energy investment has been significant. In examining the project pipeline tracked by BNEF we have determined that there are many large scale renewable energy projects being funded. BNEF tracks large investments that meet a size threshold of at least 1 MW or US$ 1million. The vast majority of the lending involved is arranged by international or regional development banks with the exception of Banco de Desarrollo de El Salvador, a public sector bank that offers a specific credit line for renewable energy; Banco Lafise Honduras, which offers financial services in the Central American and Caribbean region; and Banco Financiera Comercial Hondurena, offering corporate and consumer banking products.

Based on the findings of this desktop study, we have identified the following areas that require further investigation during the in-country Needs Assessment.

- Solicit input from senior and operational managers at local financial institutions on the perceived advantages, risks, and opportunities associated with CE lending and their needs;
- Determine the FIs' lending requirements (loan size, sectors, maximum of minimum lending criteria), lending processes, and credit product development path(s);
- Assess existing successful and identify potential financial instruments that would scale-up and/or reduce perceived risks of CE lending;

- Analyze the perceived attitudes towards CE lending of the FIs about the current enabling environments and explore recommendations for removal of any barriers;
- Inquire about interest in lending to the geothermal sector;
- Determine the short versus long-term capitalization requirements, debt securitization, available loan guarantees, participation with other FIs (impact investors, micro-financing institutions, development banks) that help mitigate lending risks;
- Perform a cursory market diagnostic of the capability of local financial institutions on CE lending; based on an existing bank-capacity CE lending survey tool developed by Enclude Solutions, Ltd.;
- Analyze and incorporate into interviews involvement of vulnerable populations (indigenous people, women) financial institution outreach and CE lending programs; and,
- Interview national, regional, and international development bank representatives and representatives of other actual or potential CE lenders to determine their current or planned involvement in the market and with commercial lending institutions.
- Discuss with USAID, host country governments, CE trade associations, project developers and other CE market actors the current incentives and disincentives for increasing CE lending by the commercial sectors;
- Identify current and planned use of modeling for CE and LEDS planning at the national levels;
- Solicit recommendations for linking LEDS planning to CE financing from policy makers and financiers to ensure compatibility of market signals with national climate change goals; and,
- Analyze the roles for vulnerable populations and women in local and national planning initiatives and CE project development.

At the conclusion of the Needs Assessment, the CEADIR team will present options for technical assistance in the form of knowledge dissemination, networking, and training to build capacity of financial institutions for the purpose of facilitating the mobilization of private and public investment in CE in Central America to reduce GHG emissions.

6.1 POTENTIAL INTERVENTIONS

Based on a review of the remaining barriers to CE investment and the activities underway by USAID and other donors, we have developed preliminary ideas of potential interventions to assist in mobilizing financing for CE activities to reduce GHG emissions and promote economic growth. These are initial concepts to be explored with the mission and local stakeholders.

Potential interventions for CE financing and LEDS include:

- **Direct, hands-on, embedded capacity development for commercial lenders.** Embedded capacity, or technical assistance that is co-located with the commercial lenders and exclusively dedicated to this area, allows "learning-by-doing" and allows the banks to understand market opportunities, credit development needs of the CE markets, and how to properly evaluate projects. Although this form of assistance is more expensive than training sessions, it ensures that the assistance is available exactly when needed and increases confidence by lenders in their analysis.

- **Capacity development tailored to commercial and potentially national development banks' and project developers' needs to mobilize lending to this emerging CE market.**

