

Renewable Energy and Energy Efficiency Partnership,
Latin American Regional Meeting, August 2003

BACKGROUND PAPER

**RENEWABLE ENERGY AND ENERGY EFFICIENCY (REEES)
IN CENTRAL AMERICA**

PREPARED BY: DR. OSCAR COTO-CHINCHILLA, EMA S.A.¹

I. INTRODUCTION

Central American energy scenarios has been changing in the recent years due to rapid transformations on the structure of energy markets and their structures . At the same time, a sizeable fraction of the population continues without access to rural energy services. The purpose of this paper is to provide an overview on basic information on key policies, regulatory and financing issues, and opportunities for the Renewable Energy and Energy Efficiency Systems (REES) in the region.

II. STATUS OF ENERGY SECTOR STRUCTURE AND REGULATION

Overview of Regional Needs and Development Challenges

Central American countries underwent profound political changes during the 1990's with the end of the armed conflict and the introduction of fair and free election of democratic leaders. However, these political changes were not accompanied by the necessary economic and social transformations, and Central America continues to be among the hemisphere's poorest region. While economic performance varies between countries, the level and quality of social investment and annual rates of growth fall significantly short of requirements for improving living condition of the poorest within the region. Better regulations and expansion of the increasingly "regional" financial sector, and greater efficiency of the economy seem to become essential for the region to attempt to seize new trading opportunities.

Given the similarities in development needs and inter-dependence of the economies of the region, countries have increasingly looked at different levels of integration, which could lead to, for example, preferred negotiations on trade agreements.

Some of the most important issues for regional development, in the short to medium term, are:

- Promotion of more responsive and transparent governance at all levels;
- Expansion, integration, and openness of the economy to reduce poverty;
- Improve access to health, education, and infrastructure, and;
- Reduction of environmental vulnerabilities.

¹ EMA S.A. Energia, Medio Ambiente y Desarrollo S.A. The author can be contacted at ocoto@amnet.co.cr

The Central American Energy Scenario

Of the 36 million inhabitants of Central America, around 12 million people do not have access to modern energy services. The population is likely to double in the next 15-18 years, to 70 million inhabitants.

A study published in 2002 by the International Energy Agency² provides information on the relative share of renewable energies in the Total Primary Energy Supply (TPES) in the Central American region, indicated that:

- The share of renewable energies in TPES including all renewables (hydro, geothermal-wind-solar, and biomass) ranges from as low as 5.4% in El Salvador, to more than 50% in Guatemala, Honduras and Nicaragua. El Salvador is an example of a country endowed with a restrictive base of available natural resources especially fuel wood due to its size and environmental degradation. Other countries have a large base of biomass consumption for cooking in rural areas. The share of renewable energies in TPES including all renewables range from about 28% in Panama to 42.4% in Costa Rica.
- The share of renewable energies in TPES including only hydro and geothermal-wind-solar components of renewable energies (i.e. not including biomass) varies across the region. In Costa Rica, that share of about 31.2% means a more significant presence of hydro and geothermal-wind in the TPES. In comparison countries like El Salvador, Guatemala, Honduras, Nicaragua and Panama are in the range from 2.6% to 10.6%, fact that reinforces the relative weight of biomass in the energy balance.

Total electricity consumption in the region in 2001 reached around the 28,000 GWh, of which around 48.9 % was hydroelectric, 8 % geothermal, 42.4 % was fossil fuel based thermal generation and the remaining 0.7 % was either wind or biomass sugar cogeneration.

The region's installed capacity for electricity production in 2001 was 7,399.2 MW, of which 50.3 % was private sector investment and 51.1% was installed power capacity based on renewable energy resources.

In 2001, the structure of electricity generation differed from country-to-country. Costa Rica is the country with the largest share of renewable energy generation with a 98.4 % of total generation, followed by El Salvador with 53.1 %, Panama with 48.6 %, Honduras with 48.0 %, Guatemala with 42.5 % and Nicaragua with 16.5 %.

Demand continues to grow by 5-6% annually. It is expected that by 2014, energy consumption will be 2.75 times the level of electricity consumption in 2001, to a total forecasted demand of about 77,000 GWh.

Central America needs to add about 2000 MW of new capacity by 2005. It is expected that nearly a 62% of that capacity is going to be fossil fuel based (according to current expansion plans as well as investment trends in the industry within the region), with the remaining 780 MW expected to be

² International Energy Agency (IEA), Renewables in Energy Supply: an IEA Fact Sheet. November 2002, available at www.iea.org

renewable (mostly hydro and geothermal). In the long run, for the period 2006-2014, it is estimated that capacity additions of 5000-5700 MW will be needed. Different simulation models, developed by the Central American Electrification Council (CEAC), using different types of assumptions related to technologies, demand growth and degree of regional market integration, call for a participation of renewable energy resources of 50-63% (that is a potential capacity addition in the order of 2,500-3,500 MW), implying that annual investments in renewable energy projects should at least be in the order of 300-350 MW within the region, compared to a current trend of about 160 MW per year.

Structural and Regulatory Frameworks

The electricity sector in Central America is coming out of a transitional period that started in the 90s, characterized by a series of reforms of first and second generation, including private sector participation in generation, through the signing of Power Purchase Agreements with private sector energy producers; and the implementation of Wholesale Electricity Markets (WEM) in Guatemala, Nicaragua, El Salvador and Panama. Only Costa Rica, and Honduras have not implemented this kind of open market arrangements, or reform processes.

Energy policy frameworks are beginning to be inclusive of the necessary sustainability blueprints required to define and use policy instruments. Several lessons learned are clear to energy policy makers in the region:

- Inequalities related to access to energy service provision in rural areas and persistence in the use of traditional biomass fuels and their associated sustainability.
- Current technology choice paths and trends for investment in generation in reformed markets in favor of thermal/fossil fuel based generation.
- Presence of pervasive threats to the sustainability of the reform processes, especially in emerging regulatory institutions in the energy markets.
- Environmental aspects and vulnerability associated with large dam development and fossil fuel generation emissions.

There is a wide variety of institutional and market arrangements in the sector across the region. There are around 223 agents/players in the electricity sector/markets in the region, although there are large differences in terms of participation country by country. Guatemala has the largest number of agents in the Wholesale Electricity Market (WEM), 70. Nicaragua has 12 agents in the WEM, the lowest. On the other hand, Costa Rica, a country that does not have a WEM, but rather a vertically integrated utility, has a large number of Independent Power Producers (all renewable energy IPPs) that became stakeholders in the sector. Most of the electricity markets in the region continue to be medium to highly concentrated, meaning that the power in the market/sector is in the hands of a relatively small number of players, concentrating market power in a relatively small number of players, thus becoming a threat to the sustainability of the reform processes.

The region is currently implementing a series of electricity interconnection activities aimed at increasing the capacity of power transactions by the launch of a 300 MW capacity high voltage line (SIEPAC Project) that should be operational by 2006-2007. At the same time, steps and studies to define regulatory and market aspects, as well as the signing of a treaty between countries, become part of the on-going activities for the establishment of a proposed Central American Regional Electricity Market, that is expected to be fully operational by 2010.

III. REES POTENTIALS AND EXISTING POLICY IN SUPPORT OF REES

The Central American region has been endowed with a broad base of renewable energy resources. Estimates on potential availability of resources include:

1. Large and medium size hydro electric resources represent a potential in the range up to 20,000 MW. The current use is small, with an installed capacity of about 3,000 MW. Small hydro resources, although their inventories, not yet completely mapped, have a large potential for participation (for example, Costa Rica brought about 200 MW of small scale hydro resources in projects with less than 20 MW capacity in the 1994-1998 period).
2. Wind resources are typically associated with tropical wind regime bands. Current information available indicates that there are 66 MW operating in Costa Rica and identified project investment and resource assessments at this time³ indicate 410 MW of projects are at some stage of project development. Potential areas already mapped include Costa Rica, Nicaragua and Panama, although other countries are beginning to conduct resource assessments.
3. Solar energy in the region has being tracked for many years especially in relation to global radiation levels at the horizontal level, as part of meteorological monitoring. Readily available conversion of that data for use of solar applications is not necessarily available in the form of maps, etc. The resource availability is suitable for many applications of solar energy both photovoltaic and thermal. Estimates of the current photovoltaic market⁴ indicate that about 300-400 KW_p are installed every year in the region. The potential for growth is very large due to the large percentage of the population with no access to energy services, especially in rural areas.
4. Geothermal resources currently produced are estimated to be about 400 MW of electricity. The potential for several geothermal fields in the Central America is estimated to be around 3000-5000 MW. Very few applications of geothermal energy for thermal load supply have been developed, with the exception of Guatemala Resource assessments are available on the geological prospects of several volcanic areas in the region.
5. Biomass resource assessment are not available in the region. Information is available on the different biomass participation at the national energy balance level. Short term potential of capacity additions range in the order of 100-300 MW, mostly coming from agricultural processing industries interested in exporting surplus electricity to the grid.
6. Very little work has being carried out in support of assessing at the regional level the potential for energy conservation, although there is work in promotion of energy efficiency policies such as labeling, and reduction of import tariffs for equipment. Honduras has carried out an inventory of energy efficiency projects, and Costa Rica, amongst others has an energy efficiency unit both at the ministerial level as well as within the cambers of industry.