- **Information dissemination of CE market assessments to build a publicly available, internet accessible repository of existing CE markets, including resource assessments**.
- **Support of development of standardized Purchase Power Agreements (PPAs)** to increase transparency and decrease transaction time and cost for all parties.
- **Internal market diagnostics of selected DCA approved financial institutions and other interested lenders to assess capabilities and develop products for CE lending.**
- **Roll out the USAID Clean Energy Lending Toolkit to interested lending institutions.**
- **Development of a CE investor guide with project, financial lender, and bankable policy needs toolbox.**
- **Facilitate training for integrated technical solutions, electric power modeling, economic analysis, and LEDS preparation.**
- **Identification of** good practices and assessments of tools such as quotas and feed-in tariffs.
- **Increase bank access to USAID/DCA guarantees** as well as long-term financing to increase their capacity to support CE project development**.**
- **Support the establishment of M&E frameworks**. Mexico's Special Program on Climate Change developed an online system to track approximately 300 climate change mitigation and adaptation goals. Establishment of a monitoring framework could help other countries learn whether they are on target to meet their goals, and whether approaches should be replicated.

In terms of mobilizing finance for CE, there are three key areas of concern. First, it is unclear when the legislation promoting energy efficiency will be passed and how the financial markets will respond to the opportunity. Energy efficiency is typically an area of missed opportunities. Second, the financing is largely taking place without the participation of local banks, reducing the local benefits of CE investments and displaying a dependence on external development institutions rather than an integrated, competitive private market. Finally, it is unclear whether the increased investment in CE will be sufficient to meet the projected increases in energy demand without continued effort by external donors, or whether these countries will turn to fossil fuels for new capacity, increasing GHG emissions. Fortunately, there is

USAID Clean Energy Lending Toolkit Case Study

Under the USAID Analysis and Investment for Low-Emission Growth (AILEG) project, Enclude Solutions and Abt Associates prepared a Clean Energy Lending Toolkit that provides guidance to banks to loan to businesses seeking to modify their existing energy matrix and move toward clean, renewable, viable, and efficient technologies. While clean energy loans can be a profitable specialized financing area, financial institutions may need support in assessing the profitability of clean energy opportunities in their service territories and developing the internal systems, credit products, and resources needed to prudently serve this new market.

USAID launched the pilot-testing of the Clean Energy Lending Toolkit to its partner Liberian banks under the USAID Development Credit Authority (DCA). With the International Bank of Liberia and Ecobank participating, USAID/Liberia and Enclude/Abt worked to support the pilot testing of the Toolkit in Liberia, as well as to conduct a formal CE lending workshop and renewable energy pipeline analysis for the banks in March/April 2014. The pilot test found strong interest in continuing training and application in Liberia as well as developing CE loan products and a pipeline of loans.

donor activity in each of these activities. An exception is in providing hands-on, direct technical assistance and capacity development to local financial institutions.

6.2 INITIAL LIST OF ORGANIZATIONS TO MEET WITH DURING THE NEEDS ASSESSMENT

This section includes an initial list of organizations we hope to meet with during the Needs Assessment. Additional local banks, institutions of higher education, and civil society groups will be identified when the Needs Assessment trip is approved.

<u>El Salvador</u>

Banco de Desarrollo del El Salvador, national development bank

Consejo Nacional de Energía, energy regulator

Alianza en Energía y Ambiente con Centroamérica, organization to promote sustainable energy and technology

Asociación Salvadoreña de Energías Renovables, association of renewable energy generators and developers

UDP Neoen-Almaval, renewable energy developer

UDP Proyecto La Trinidad, renewable energy developer

<u>Guatemala</u>

Asociación de Combustibles Renovables, association for biomass developers

Asociación de Generadores con Energía Renovables, association for renewable enegy producers

Banco Centroamericano de Integración Económica, regional development bank

Inversiones Atenas, hydroelectric developer

Republica de Guatemala Ministerio de Energia y Minas, the ministry of energy and mines

<u>Honduras</u>

Banco Nacional de Desarrollo Agrícola, national development bank

Banco Atlántida, bank engaged in mid-scale renewable energy lending

Asociación Hondureña de Productores de Energía Renovable, association of renewable energy developers

Soluz, PV installer

Banco Financiera Comercial Hondurena, lead debt arranger for small hydro plant

Empresa Nacional de Energia Electrica, state owned commercial power company

Grupo Terra, family controlled company with three renewable energy projects permitted or in under construction

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