³ FOCER. Manuales sobre Energia Renovable: Eolica. Published by UNDP, GEF-BUN-CA, September 2002

⁴ Coto, O. Valoración del Mercado de Sistemas Solares Fotovoltaicos en Centro America. Published by REPSO-Central America, Fundación Solar. Guatemala, Noviembre 2001.

Existing policy frameworks in support of REES include:

Guatemala: Wholesale electricity market operating. Legal framework does not address REES explicitly although policy statements are inclusive of REES. There is proposed legislation for provision of fiscal incentives, a proposal by the current administration for the establishment of a fund for risk mitigation of RE projects, on going support for the establishment of a Center for Promotion of REES, and studies for the establishment of rural micro hydro enterprise development funds. There is an operational trust fund created after the privatization of distribution supporting rural electrification, but not inclusive of rural energy service provision using RE

Honduras: vertically integrated state utility, with private power producers selling energy to the grid, state owned utility unable to invest on new capacity. There is an existing decree in support of RE, providing fiscal incentives; tax exemptions as well as recognizing a 10% premium over short-term marginal cost per KWh, to RE projects of less than 50 MW. There is a proposal for the establishment of a rural electrification fund.

El Salvador: Wholesale electricity market operating. No specific frameworks in place for REES support, although policy statements are inclusive of REES. On going discussions and preparation of a national project for rural energy provision with RE, as well as energy efficiency.

Nicaragua: Wholesale electricity market operating. Rural energy policy statements as well as organization of rural electrification schemes are inclusive of RE. There is a presidential decree supporting a 5 % market penetration rate of RE technologies (specially run of river and wind), by indicating that the distribution companies have to buy that power production

Panama: Wholesale electricity market operating. Policy statements in support of RE. Legal framework recognizes a 5 % premium over market price for RE projects negotiating in the WEM. Current policy work aimed at removing entry barriers for RE projects, including a portfolio standard for small scale capacity additions.

Costa Rica: State owned utility, with RE private sector power producers allowed controlled participation of up to 15 % of the system's capacity in renewable energy projects of less than 20 MW and another 15 % of the system's capacity for private/public schemes selling to government power bids. Policy directives are clear on the role of RE in energy provision, although the issue of scale is not consistent. Project under formulation for rural energy service provision based on RE. Specific legislation approved on energy efficiency for industrial and large consumers. On going discussion of an Energy Plan inclusive of specific policy objectives for REES.

IV. CURRENT BARRIERS TO DEVELOPMENT

Several barriers have been identified for the development of REES in the Central American region:

Policy: Lack of integrated policy frameworks and blueprints, linking energy and sustainability, continue to hinder policy makers from making more explicit the forward and backward linkages that relate REES with overall energy sector policy, in response to goals on rational use of resources, diversification of energy matrixes, use of renewable resources and integration; as well as appropriate consideration of the rural and gender dimensions of the energy problem. Recent developments with respect to the development of more comprehensive energy policy statements and energy sector plans in most of the countries create the space for more appropriate inclusion of REES at the policy level.

Regulatory and Market Entry: Existing and emerging electricity market regulations are creating restrictions for the deployment of REES. This relates to a wide range of perceived barriers ranging from minimum power requirements for participation in energy markets, complexities on procedures and permits required for market participation, etc. Perceived non-convergence of regulatory practices across countries, in relation to market operation, may preclude REES from participation in the emerging regional electricity market in the medium term. The creation of a regional association of regulatory agencies , as well as the development of the local renewable energy power producers associations in most of the countries, creates the opportunity to work on the inclusion of REES considerations in the regulatory framework of the market.

Financial Access: Limited access to innovative financing mechanisms supporting REES. The financial barriers are especially present in the development of very small RE projects, of the rural village level energy service level, and small energy infrastructures that have almost no resources available to finance the relative high initial cost of RE technologies. In some cases, access to credit capacity to finance start ups of small renewable energy business ventures, as well as business development activities is a major burden for small developers willing to take risks in providing commercial technologies/ or energy services in rural areas.

Stakeholder Participation: Limited development of stakeholders networks preclude the active integrated effort of REES development. Network development, interpreted as the collaborative work of different types of stakeholders is critical for supporting the development of REES in the region. Fostering of networks in four important areas such as: regulations, knowledge bases/ technological support, social organizational development, and trade/business development; is critical in the short to medium term to assist capacity building in support of REES. Current network integration is being supported in the region in areas such as policy making and trade and business development, but there is scope for increasing the network capacities to strength linkages amongst stakeholders. The ground work established by GEF undertakings as well as other agencies in the region create the opportunity to foster policy incidence capacity as well as the development of interventions that can serve the purpose of continue the sthrengthening of active stakeholders.

V. PRIORITIES FOR ACTION

REES can play a very significant role in the changing and demanding energy markets in the Central American region. Both at the grid connected level as well as in rural energy and basic infrastructure segments, there are ample opportunities to install RE technologies. Energy Efficiency Technologies can also play a pivotal role in assisting the region's economy to make a more rational use of energy carriers.

Priorities to provide catalytic assistance for REES development should focus on:

1. **Supporting the development of sustainable energy policy frameworks**, that can provide clear directives to narrow perceived gaps in the policy making process; and that serve as policy instrument to create forward and backward linkages of REES within the energy sector and to ensure sustainable development within in the region.
2. **Supporting the development and strengthening of existing and new required networks of stakeholders/actors**. The inclusion of clean energy issues as well as renewable energy in the agenda of electric sector regulators, in the short-term, is crucial. In the trade/business sphere of the generation business, there is a need to provide assistance to balance historical dependency of the technology for large scale hydro development as well as recent trends on investment in fossil fuel generation. Inclusion of the discussion of social, gender and environmental benefits of energy sector reforms and rural energy service provision, seems a key objective for the development of social organization and NGO's participation. There is a need to provide support for exchanges and generation of lessons learned on technology transfer issues, especially associated to small scale and rural applications of REES, including the hardware, information needs, human resource development and enterprise models that are proving adequate to increase market penetration of REES.
3. **Strategic support for the development of innovative financing**. Removing barriers related to the design and implementation of "financial facilities" and "clearinghouses", in particular serving the needs of new breeds of entrepreneurs interested in REES is critical, working in small applications; and serving grid connected markets and rural energy service provision is critical in the short term.

The REEEP partnership in the Central American region, if established as a dynamic, flexible and participatory platform should enable a wide range of existing and new to be formed institutions and organizations. Such partnership could provide the tools and strategic support needed to catalize actions and learning processes in support for the common goal of contributing to the formation of sustainable energy paths in the Central American region.

Annexes: Information on the Central American Energy Sector

Table 1. Energy-Economy Indicators for the Central American Countries

Country	Population	Gross Domestic product	Final Energy Consumption	Per Capita GDP	Per Capita Final Energy consumption	Energy Intensity	Electricity Consumption	Per Capita Electricity Consumption	Consumption of Oil products	Per Capita Consumption of Oil Products	Electricity Sector CO ₂ emissions	Total Energy Sector CO ₂ Emissions
Unit	10 ³ inhab	10 ⁶ 1995 US\$	10 ³ Boe	1995 US\$/inhab	Boe/inhab	Boe/10 ³ 1995 US\$	GWh	KWh/inhab	10 ³ Boe	Boe/inhab	10 ³ Tons	10 ³ Tons
Costa Rica	3934	15112	17940	3841	4.6	1.2	6030	1533	11612	3.0	371	5706
El Salvador	6397	11247	21865	1758	3.4	1.9	3753	587	13577	2.1	1438	5883
Guatemala	11687	18115	47343	1550	4.1	2.6	4177	357	22748	1.9	2521	9973
Honduras	6656	4718	21195	709	3.2	4.5	3368	506	11841	1.8	1220	5419
Nicaragua	5205	2554	15177	491	2.9	5.9	1616	310	9056	1.7	1499	3752
Panama	2833	9481	13290	3346	4.7	1.4	3884	1371	16895	6.0	1080	4421
Total	36712	61227	136810				22828		85729		8129	35154

Source: Information extracted from Organización Latinoamericana de Energia, OLADE. Sistema de Información Estadísticas Energéticas, available at www.olade.org



renewable
energy
& energy
efficiency
partnership



Table 2. Share of Renewable Energy in Total Primary Energy Supply in Central America

Country	Share of Renewable Energy in Total Primary Energy Supply considering total renewables (including hydro, geothermal-wind-solar, and combustible renewables and waste)	Share of Renewable Energy in Total Primary Energy Supply (excluding combustible biomass and waste)
	(%)	(%)
Costa Rica	42.4	31.2
El Salvador	5.4	2.6
Guatemala	57.3	2.8
Honduras	50.5	6.5
Nicaragua	56.5	4.9
Panama	28.7	10.6

Source: International Energy Agency. Renewables in Global Energy Supply: an IEA Fact Sheet. November 2002. Available at www.iea.org



renewable
energy
& energy
efficiency
partnership



Table 3. Electric Sector Statistics for the Central American Region

	Unit	Region	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panamá
Installed Capacity	MW	7399.2	1718.9	1191.9	1672.1	921.5	633.2	1261.7
Hydroelectric	MW	3310.4	1255.5	407.4	524.9	435.2	103.4	614.1
Geothermal	MW	409.2	145.0	161.2	33.0	-	70.0	-
Fósil Fuel	MW	3617.4	286.2	623.3	1114.2	486.3	459.8	647.6
Wind	MW	62.3	62.3	-	-	-	-	-
State Owned Capacity	MW	3675.2	1499.5	557.0	622.9	502.4	342.0	151.5
Private sector Owned Capacity	MW	3724.0	219.4	634.9	1049.2	419.1	291.2	1110.2
Max Power Demand	MW	4954.9	1136.9	734.0	1074.6	758.5	411.6	839.3
Gross Electricity Generation	GWh	28399.1	6940.1	4150.8	5758.0	4082.2	2355.4	5143.7
Net Electricity Generation	GWh	28032.9	6895.7	3976.1	5772.2	3959.1	2286.1	5143.7
Hydroelectric	GWh	13714.6	5649.6	1206.0	2264.3	1904.0	189.5	2501.2
Geothermal	GWh	2241.5	952.3	906.9	193.7	-	188.7	-
Fósil Fuel	GWh	11891.3	108.4	1863.2	3314.2	2055.1	1907.9	2642.5
Wind	GWh	185.5	185.5	-	-	-	-	-
State Owned Generated Electricity	GWh	13202.0	5764.2	2065.3	2060.4	1914.0	929.1	468.9
Exports of Electricity	GWh	771.4	240.2	43.8	369.0	0.3	-	118.0
Imports of Electricity	GWh	774.8	0.5	352.8	53.0	308.3	17.3	42.9
Private Sector Generated Electricity	GWh	14830.9	1131.5	1910.7	3711.8	2045.1	1357.0	4674.8
Electricity Sales	GWh	23364.2	6044.1	3613.2	4812.2	3420.7	1554.0	3919.9
Regulated Market	GWh	21842.7	6044.1	3365.8	3666.2	3342.8	1554.0	3869.7
No Regulated Market	GWh	1521.5	-	247.4	1146.0	77.9	-	50.2
Total Income of Electricity Sales	Miles US\$	-	458625.1	403225.8	n.d	280921.5	168879.9	460046.1
Exchange Rate			329.16	8.79	7.87	15.65	13.44	1.00
Total # of customers		5660949	1084516	1128764	1752282	713815	454082	527490
Transmission and Distribution of Losses	%	15.6	9.2	12.6	11.8	19.8	32.5	19.7



renewable
energy
& energy
efficiency
partnership



System Load Factor	%	63.8	66.8	64.3	58.0	64.2	63.9	66.4
Electrification Index	%	-	95.0	77.4	79.9	61.9	46.8	70.0

Source: ECLAC, on the basis of oficial data, preliminary actualizations, published in “Istmo Centroamericano: Estadísticas Subsector Eléctrico, Datos Actualizados Septiembre 2002”. Economic Comisión for Latin America and the Caribbean ECLAC, México November 2002.



Table 4. Installed Capacity in Central America (MW)

	Total	Hydro	Geothermal	Fossil Fuel (Steam)	Fossil Fuel (Diesel)	Fossil Fuel (Gas Turbine)	Coal	Biomass Cogen.	Wind
Region	7399.2	3310.4	409.2	581.6	1388.9	1214.3	142.0	290.6	62.3
Costa Rica	1718.9	1255.5	145.0	-	51.5	222.7	-	12.0	62.3
El Salvador	1191.9	407.4	161.2	-	203.4	383.5	-	36.4	-
Guatemala	1672.1	524.9	33.0	53.0	337.4	381.8	142.0	200.0	-
Honduras	921.5	435.1	-	-	381.1	102.5	-	2.7	-
Nicaragua	633.2	103.4	70.0	157.6	191.6	81.0	-	29.6	-
Panamá	1261.7	614.1	-	371.0	223.8	42.8	-	9.9	-

Source: ECLAC, on the basis of official data, preliminary actualizations, published in “Istmo Centroamericano: Estadísticas Subsector Eléctrico, Datos Actualizados Septiembre 2002”. Economic Comisión for Latin America and the Caribbean ECLAC, México November 2002.

Table 5. Recent Evolution of Power Technologies in Central America (as relative % of growth per period of time)

Period	Total	Hydro	Geothermal	Fossil Fuel (Steam)	Fossil Fuel (Diesel)	Fossil Fuel (Gas Turbine)	Biomass Cogen.	Wind
85-90	1.0	1.0	4.9	-	-2.7	2.9	-	-
90-95	4.8	0.6	7.4	-1.8	21.4	15.5	-	-
95-96	4.1	3.6	2.1	-	12.2	-	34.5	-
96-97	3.5	2.4	2.1	-3.2	11.1	-	61.5	-
97-98	6.1	0.4	22.5	-0.8	32.4	0.4	21.1	40.9
98-99	10.2	2.3	21.3	-5.7	26.9	7.6	-	82.6
99-00	10.4	8.7	11.2	12.2	12.7	13.7	7.7	-
00-01	2.0	-0.1	1.0	20.8	2.0	-7.0	41.6	46.6

Note: Coal does not appear in the table since there is only one plant, therefore there is no relative % of growth.. Numbers indicate percentage changes in the capacity additions of a given type of generating technology with respect to the installed capacity of each technology at the beginning of a period.

Source: ECLAC, on the basis of official data, preliminary actualizations, published in “Istmo Centroamericano: Estadísticas Subsector Eléctrico, Datos Actualizados Septiembre 2002”. Economic Comisión for Latin America and the Caribbean ECLAC, México November 2002.



renewable
energy
& energy
efficiency
partnership





Table 6. Estimates of Maximum Power Demands and Electricity Consumption in Central America

Country	Year	Forecasted Max Power Demand (MW)	Forecasted Electricity Demand (GWh)
Costa Rica	2005	1460	8343
	2014	1931	14000
El Salvador	2005	875	4730
	2014	n.d.	8200
Guatemala	2005	1505	7806
	2010	1967	10400
Honduras	2005	956	5369
	2014	1247	8400
Nicaragua	2005	n.d.	3500
	2014	629	5500
Panamá	2005	1530	6200
	2014	1997	10000

Source: based on the following references: Costa Rica: Baseline Report, Peñas Blancas Hydroelectric Project ICE/OCIC August 2002. El Salvador: Proyección de la demanda de Energía 2001-2005, Unidad de Transacciones, División de Mercado, El Salvador Febrero 2001. Guatemala: Plan Indicativo del Subsector Eléctrico 2001-2005 Ministerio Energía y Minas de Guatemala, 2001. Honduras: Proyecciones de Demanda del SCI, Empresa Nacional de Energía Eléctrica ENEE, Noviembre 2001. Nicaragua: Síntesis Plan Indicativo Inicial del Sector Eléctrico, Comisión Nacional de Energía, Dirección de Políticas Energéticas, Junio 2001. Panamá: Plan de Expansión del Sistema de Generación 1999-2015, Empresa de Trasmisión Eléctrica ETESA, 2000. data adjusted based on information provided by the “Consejo de Electrificación de América Central” as it appears in: Plan Indicativo Regional de Expansión de la Generación para el período 2001-2014. El Salvador, Marzo 2002.

Table 7. Indicative Requirements for Total Capacity Additions in Central America

Period	Capacity Additions (MW)	Comment
2000-2005	2189	Based on existing investment plans show a trend of 62% fósil fuel, 29% hydro and 9% geothermal
2006-2014	5500	Average growth of demand (5.7% year), no participation of natural gas, SIEPAC interconnection shows a trend of 37% fósil fuel, 8% geothermal and 54% hydro
2006-2014	5700	Average growth of demand with natural gas participation through extra regional gas ducts and SIEPAC interconnection shows a trend of 40% fósil fuel, 8% geothermal and 52% hydro
2006-2014	5500	Average growth of demand without natural gas participation and only a first circuit of SIEPAC delayed to 2010 shows a trend of 38% fósil fuel, 8% geothermal and 55% hydro
2006-2014	5000	Average growth of demand, without participation of natural gas and allowing only projects of less than 150 MW, with SIEPAC operating shows a trend of 50% fósil fuel, 10% geothermal and 40% hydro



renewable
energy
& energy
efficiency
partnership



Nota: Information based on CEAC “Consejo de Electrificación de América Central” using the SUPEROLADE model for simulating the electric sector in the region.

Source: Data provided by Consejo de Electrificación de América Central (CEAC) published in: Plan Indicativo Regional de Expansión de la Generación para el período 2001-2014. El Salvador, March 2002.



Table 8. Structure of the Electric Sector Industry in Central America

Level	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panamá
Executive	Ministerio Ambiente y Energía, Dirección Sectorial de Energía (MINAE)	Dirección General de Electricidad (DGE), Ministerio de Economía	Ministerio de Energía y Minas, Dirección General de Energía (MEM)	Secretaría Recursos Naturales y Ambiente, Dirección General de Energía (SERNA)	Comisión Nacional de Energía (CNE)	Comisión de Política Energética (COPE)
Regulatory	Autoridad Reguladora de los Servicios Públicos (ARESEP)	Superintendencia General de Electricidad y Telecomunicaciones (SIGET)	Comisión Nacional de Energía Eléctrica (CNEE)	Comisión Nacional de Energía (CNE)	Instituto Nicaragüense de Energía (INE)	Ente Regulador de los Servicios Públicos (ERSP)
Business						
Generation	2 / 75 IPPs	13 (2 state / 11 IPPs)	22 (1 state / 21 IPPs)	11 (1 state / 10 IPPs)	9	11 IPPs
Transmission	1 Instituto Costarricense de Electricidad (ICE)	1 Empresa de Transmisión de El Salvador S.A. de CV (ETESAL)	1 Empresa de Transporte y Control de Energía Eléctrica (ETCEE) y un operador independiente	1 Empresa Nacional de Energía Eléctrica (ENEE)	1 Empresa Nacional de Transmisión Eléctrica S.A. (ENTRESA)	1 Empresa de Transmisión Eléctrica S.A. (ETESA)
System and Market Operators (SMOs)	Centro Nacional de Despacho	Unidad de Transacciones S.A. de C.V. (UT)	Administración del Mercado Mayorista (AMM)	Empresa Nacional de Energía Eléctrica (ENEE)	Centro Nacional de Despacho de Carga (CNDC)	Centro Nacional de Operación (CON)
Distribution	7	5	16	2	2	3
Marketers	-	4	5	-	Do not exist in the law	-
Large Consumers	-	2	26	-	-	2
Total Number of agents / stakeholders participating in the market/sector	85	25	70	14	12	17

Fuente: Elaboración del autor en base a datos de CEPAL y consultas realizadas en la región al 2001.



renewable
energy
& energy
efficiency
partnership



Nota: Guatemala, El Salvador, Nicaragua y Panamá tienen estructuras de Mercado Mayorista en tanto Costa Rica, y Honduras no han realizado reformas sectoriales.



Table 9. Relevant Legal Frameworks for the Electric Sector in Central America

Country	Laws	Date	Norms	Dates
Costa Rica	Ley de Creación del Instituto Costarricense de Electricidad (Decreto Ley 449)	8/4/1949	Each one of the laws has a normative guide	different
	Ley de Concesión de Servicios Públicos (Ley No 7329)	1993		
	Ley de Generación Privada (Ley No 7200)	1990		
	Decreto Ley Modificación Ley No 7200 (Ley No 7508)	1995		
	Existen otras relativas a la creación y regulación de ICE, CNFL, empresas municipales y cooperativas			
El Salvador	Ley General de Electricidad (Decreto No 843)	21/10/1996	Reglamento de Operación del Sistema de Transmisión y del Mercado Mayorista (Acuerdo SIGET No E-13-99)	19/7/1999
Guatemala	Ley General de Electricidad (Decreto No 93-96)	13/11/1996	Reglamento del Administrador del Mercado Mayorista (Acuerdo Gubernativo No 299-98)	25/5/1998
Honduras	Ley Marco Sub Sector Eléctrico (Decreto No 158-94) y Decretos 267-98 y 9-2001	1994	Reglamento Ley Marco Sub Sector Eléctrico (Decretos 131-98, 89-98)	1998
Nicaragua	Ley de la Industria Eléctrica (Ley No 272)	20/04/1998	Normativa de Operación (Resolución INE, ING-03)	09/11/2000
Panamá	Marco Regulatorio e Institucional para la Prestación del Servicio Público de Electricidad (Ley No 6)	03/02/1997	Reglamento de Operación (ERSP Resolución JD-605 y sus modificaciones)	24/4/1998

Note: Names of Laws and Legislation as well as respective Norms and Decrees appear in Spanish. There may be additional legislation that is not cited here.



Table 10. State of Electric Sector Reforms in Central

Type of Reform	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panamá
Participation of IPPs selling to a single buyer in the sector (the state)	1990 Law 7200/7508, qualifying possible suppliers of renewable energy projects	1994 Starts with PPAs signed with fossil fuel based IPPs	1991 Starts with PPAs signed with fossil fuel based PPAs	1993 Starts with PPAs signed with fossil fuel based PPAs	1996 Starts with PPAs signed with fossil fuel based PPAs	1997 Starts with PPAs signed with fossil fuel based PPAs
Competition in a Wholesale Market (WEM)	No	Yes, 1996 Law	Yes, 1996 Law	No, even though a Law was passed in 1994	Yes, 1998 Law	Yes, 1997 Law
Competition in Retail Electricity Market	No	Yes, 1996 Law	No	No	No	No

Fuente: Tomiak,R and Millán, J. Sustainability of Reform in Central America: Market Convergence and Regional Integration. Interamerican Development Bank, Washington D.C. 2002.

Table 11. Indicators of the Electric Sector Reform Processes in Central America

Indicator	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panamá
Existence of a Legal Framework for Reform/Liberalization of the Sector	No	Yes	Yes	Under analysis	Yes	Yes
Existence of “Anti-Trusts” legislation	Yes	No	No	No	No	Yes
Existence of a Derregulation program	No	No	No	No	No	5 year transition period
Degree of Legal Openess	None	Full	Full	Not Clear	Full	Full
Type of Regulatory Authority	Multi-sectorial	Multi-sectorial	Sectorial	Sectorial	Sectorial	Multi-sectorial
Independence of Regulators	Yes	No	No	No	Limited	Yes

Fuente: Tomiak,R and Millán, J. Sustainability of Reform in Central America: Market Convergence and Regional Integration. Interamerican Development Bank, Washington D.C. 2002.



renewable
energy
& energy
efficiency
partnership



Available Web Sites with Information on the Energy/Electric Sector

in Central America

GUATEMALA

1. Administrador del Mercado Mayorista, www.amm.org.gt
2. Comisión nacional de Energía Eléctrica, www.cnee.org.gt
3. Ministerio de Energía y Minas, www.mem.gob.gt
4. Instituto Nacional de Electrificación, www.inde.gob.gt

HONDURAS

5. Empresa Nacional de Energía Eléctrica, www.enee.hn

EL SALVADOR

6. Ministerio de Economía, www.minec.gob.sv
7. Unidad de Transacciones, www.ut.com.sv
8. Comisión Ejecutiva Electrificación Lempa, www.cel.gob.sv
9. Superintendencia General de Electricidad y Telecomunicaciones www.siget.gob.sv

NICARAGUA

10. Comisión Nacional de Energía, www.cne.gob.ni
11. Instituto Nicaragüense de Electricidad, www.ine.gob.ni
12. Centro Nacional de Despacho de Carga, www.cndc.org.ni

COSTA RICA

13. Instituto Costarricense de Electricidad, www.ice.go.cr
14. Compañía Nacional de Fuerza y Luz, www.cnfl.go.cr
15. Autoridad Reguladora de los Servicios Públicos, www.aresep.go.cr

PANAMA

16. Ente Regulador de los Servicios Público, www.enteregulador.gob.pa
17. Empresa de Transmisión de Electricidad, www.etsa.com.pa

REGIONALES

18. Consejo de Electrificación de América Central, www.ceac-ca.org.sv
19. Comisión Económica para América Latina, www.eclac.cl/mexico
20. Banco Interamericano de Desarrollo, www.iadb.org
21. Banco Mundial, www.wb.org



renewable
energy
& energy
efficiency
partnership



22. World Resources Institute, www.wri.com
23. Biomass Users Network-Central America, www.bun-ca.org
24. FENERCA, www.fenerca.org
25. International Energy Agency, www.iea.org
26. Centro Internacional Política Económica UNA, <http://cinpe.una.ac.cr/ecomap>